

Accidents in Building Engineering in the European Union Countries in the Years 2008 - 2014

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Abstract. According to the ESAW ¹, an accident at work is an event that results in physical or mental harm to the person doing the work. As a result of this incident, fatal accidents may occur (which in the course of one year lead to death of the victim) or non-fatal accidents (that imply at least four full calendar days of absence from work). In the paper the authors present the number and the analysis of the causes of accidents at work in the construction industry in the years 2008 - 2014 in 28 countries of the European Union. The descriptive statistics method was used to achieve the intended goal. The accident rate indicator for individual European Union countries has been shown in the analyzed period. The structure and trends of accidents during the period under investigation, divided into two groups: fatal accidents and non-fatal accidents, were presented. Both groups were analyzed for what caused them and what factors affected the quantity (Age of the victim, work experience, month of occurrence). On the basis of the analyzed causes and factors causing accidents in the construction industry in years 2008 - 2014, the classification of EU countries has been shown in terms of accidents. The paper was concluded with a summary.

1. Introduction

The aim of the article is to present the problem of accidents in the construction industry in 28 European Union countries. The analysis was conducted for accidents that occurred in the years 2008-2014. The structure and trend of accidents during the analyzed period, divided by fatal accidents and non-fatal accidents, were presented. In both groups of cases, the cause of their occurrence was analyzed and the factors influencing their number (age of the victim, job seniority, month of occurrence). On the basis of the analyzed causes and factors causing accidents in the construction industry in 2008-2014, the classification of the EU Member States has been shown in terms of accidents. The objective was achieved using the descriptive statistics method.

¹ European Statistics on Accidents at Work.



2. Accidents in 2008-2014

Construction has been seen for many years as one with significant levels of occupational risk [1,2,3,5,6]. The number of accidents is shown in Table 1.

Table 1. Number of accidents² at work in 2008-2014.

Specification: a) accidents in overall economy b) accidents in construction		Year						
		2008	2009	2010	2011	2012	2013	2014
European Union								
	a)	3.856.434	3.534.240	3.586.077	3.418.876	3.169.332	3.131.220	3.180.379
	b)	627.571	549.813	505.581	480.826	419.283	379.033	370.579
Belgium								
	a)	76.610	66.483	67.337	65.108	58.467	56.471	65.639
	b)	12.740	11.486	10.996	11.193	9.985	9.185	8.555
Bulgaria								
	a)	3.188	2.572	2.423	2.351	2.376	2.251	2.363
	b)	423	337	258	275	245	220	244
Czech Republic								
	a)	99.652	66.516	65.230	42.669	41.419	44.200	42.424
	b)	7.721	6.034	5.593	3.385	3.056	3.150	2.784
Denmark								
	a)	71.335	61.423	62.564	57.685	57.808	55.970	54.195
	b)	8.908	7.088	6.841	6.791	7.058	6.640	6.471
Germany								
	a)	944.615	861.286	931.014	887.356	855.18	852.505	847.870
	b)	125.881	127.744	112.295	125.418	117.0061	105.132	114.594
Estonia								
	a)	7.249	5.032	5.573	5.944	5.861	6.195	6.304
	b)	2.094	935	1.033	1.074	1.074	878	847
Ireland								
	a)	18.129	11.430	19.336	16.797	15.327	18.089	18.162
	b)	3.180	736	2.480	2.408	1.408	942	1.282
Greece								
	a)	24.275	19.910	15.493	13.527	11.109	9.698	3.438
	b)	6.001	4.332	3.407	2.455	1.665	1.352	423
Spain								
	a)	689.660	535.846	494.127	445.827	356.110	370.446	387.719
	b)	162.332	104.322	85.613	69.053	44.960	37.623	38.322
France								
	a)	637.646	590.551	593.529	612.356	587.666	567.960	725.251
	b)	109.479	102.453	98.155	98.888	92.268	86.211	83.062
Croatia								
	a)	:	:	11.938	13.606	11.207	11.738	11.695
	b)	:	:	1.295	1.372	719	1.016	951
Italy								
	a)	504.211	448.219	438.539	406.509	359.967	329.921	313.834
	b)	78.339	67.472	59.803	50.507	39.975	37.863	33.110
Cyprus								
	a)	2.367	2.227	2.184	2.010	1.741	1.538	1.618
	b)	649	562	539	418	328	250	185
Latvia								
	a)	1.748	1.187	1.220	1.387	1.541	1.738	1.766
	b)	226	119	102	137	174	157	151
Lithuania								
	a)	3.235	2.068	2.316	2.676	2.866	3.101	3.175
	b)	601	266	285	371	363	357	366
Luxembourg								
	a)	8.143	6.884	6.998	7.142	7.177	7.061	7.193
	b)	2.650	2.187	2.235	2.364	2.432	2.238	2.342

² An accident is considered as an event resulting in a 4 - day absence.

Table 1 continued.

Hungary								
	a)	22.454	18.664	20.085	17.384	20.542	18.954	19.572
	b)	1.338	1.132	1.066	870	986	813	784
Malta								
	a)	3.216	2.756	2.754	2.460	2.536	2.605	2.636
	b)	562	504	539	466	444	394	461
Netherlands								
	a)	184.227	177.42	183.084	170.664	165.468	152.256	88.009
	b)	18.023	10.5914	16.797	11.157	18.374	10.477	7.145
Austria								
	a)	73.160	64.223	78.595	70.551	67.169	64.789	65.544
	b)	14.620	12.757	12.862	12.647	12.430	11.989	11.842
Poland								
	a)	96.838	79.952	86.271	88.145	87.095	77.616	76.537
	b)	10.131	8.333	8.699	8.854	7.961	6.315	5.918
Portugal								
	a)	147.570	135.315	130.475	126.104	113.348	123.297	130.313
	b)	:	33.312	31.485	27.608	19.746	18.426	19.295
Romania								
	a)	5.056	3.969	4.103	3.516	3.557	3.722	3.668
	b)	892	671	553	501	462	457	489
Slovenia								
	a)	20.213	17.155	16.391	15.001	14.319	12.557	12.339
	b)	3.185	2.709	2.315	1.869	1.666	1.411	1.457
Slovakia								
	a)	11.694	9.216	9.174	8.826	8.536	8.796	8.592
	b)	936	746	659	541	511	468	446
Finland								
	a)	57.407	46.338	48.300	52.935	46.958	47.454	:
	b)	9.690	7.677	7.994	8.048	7.832	7.492	:
Sweden								
	a)	34.481	31.461	34.255	34.649	36.143	36.223	35.336
	b)	3.092	2.908	3.259	3.353	3.359	3.474	4.113
United Kingdom								
	a)	255.625	266.132	252.769	245.690	227.837	244.069	245.187
	b)	43.878	32.400	28.422	28.804	22.796	24.119	24.938
Great Britain								
	a)	219.358	:	:	:	:	:	:
	b)	22.340	:	:	:	:	:	:
Iceland								
	a)	:	:	:	:	1.580	:	:
	b)	:	:	:	:	80	:	:
Norway								
	a)	56.568	51.670	38.706	26.464	45.715	22.855	10.169
	b)	6.876	6.064	4.674	3.276	5.575	2.764	1.378
Switzerland								
	a)	73.730	76.055	79.282	84.264	85.491	86.116	86.420
	b)	17.350	17.759	18.592	19.831	19.739	20.786	21.076

Source: The authors' study based on published data [4].

It is clear from Table 1 that in the years 2008-2014, the European Union experienced a greater decline in construction work accidents than the overall economy. The drop was 40.95% for the construction industry and 17.53% for the economy. Only in Sweden and Switzerland in the analyzed period was the increase in accidents at work for the whole economy and for the construction industry. The increase was:

- for overall economy:
 - a) Sweden 3.48 %,
 - b) Switzerland 17.21%,
- for construction:

- a) Sweden 33.02 %,
b) Switzerland 21.48 %.

The decrease or increase in accidents at construction work in 2014 in comparison with 2008 is shown in Figure 1.

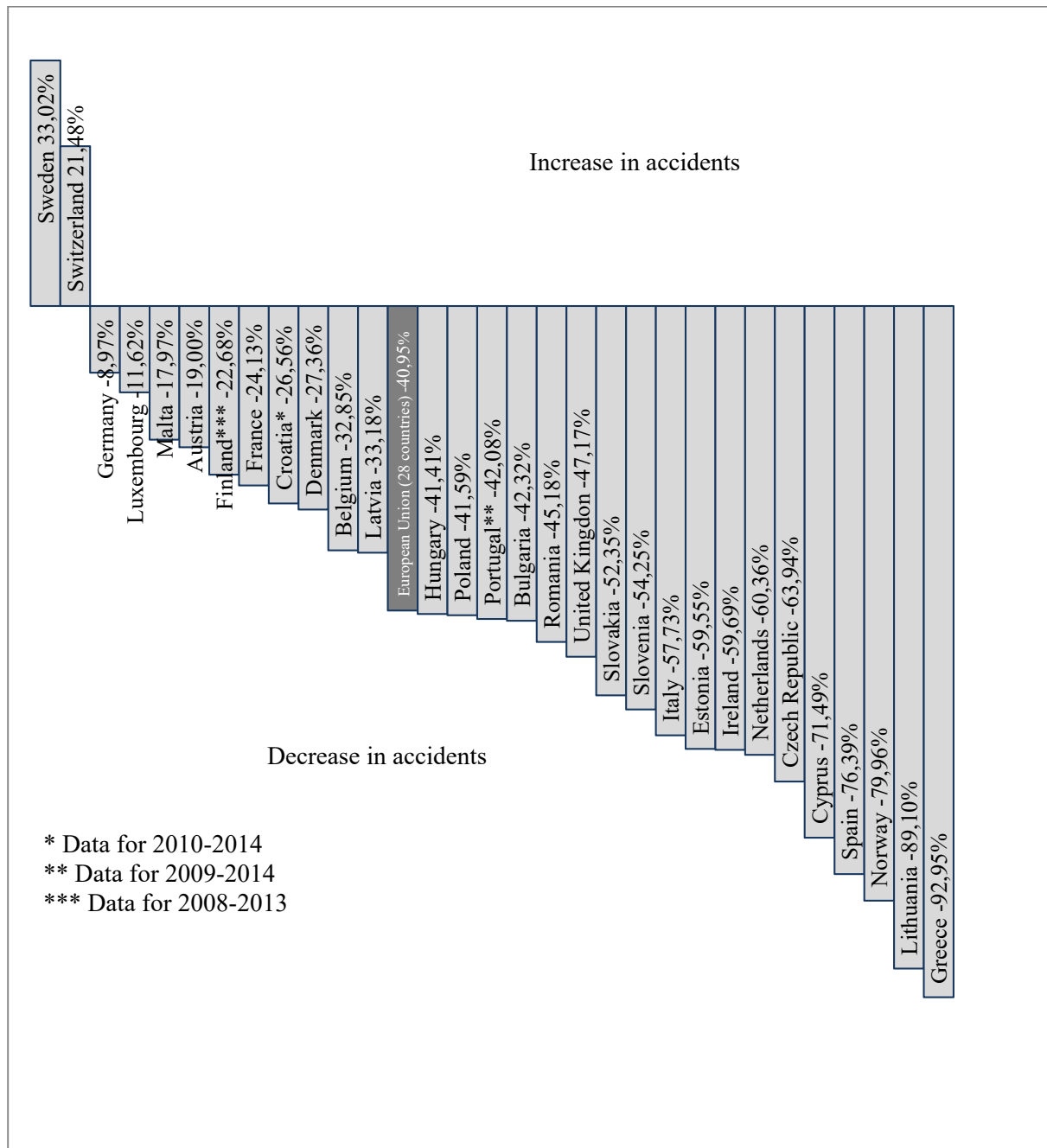


Figure 1. Decrease/increase in occupational accidents in construction in 2014 compared to 2008, Source: The authors' study based on published data [4].

The large decrease in work-related accidents in construction in the European Union countries has been caused by a significant reduction in accidents in 12 countries, which amounted to more than 50%.

The share of construction in accidents at work in relation to the total accident presents In each European Union country is presented in table 2.

Table 2. The share of construction accidents at work, in relation to the total number of accidents in 2008 – 2014.

Specific	% share per year						
	2008	2009	2010	2011	2012	2013	2014
European Union	16.27	15.56	14.10	14.06	13.23	12.10	11.65
Belgium	16.18	17.28	16.33	17.20	17.08	16.27	13.04
Bulgaria	13.27	13.11	10.65	11.70	10.32	9.78	10.33
Czech Republic	7.75	9.08	8.58	7.94	7.38	7.13	6.57
Denmark	12.49	11.54	10.94	11.78	12.21	11.87	11.94
Germany	13.33	14.84	12.07	14.14	13.69	12.34	13.52
Estonia	28.89	18.59	18.54	18.07	18.33	14.18	13.44
Ireland	17.54	6.44	12.83	14.34	9.19	5.21	7.06
Greece	24.72	21.76	21.99	18.15	14.99	13.99	12.31
Spain	23.54	19.47	17.33	15.49	12.63	10.16	9.89
France	17.17	17.35	16.54	16.15	15.70	15.18	11.46
Croatia	:	:	10.85	10.09	6.42	8.66	8.14
Italy	15.54	15.06	13.64	12.43	11.11	11.48	10.55
Cyprus	27.42	25.24	24.68	20.80	18.84	16.26	11.44
Latvia	12.93	10.03	8.36	9.88	11.30	9.04	8.55
Lithuania	18.58	12.87	12.31	13.87	12.67	11.52	11.53
Luxembourg	32.54	31.77	31.94	33.10	33.89	31.70	32.56
Hungary	5.96	6.07	5.31	5.00	4.80	4.20	4.01
Malta	17.48	18.29	19.57	18.94	17.51	15.12	17.49
Netherlands	9.78	5.96	9.17	6.53	11.10	6.88	8.12
Austria	19.98	19.86	16.36	17.93	18.51	18.50	18.07
Poland	10.46	10.42	10.08	10.04	9.14	8.14	7.73
Portugal	:	24.62	24.13	21.89	17.42	14.94	14.81
Romania	17.64	16.91	13.48	14.25	12.99	12.28	13.33
Slovenia	15.76	15.79	14.12	12.46	11.63	11.24	11.81
Slovakia	8.00	8.09	7.18	6.13	5.99	5.32	5.19
Finland	16.88	16.57	16.55	15.20	16.68	15.79	:
Sweden	8.97	9.24	9.51	9.68	9.29	9.59	11.64
United Kingdom	17.16	12.17	11.24	11.72	10.01	9.88	10.17
Great Britain	10.18	:	:	:	:	:	:
Iceland	:	:	:	:	5.06	:	:
Norway	12.16	11.74	12.08	12.38	12.20	12.09	13.55
Switzerland	23.53	23.35	23.45	23.53	23.09	24.14	24.39

Source: The authors' study based on published data [4].

Table 2 shows that in the years 2008-2014 the share of construction in occupational accidents in relation to the number of accidents in the entire economy of the European Union countries tends to decrease (Figure 2). Not applicable to the following countries: Germany, Luxembourg, Malta, Sweden, Norway, Switzerland. In these countries in 2014, the share of construction in occupational

accidents increased in relation to the economy as a whole. Compared to 2008, the largest drop in the share of construction in occupational accidents in the whole economy in 2014 occurred in Ireland, Cyprus, Spain. The largest increase in the year of 2014 compared to 2008 was the increase in the share of construction in accidents Sweden reported.

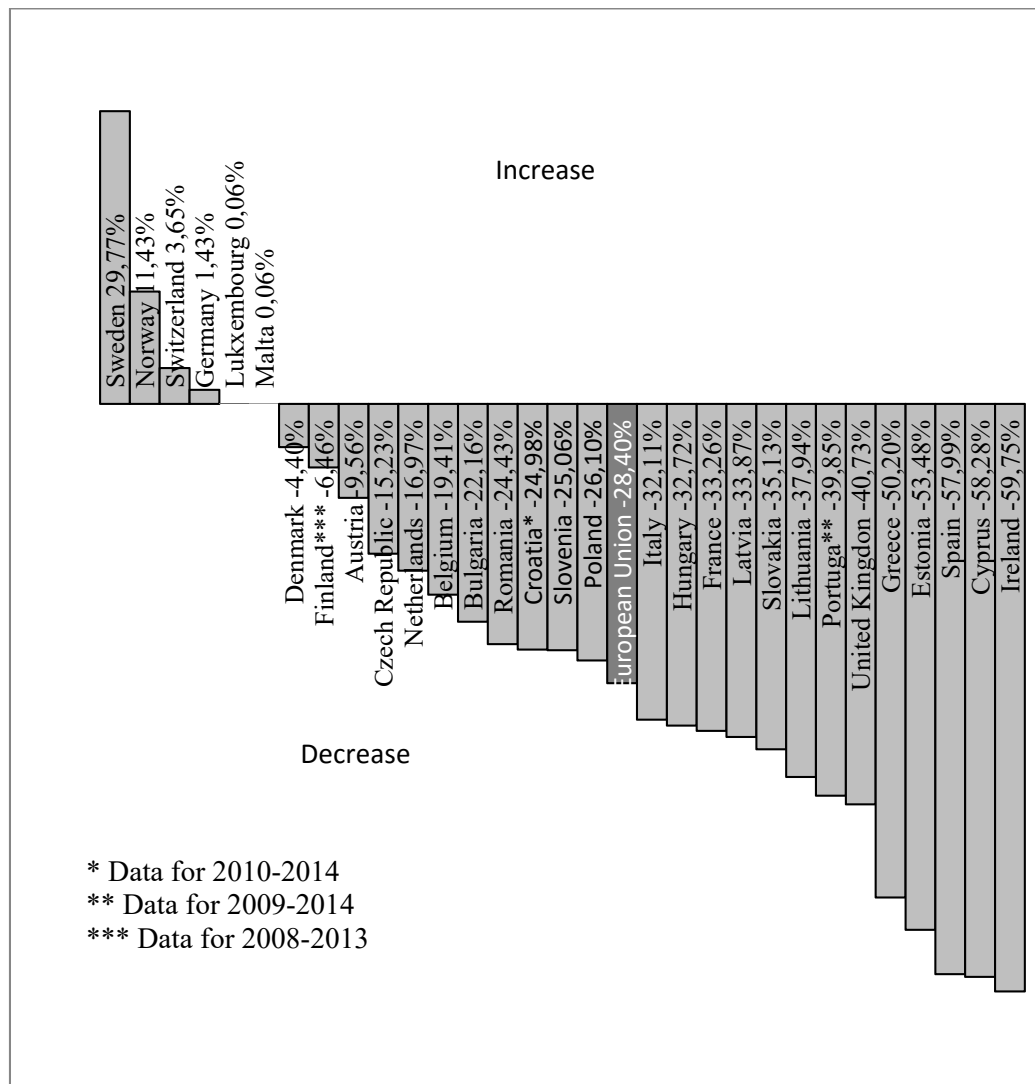


Figure 2. Decrease / increase in 2014, compared to 2008, share of construction in accidents at work.
 Source: The authors' based on published data [4].

The structure of accidents at work in construction in 2008-2014 is presented in table 3. In 28 EU countries in the years 2008-2014, the share of fatal accidents in all cases at work in construction has a slight upward trend. The share of fatalities in 2014, compared to 2008, increased by 5.00%.

Table 3. The structure of accidents at work in construction in 2008-2014.

Specification a) fatal accidents b) non-fatal accidents	% share per year						
	2008	2009	2010	2011	2012	2013	2014
European Union							
a)	0.20	0.21	0.21	0.20	0.21	0.21	0.21
b)	99.80	99.79	99.79	99.80	99.79	99.79	99.79
Belgium							
a)	0.19	0.18	0.20	0.17	0.14	0.22	0.14
b)	99.81	99.82	99.80	99.83	99.86	99.78	99.86
Bulgaria							
a)	12.29	8.61	10.47	6.91	6.53	9.09	9.02
b)	87.71	91.39	89.53	93.09	93.47	90.91	90.98
Czech Republic							
a)	0.74	0.31	0.48	0.86	0.72	0.86	1.01
b)	99.26	99.69	99.52	99.14	99.28	99.14	98.99
Denmark							
a)	0.12	0.11	0.12	0.12	0.07	0.05	0.06
b)	99.88	99.89	99.88	99.88	99.93	99.95	99.94
Germany							
a)	0.10	0.07	0.08	0.09	0.08	0.08	0.09
b)	99.90	99.93	99.92	99.91	99.92	99.92	99.91
Estonia							
a)	0.29	0.53	0.39	0.37	0.28	0.68	0.59
b)	99.71	99.47	99.61	99.63	99.72	99.32	99.41
Ireland							
a)	0.41	1.22	0.20	0.21	0.50	1.06	1.65
b)	99.59	98.78	99.80	99.79	99.50	98.94	98.35
Greece							
a)	0.43	0.42	0.38	0.65	0.66	0.59	1.65
b)	99.57	99.58	99.62	99.35	99.34	99.41	98.35
Spain							
a)	0.11	0.12	0.12	0.15	0.15	0.15	0.15
b)	99.89	99.88	99.88	99.85	99.85	99.85	99.85
France							
a)	0.07	0.13	0.12	0.13	0.13	0.15	0.15
b)	99.93	99.87	99.88	99.87	99.87	99.85	99.85
Croatia							
a)	:	:	1.08	1.09	2.50	0.79	0.63
b)	:	:	98.92	98.91	97.50	99.21	99.37
Italy							
a)	0.23	0.27	0.31	0.28	0.28	0.27	0.32
b)	99.77	99.73	99.69	99.72	99.72	99.73	99.68
Cyprus							
a)	0.77	0.36	1.67	0.24	0.61	1.60	0.54
b)	99.23	99.64	98.33	99.76	99.39	98.40	99.46
Latvia							
a)	5.31	5.88	4.90	7.30	6.32	1.91	3.31
b)	94.69	94.12	95.10	92.70	93.68	98.09	96.69
Lithuania							
a)	3.49	4.14	2.11	3.50	4.41	4.76	3.28
b)	96.51	95.86	97.89	96.50	95.59	95.24	96.72
Luxembourg							
a)	0	0.18	0.09	0.08	0.08	0.04	0.09
b)	100.00	99.82	99.91	99.92	99.92	99.96	99.91
Hungary							
a)	3.06	2.65	2.44	2.07	1.83	2.21	2.42
b)	96.94	97.35	97.56	97.93	98.17	97.79	97.58
Malta							
a)	0.18	0.40	0.37	0	1.35	0.25	0.22
b)	99.82	99.60	99.63	100.00	98.75	99.75	99.78
Netherlands							
a)	0.22	0.23	0.09	0.07	0.04	0.07	0.07
b)	99.78	99.77	99.91	99.93	99.96	99.93	99.93
Austria							
a)	0.19	0.31	0.16	0.08	0.25	0.20	0.13
b)	99.81	99.69	99.84	99.92	99.75	99.80	99.87

Table 3 continued.

Poland								
	a)	1.23	1.42	1.31	1.12	1.03	1.12	0.93
	b)	98.77	98.58	98.69	98.88	98.97	98.88	99.07
Romania								
	a)	15.25	17.14	17.18	11.78	14.07	12.25	13.70
	b)	84.75	82.86	82.82	88.22	85.93	87.75	86.30
Slovenia								
	a)	0.28	0.44	0.52	0.27	0.42	0.35	0.48
	b)	99.72	99.56	99.48	99.73	99.58	00.65	99.52
Slovakia								
	a)	1.92	1.88	0.46	0.55	2.54	1.50	1.57
	b)	98.08	98.12	99.54	99.45	97.46	98.50	98.43
Finland								
	a)	0.06	0.10	0.09	0.05	0.11	0.05	:
	b)	99.94	99.90	99.91	99.95	99.89	99.95	:
Sweden								
	a)	0.55	0.31	0.18	0.18	0.19	0.21	0.20
	b)	99.45	99.69	99.82	99.82	99.81	99.79	99.80
United Kingdom								
	a)	0.11	0.13	0.18	0.18	0.19	0.21	0.20
	b)	99.89	99.87	99.82	99.18	99.81	99.79	99.80
Great Britain								
	a)	0.13	:	:	:	:	:	:
	b)	99.87	:	:	:	:	:	:
Iceland								
	a)	:	:	:	:	0	:	:
	b)	:	:	:	:	100.00	:	:
Norway								
	a)	0.12	0.18	0.19	0.34	0.18	0.36	0.80
	b)	99.88	99.82	99.81	99.66	99.82	99.64	99.20
Switzerland								
	a)	0.16	0.11	0.10	0.06	0.11	0.09	0.10
	b)	99.84	99.89	99.90	99.94	99.89	99.91	99.90

Source: The authors' based on published data [4].

This has led to an increase in the share of fatal accidents in 11 EU countries. In 2014, the increase in the proportion of fatal accidents in all cases at work in construction compared to 2008 was recorded in:

- Norway 566.67 %.
- Ireland 302.44 %.
- Greece 283.72 %.
- France 114.29 %.
- Estonia 103.45 %.
- United Kingdom 81.82 %.
- Slovenia 71.43 %.
- Italy 39.13 %.
- Czech Republic 36.49 %.
- Spain 36.36 %.
- Malta 22.22 %.

The largest share of fatal accidents in the years 2008-2014 in all construction work cases was recorded in Romania and the smallest in Germany.

The number of fatal and non-fatal accidents in 2008-2014, according to the size of the construction company in the 28 EU countries, is shown in Figure 3.

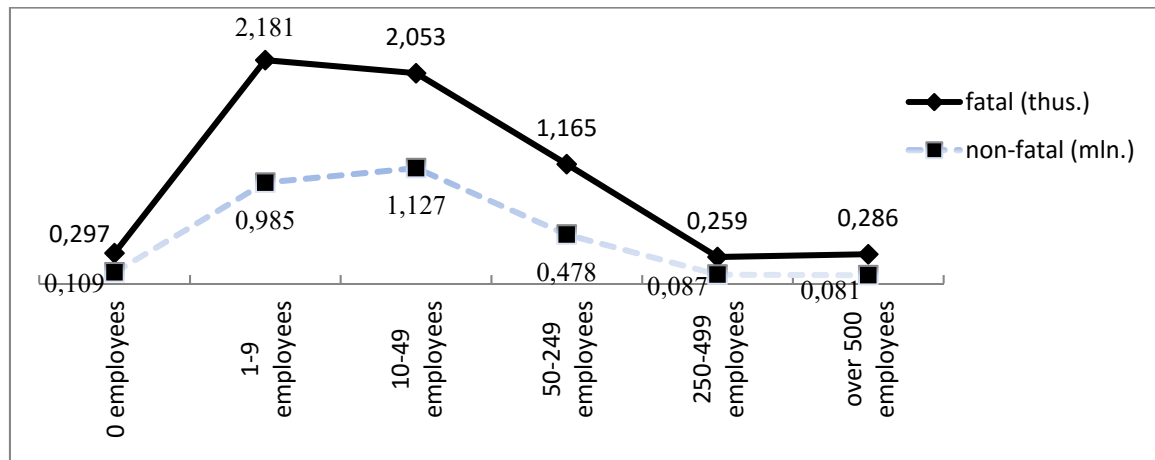


Figure 3. Fatal and non-fatal accidents in 2008-2014 in construction companies. Source: The authors' based on published data [4].

Most fatal and non-fatal accidents in the years 2008-2014 occurred in construction companies employing 1-9 and 10-49 employees. They accounted for 67.84% of all fatalities and 73.66% of all non-fatal accidents in the years 2008-2014. The most fatal accidents occurred in Italy (501 accidents) in companies employing 1 to 9 employees. In the case of non-fatal accidents, most accidents at work in construction occurred in Germany (312,272 accidents) in companies employing 10-49 employees.

An important indicator in the assessment of the number of accidents at work is the rate of accidents. The accident rate for construction in 2008-2014 is shown in figure 4.

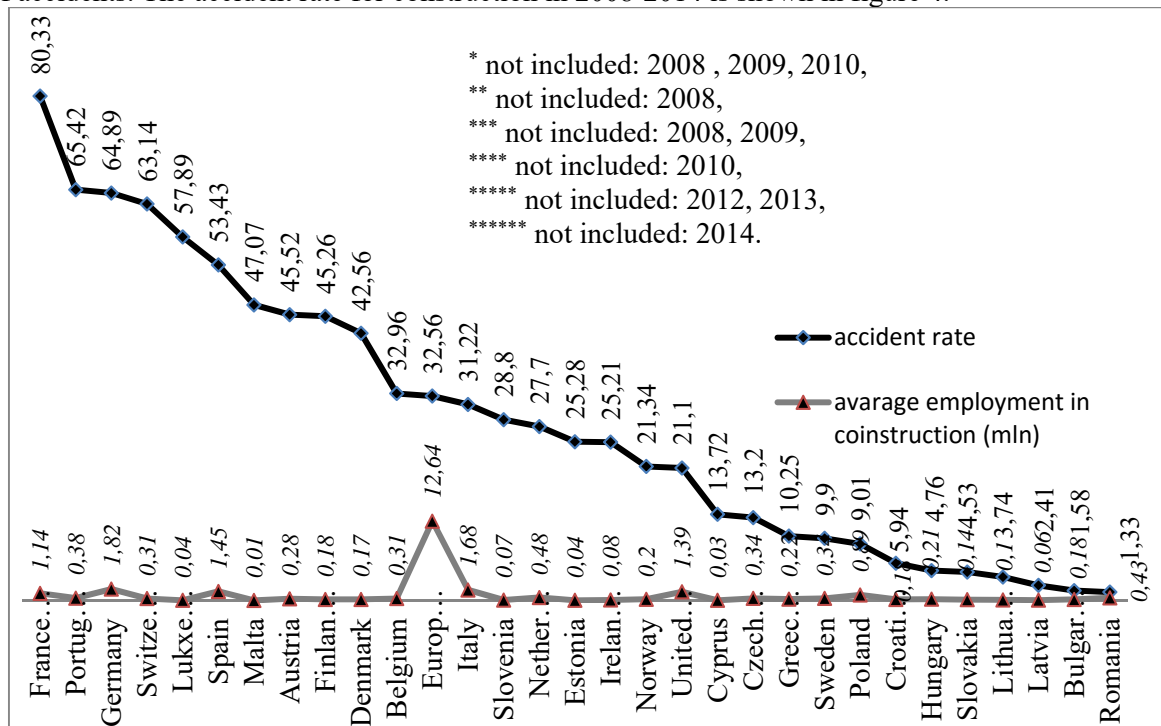


Figure 4. Accident rate and average employment in construction in 2008-2014. Source: The authors' based on published data [4].

Figure 4 shows clearly that the number of employees in construction has no significant impact on accident rates. Attention should be paid to the fact that the accident rate is highest in these European Union countries where migration has occurred.

3. Conclusions

An analysis of accidents in construction in 28 EU countries, 2008-2014, allows the following conclusions to be drawn:

- 1) In the analyzed period there was a greater decrease in accidents at construction work than in the whole economy. Only Sweden and Switzerland recorded an increase in accidents at work both in construction and in the economy as a whole.
- 2) The share of construction in occupational accidents tends to decrease in all accidents that occurred in the economy of the European Union.
- 3) In 2014 there was a 5.00% increase in the share of fatalities in all accidents compared to 2008.
- 4) Most fatal accidents occurred in companies employing 1-9 employees and non-fatal accidents in companies employing 10-49 employees.
- 5) Size of employment on construction companies had no impact on accident rates.

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