SITUATION OF STEEL INDUSTRY IN EUROPEAN UNION

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Abstract

The aim of this article is to present the situation of the steel industry in European Union countries, and to show the impact of economic conditions on this sector. The study covers the period from 2005 to 2014. The EU steel industry underwent restructuring and was under strong influence of fluctuations caused by the economic crisis in 2009. The findings of the study indicate that steel production was strongly linked to the economic situation, measured by the value of the GDP, exports, imports and the value of household consumption. The only exception were industrial production and construction which did not indicate such a strong link. The largest steel producer in the European Union was Germany. The industry showed a high concentration because 75% of the total EU production was generated by 7 countries.

Keywords: Steel industry, macroeconomic indicators, steel production

1. INTRODUCTION

Apart from concrete and wood, steel is one of the most important construction materials. The advantages of this material include wide range of possible applications, affordable prices and recyclability [1]. Iron and steel sectors are treated as separate branches of industry in EU documents [2]. According to numerous authors, one of the factors affecting economic advancement is the development of the steel industry. At the same time, the volume of steel production may be regarded as an indicator of the condition of the economy. The increase in demand for steel products is believed to be closely associated with the development of the construction, transport, machine and automotive industries, as well as manufacturing of household appliances and other types of activity. An increase or decrease in demand for steel products results in the increase or decrease in crude steel production since it is mostly produced in the framework of contracts [3, 4]. The steel market is not an isolated one, and the variables in this market are affected by other global factors. Many authors, e.g. [5], [6], [7], [8], [9] believe that the demand for steel, and as a result, the volume of its production, is linked to changes in GDP and the developments in industrial production on a global and national scale. It is reported that one of the key measures of the development of the steel market is the so-called S-curve for steel, which shows the relationship between GDP per capita and the consumption of finished steel products per capita for each country. Historical observations in North America and Western Europe indicate that the consumption of steel tended to increase rapidly whenever the GDP per capita began to grow, reaching its peak with GDP per capita of approx. USD 20,000, and tended to decline whenever the country entered a stage of less intensive development in terms of demand for steel [10].

The first problems on the European steel market emerged in the third quarter of 2005. At that time, many companies temporarily reduced their production. The decrease in production was only temporary because already in the fourth quarter of 2005, there was a renewed increase in steel production which continued until the third quarter of 2008. The first signs of weakening demand for steel products were visible in the second half of 2008, and steel companies began to feel the effects of the downturn. As a result, the prices of crude steel dropped rapidly. During the economic crisis, metallurgical companies reduced their production, which resulted in the decreased demand for raw materials [11]. In Europe, steel production continued to decrease until the first quarter of 2009. Production began to grow again in the second quarter of 2009, experiencing a temporary drop in the third quarter of 2010 [12].

In global terms, the largest steel producer was China, followed by the European Union [13]. In general, it should be noted that steel production was heavily concentrated. In 2014 only 65 countries accounted for more than 98% of world crude steel production. For the past decade, the steel industry was dominated by events in China. The evidence is that the steel industry is now entering a period of pause before undoubtedly picking up again when markets other than China drive new demand. China represents around 48% of the global market for steel [14]. The EU is the second largest producer of steel in the world, with an output of over 177 million tonnes of steel a year, accounting for 11% of global output. Steel industry has a significant cross-border dimension: 500 production sites are split between 23 Member States, making it a truly European industry. The European steel sector finds itself in a very difficult situation. The economic crisis has led to a marked downturn in manufacturing activity and associated steel demand [15]. As a result, several production sites have closed or reduced output with corresponding job losses, with up to 40 000 jobs lost in recent years. Consequently the pressure to restructure and reduce production capacity will remain one of the main challenges for this industry in the foreseeable future. On the production side, whereas innovation remains key to developing new products and markets and increasing efficiency, access to and prices of raw materials and energy will, inter alia, determine future trends and for import-dependent Europe the trends in these prices look set to continue rising [16].

2. METHODOLOGICAL BASES

The main purpose of this paper is to determine the relationship between the steel industry in European Union countries and the overall economic situation. In addition, specific objectives have been adopted, including presentation of the situation in the steel industry in its various aspects and illustration of the influence of the market and economic situation on steel production in EU countries. The period covered by the study is between 2005 and 2014, i.e. the years directly before the economic crisis, during the crisis, and the years of economic upturn. The sources of materials include literature, figures from the EUROFER and World Steel Association. The following methods have been used in this paper: descriptive, graphic and the Pearson linear correlation coefficient.

3. RESULTS

In the years 2005-2014, production of crude steel in EU countries decreased significantly (see **Figure 1**). A significant decline in steel production was observed in 2009, during the onset of the economic crisis (a decrease by 30%). Having recovered from the economic crisis, steel production remained at a level of approx. 1700 million tonnes a year, however, this result represented merely 80% of steel production in 2007. Throughout the period in question, the EU-15 countries invariably generated approx. 85% of the entire production, which points to a significant role of highly developed countries in the production of crude steel.

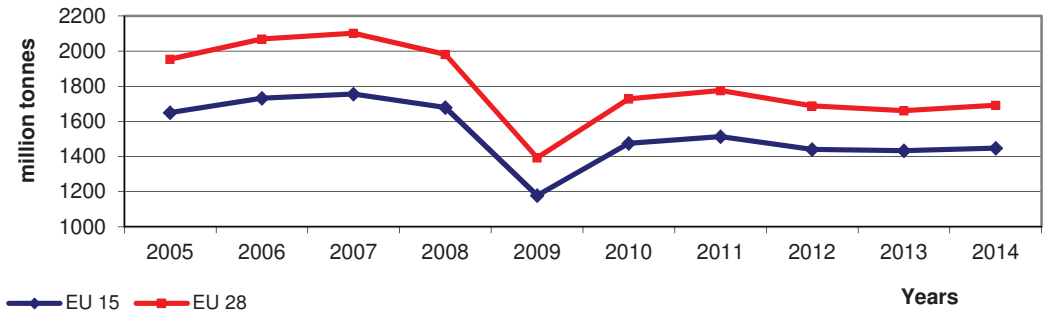

Figure 1 Production of crude steel in EU-15 and EU-28 countries in 2005-2014 (million tonnes)
Source: Own analyses based on data of EUROFER and World Steel Association.

Table 1 Production of crude steel in EU countries in 2005-2014 (thousand tons)

Countries	Production of crude steel in 2005-2014 (thousand tons)									
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Germany	44524	47224	48550	45833	32670	43830	44284	42661	42645	42943
Italy	29350	31624	31553	30590	19848	25750	28735	27252	24093	23714
France	19481	19852	19250	17879	12840	15414	15780	15607	15685	16143
Spain	17826	18391	18999	18640	14358	16343	15504	13639	14130	14187
United Kingdom	13239	13871	14317	13521	10079	9706	9478	9753	11874	12061
Poland	8336	10008	10632	9728	7129	7993	8779	8366	7950	8541
Austria	7031	7129	7578	7594	5662	7206	7474	7421	7953	7876
Belgium	10420	11631	10692	10673	5635	7973	8026	7301	7093	7331
Netherlands	6919	6372	7368	6853	5194	6651	6937	6879	6713	6964
Czech Republic	6189	6862	7059	6387	4594	5179	5583	5072	5152	5360
Slovak Republic	4485	5093	5089	4489	3747	4588	4242	4403	4511	4705
Sweden	5723	5466	5673	5164	2778	4817	4829	4289	4372	4514
Finland	4739	5054	4431	4417	3078	4030	3986	3759	3517	3807
Romania	6280	6266	6261	5035	2686	3613	3645	3292	2985	3158
Luxembourg	2194	2802	2858	2582	2141	2548	2521	2208	2089	2193
Portugal	1408	1719	1853	2017	1614	1543	1942	1960	2050	2070
Hungary	1958	2084	2227	2097	1403	1678	1732	1542	883	1131
Greece	2266	2416	2554	2477	2000	1821	1934	1247	1030	1022
Slovenia	583	628	638	642	430	606	665	666	654	641
Bulgaria	1949	2102	1909	1330	726	744	835	633	523	612
Latvia	688	690	696	635	692	655	568	805	198	220
Croatia	73	81	75	89	43	95	96	1	135	167

Source: Data of EUROFER and World Steel Association.

Table 1 shows crude steel production in most EU countries, excluding those with very low volumes of production of this raw material. The list includes 22 countries, and excludes: Cyprus, Denmark, Estonia, Ireland, Lithuania and Malta. The largest producer of crude steel in EU was Germany, which managed to maintain a constant level of production. This country accounted for 25% of crude steel production. Production was heavily concentrated because the first 7 countries listed in the table were responsible for approximately 75% of the total EU production. Generally speaking, in the years 2005-2014, production decreased in all countries, with the exception of Poland, Austria, Slovakia and Portugal. However, these were countries generally producing smaller amounts of crude steel.

In the years 2005-2014, production of pig iron was subject to similar trends as production of crude steel (see **Table 2**). Likewise, the most crisis-stricken year was 2009, when production plummeted by 33%. After exiting the crisis, the level of production of pig iron accounted only for 82% of the volume in 2007. The largest producer was Germany, whose share in the production of pig iron in the EU continued to grow, and in 2014, already amounted to 29%. The sequence of the countries was different than in the case of crude steel. We could also observe a high concentration of production, with 7 largest producers generating in total 75% of the EU production. In the years 2005-2014, production of pig iron decreased in most countries, with the exception of Austria, Poland and Slovakia.

Table 2 Production of pig iron in EU countries in 2005-2014 (thousand tons)

Countries	Production of pig iron in 2005-2014 (thousand tons)									
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Germany	28424	29777	30562	28592	19715	28112	27563	26493	26678	27379
France	12705	13013	12426	11372	8104	10137	9698	9532	10276	10866
United Kingdom	10189	10696	10960	10137	7671	7233	6625	7183	9471	9705
Italy	11423	11497	11110	10377	5692	8555	9838	9424	6933	6371
Austria	5444	5547	5908	5795	4353	5621	5815	5751	6152	6029
Netherlands	6031	5417	6412	5998	4601	5799	5943	5917	5681	5868
Poland	4477	5333	5804	4934	2984	3638	3975	3952	4011	4637
Belgium	7254	7516	6577	6977	3087	4688	4725	4073	4343	4388
Czech Republic	4627	5192	5287	4737	3483	3987	4137	3935	4040	4152
Spain	4160	3432	3976	3784	2920	3572	3540	3081	3949	3958
Slovak Republic	3681	4145	4012	3529	3019	3649	3346	3520	3617	3838
Sweden	3730	3577	3816	3583	1966	3447	3240	2805	2896	3078
Finland	3056	3158	2915	2943	2042	2564	2500	2130	2050	2475
Romania	4098	3946	3923	2958	1575	1726	1593	1467	1604	1631
EU-28	**111750**	**114733**	**116150**	**107446**	**72263**	**94054**	**93855**	**90493**	**92328**	**95176**

Source: Data of EUROFER and World Steel Association.

Table 3 Production hot-rolled products in EU countries in 2005-2014 (thousand tons)

Countries	Production hot-rolled products in 2005-2014 (thousand tons)									
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Germany	39391	42949	43823	41508	29990	38103	39286	37843	36381	36449
Italy	29523	32384	32935	31521	20743	25359	27978	26309	23553	23150
France	16566	17028	16900	15526	11704	14062	14387	13529	14716	15464
Spain	17199	18608	19049	18444	14406	15511	15251	13166	12954	13529
Belgium	11272	12761	11450	11792	7172	9649	10012	8917	8293	8392
United Kingdom	10347	10757	10182	9517	7135	8395	7963	7042	8031	8087
Poland	6346	7907	8222	7807	6358	7050	7844	7789	7514	7650
Austria	6164	6495	6816	6850	5394	6619	6875	6900	7377	7148
Netherlands	6134	6394	6177	5839	4997	6274	6401	6418	6370	6657
Slovak Republic	3992	4229	4357	4001	3395	3726	3468	3600	3660	4607
Czech Republic	5417	5824	5665	5285	3955	4625	4616	4276	4415	4375
Sweden	4958	5482	5624	5276	2956	4560	4580	4070	4140	3750
Finland	3982	4108	3691	3674	2537	3380	3380	3250	3100	3340
Romania	5305	5696	5730	4652	2862	3140	3420	2700	2410	2585
EU-28	**178092**	**193459**	**193622**	**184284**	**133193**	**159895**	**165845**	**155417**	**152442**	**154726**

Source: Data of EUROFER and World Steel Association.

Another important sector of steel production was the manufacture of hot-rolled products. In the case of this group of products, the trends resembled those in the crude steel and pig iron sectors. In the most critical year, 2009, production dropped by 27% in comparison to the previous year (see **Table 3**). Likewise, the largest producer was Germany, whose market share stayed at the same level, i.e. approx. 23%. Production was concentrated in 7 countries, generating in total 73% of hot-rolled products in the EU. In the case of these products, in the years 2005-2014, an increase in production was only reported in Poland, Austria, Slovakia and the Netherlands.

Pearson's linear correlation coefficient was used to determine the correlation between crude steel production in EU countries and selected measures of economic situation. Seven variables (**table 4**) were selected on the basis of a review of literature, among others articles of [6], [7]. 22 countries were involved in the production of crude steel. Due to very low volumes of production, six countries were excluded from the analysis. **Table 4** summarises the results of the correlations, and shows the p-value. The significance threshold was set at p = 0.05. Significant correlations were marked with grey background in the text. The correlation coefficients were calculated separately for the period before the crisis (the years 2005-2008), during the crisis (the years 2009-2010) and at the exit from the crisis (the years 2011-2014), and for the entire period, i.e. the years 2005-2014.

Table 4 Pearson correlation coefficients between production of crude steel in EU-countries and selected parameters

Parameters	Pearson correlation coefficients in years			
	2005-2008	2009-2010	2011-2014	2005-2014
The coefficients of correlation between crude steel production in EU countries and				
GDP value	0.877	0,879	0,883	0.872
p value	0.001	0.001	0.001	0.001
GDP per capita	0.198	0.192	0.188	0.187
p value	0.064	0.212	0.079	0.081
Export	0.883	0.901	0.907	0.879
p value	0.001	0.001	0.001	0.001
Import	0.901	0.893	0.890	0.883
p value	0.001	0.001	0.001	0.001
Industry production	-0.145	-0.145	-0.098	-0.097
p value	0.178	0.348	0.364	0.369
Construction industry	-0.193	-0.137	0.025	-0.069
p value	0.072	0.375	0.817	0.523
Households consumption	0.863	0.873	0.866	0.857
p value	0.001	0.001	0.001	0.001

Source: Own research.

In the case of most parameters, significant relationships were found, e.g. between crude steel production and GDP in the years 2005-2014 (correlation r = 0.872, p=0.001). The correlation was very strong and positive. Division of the period under the study into intervals did not lead to great differences in the results. This means that the production of crude steel was strongly correlated to economic situation. Economic fluctuations gave rise to similar changes in steel production. Such results were achieved in the case of economic parameters, e.g.: GDP, exports, imports and household consumption. Therefore, the correlations applied both to domestic economies and the economic situation in foreign markets. Detailed results for individual parameters are presented in **Table 4**. Interestingly, no significant relationship was found between crude steel production and

industrial production, i.e. the production of the construction industry. This means that steel, as a rule, was not a key element in these economy sectors, and their production was affected, to a greater extent, by other raw materials.

4. CONCLUSION

The EU, as the second largest steel producer in the world, is responsible for approximately 11% of global production. In EU countries, the situation of the steel sector depended on the general economic situation. During the onset of the economic crisis in 2009, there were also declines in steel production. The conducted studies confirmed a significant interdependence between crude steel production and GDP, exports, imports and household consumption. Interestingly, the study did not find any relationship between crude steel production and industrial production, production in the construction industry and GDP per capita, despite references to such relationships in other publications. This is probably attributable to the high concentration of steel production in economically developed countries, which have already undergone the stage of rapid economic growth.

REFERENCES

[1] ROKICKI, T., BARAN, J. Situation of steel industry in Poland, In Metal 2015: *24th International Conference on Metallurgy and Materials. Conference Proceedings*. Ostrava: TANGER, 2015, pp. 2044-2049.

[2] Rozporządzenie Komisji (WE) NR 364/2004 z dnia 25 lutego 2004 r. zmieniające rozporządzenie (WE) nr 70/2001 i rozszerzające jego zakres w celu włączenia pomocy dla badań i rozwoju, OJ L 63, 28.2.2004, pp. 22.

[3] ROKICKI, T. Sustainable development in energy sector in the European Union countries, In: *Economic Science for Rural Development. Proceedings of the International Scientific Conference*, 2016, No 43, pp. 108-116.

[4] GORECKA, A., ROKICKI, T. The Significance of Transportation in Agribusiness Companies, In: *CLC 2013: Carpathian Logistics Congress - Congress Proceedings*, 2014, pp. 24-30.

[5] GHOSH, S. Steel Consumption and Economic Growth: Evidence from India, *Resources Policy*, 2006, No. 31, pp. 7-11.

[6] REBIASZ, B. Polish Steel Consumption 1974-2008, *Resources Policy*, 2006, No. 31, pp. 37-49.

[7] KWANG-SOOK, H. Steel Consumption and Economic Growth in Korea: Long-Term and ShortTerm Evidence, *Resources Policy*, 2011, No. 36, pp. 107-113.

[8] PAPIEZ, M., SMIECH, S. The Analysis and Forecasting of Coke Prices. *Econometrics 32 /ed. Dittmann P., Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, 2011, No. 196, pp. 213-220.

[9] PAPIEZ, M., SMIECH, S. The Analysis of Relations Between Primary Fuel Prices on the European Market in the Period 2001-2011, *Rynek Energii*, 2011, Vol. 5, No. 96, pp. 139-144.

[10] PAPIEZ, M., SMIECH S. Wykorzystanie modelu SVECM do badania zależności pomiędzy cenami surowców a cenami stali na rynku europejskim w latach 2003-2011. *Przegląd Statystyczny*, 2012, Vol. 59, No. 4, pp. 504-524.

[11] OZGA-BLASCHKE, U. Wpływ kryzysu gospodarczego na rynek stali, węgla koksowego i koksu. *Przegląd Górniczy*, 3-4, pp. 1036-1037.

[12] EUROFER, The European Steel Association, Brussels. [online]. [cit. 2016-03-08]. http://www.eurofer.org/

[13] PADUCH J., SZULC W. Renesans przemysłu stalowego w Unii Europejskiej. *Prace IMŻ*, 2014, No 3, pp. 3-11.

[14] World steel in figures 2015, *World Steel Association*, pp. 1-17.

[15] *Economic and Steel Market Outlook*. Eurofer, 2012.

[16] *Steel Market Developments, 2nd Quarter, 2015, Paris, OECD, pp.* 1-23.