

DIRECTIONS FOR THE DISTRIBUTION OF STEEL METALLURGICAL PRODUCTS IN POLAND

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Abstract

The aim of this article is to present the directions of steel consumption in Poland, and to show the impact of economic conditions on this distribution. The study covered the period from 2006 to 2016. The following methods have been used in paper: descriptive, tabular, graphic and Pearson's linear correlation coefficient. The findings of the study indicate that only the consumption of long steel products was strongly linked to the economic situation, measured by the value of GDP, volume of demand and value of import. In the case of other product groups, such as flat steel products, cold-rolled steel pipes and profiles, there was no significant correlation with the market situation. Interestingly, no significant relationship was found between apparent consumption of finished steel products and industrial production. 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. Summarizing, the relationships between individual types of steel products and the economic situation should to be analyzed separately.

Keywords: Steel industry, macroeconomic indicators, steel consumption, long products of steel

1. INTRODUCTION

Steel, together with concrete and wood, is one of the most important construction materials. The advantages of this material are great use possibilities, affordable price and the possibility of recycling [1]. The metallurgy and steel sector are separated in both EU and national documents. In the Polish Classification of Activities, metallurgy includes production of pig iron, ferroalloys, cast iron, steel and steel products, production of pipes, hoses, profiles, seals and fittings made of steel, production of flat cold-rolled products [2,3].

The production of iron and steel has been affecting the development of civilization for several millennia, as this raw material has been used in agriculture, construction, industry, machinery and equipment production, etc. Steel and iron played, along with coal and cotton, a large role in the industrial revolution [4,5]. Steel production grew very quickly in the second half of the twentieth century. At the same time, the share of European countries in global steel production was systematically decreasing. There was also an increase in productivity and production efficiency in this sector [6-8].

EU steel producers in 2016 to lose their competitive position over cheap steel imports from third countries. Non-EU steel imports in 2016 rose 43 % as compared to 2014. The share of steel import in the EU apparent consumption increased to 16 % from 12 % over that period. The decline in the competitiveness of EU-made steel was compounded mostly by high costs of EU environmental policies. These costs were not borne by third country producers [9].

In 2016, steel consumption in Poland amounted to more than 13 million tonnes. That was the highest level of consumption since 1989. The construction sector accounts for almost half (about 45 %) of domestic steel consumption. Other steel-consuming sectors of industry was metal products, automotive, household appliances. The main beneficiaries of steel consumption growth in Poland were foreign steelmakers as domestic deliveries accounted for only 31 % of ASU (Apparent Steel Use). The main barriers to the competitiveness of the Polish steel industry include, besides cheap imports crowding out domestic suppliers,

high electricity and gas prices and the costs borne to meet environmental requirements. Another important barrier is the finished steel production output lagging behind the changing market [10]. The problem related to environmental protection is particularly important in Poland, which, apart from Germany, Austria and the Czech Republic, was the largest emitter of greenhouse gases in the metallurgical industry [11,12]. The measures taken to improve the efficiency of the steel industry are important because in a market economy enterprises should provide high quality products, in appropriate quantities, to the right customer at the lowest costs and capital involvement [13]

In Poland, domestic production accounted for an average of 73 % of the apparent consumption, which means a significant level of imports of steel products. In the EU, however, production exceeded, on average, around 4 % the level of apparent consumption. The assortment structure of steel products consumption in Poland was similar to that in the EU: a significant share (over 50 %) were flat products, about 35 % long and about 10 % pipes and profiles. In Poland, import of products significantly exceeded their exports. For example, the total domestic demand for flat products was met in approximately 90 % by import [14-17].

The iron and steel market is sensitive to the general economic situation as well as to the industries based on steel and metal [18,19]. The steel market is not an isolated one, and the variables in this market are affected by other global factors. 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 [20].

The main aim of the paper is to determine the relationship between the apparent consumption of finished steel products in Poland and the overall economic situation. In addition, specific objectives have been adopted, including presentation of the situation in the sell of finished steel products, determination of the condition and changes of the economic situation, and illustration of the influence of the market and economic situation on sell of finished steel products in Poland.

2. METHODOLOGICAL BASES

The period covered by the study is between 2006 and 2016, 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 Main Statistical Office, and almanacs of the Polish Steel Association. The following methods have been used in this paper: descriptive, graphic and Pearson's linear correlation coefficient.

3. RESULTS

The production of crude steel in Poland in the years 2006-2008 was about 10 million tonnes (**Figure 1**). A clear decline was only visible in 2009 at the time of the economic crisis. In the following years, the production of crude steel remained at the level of 8-9 million tonnes. This production category is the basis for the production of steel elements for the needs of various industrial sectors. The share of steel from the BF/BOF process was higher than the steel produced by the electric arc furnace route. In 2016, 5.1 million tonnes of BOF steel (57 %) and 3.9 million tonnes of EAF steel (43 %) were produced. In 2016, the average utilisation of production capacities in the domestic steel industry amounted to 72%. Both BF + BOF and EAF processes are cutting edge and BAT compliant. Poland's share of overall steel production in the EU was 5.6%. In 2016, The total quantity of crude steel made in Poland includes non-alloy steels accounting for 92 %, alloy steels at 8%, and corrosion resistant steels at 0.01 %.

The turnover of foreign trade in metal products has been systematically increasing (**Figure 2**). Only during the economic crisis in 2009 there was a decline in exports and a greater extent of imports. After the economic crisis, imports increased faster than exports. This shows some dependence of industrial plants on steel from abroad. The balance of foreign trade in 2016, both by volume and by value, was negative and amounted to - 4.5 million tonnes and - EUR 3.2 billion, respectively. In 2016, the shipments to the EU accounted for 91 % of

total Polish exports. In this year, imports from EU countries increased 6% and, as in previous years, accounted for almost 75 % of total imports.

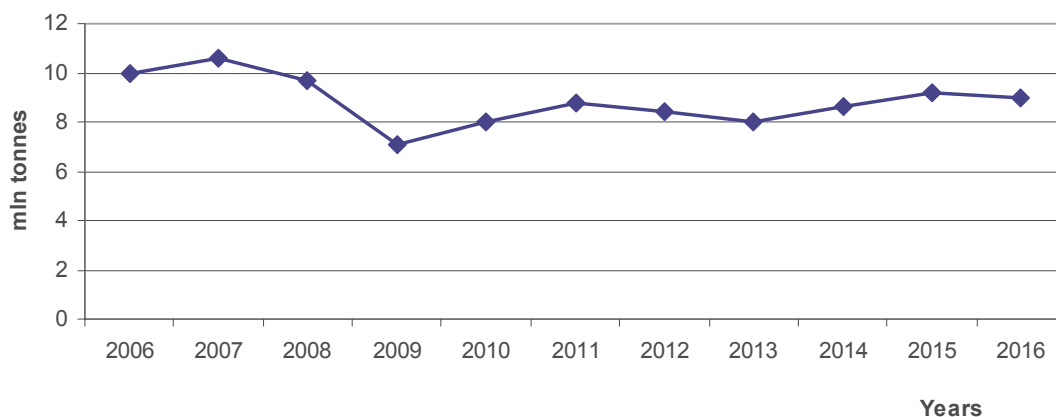


Figure 1 Crude steel production in Poland in 2006-2016 (million tonnes) [10]

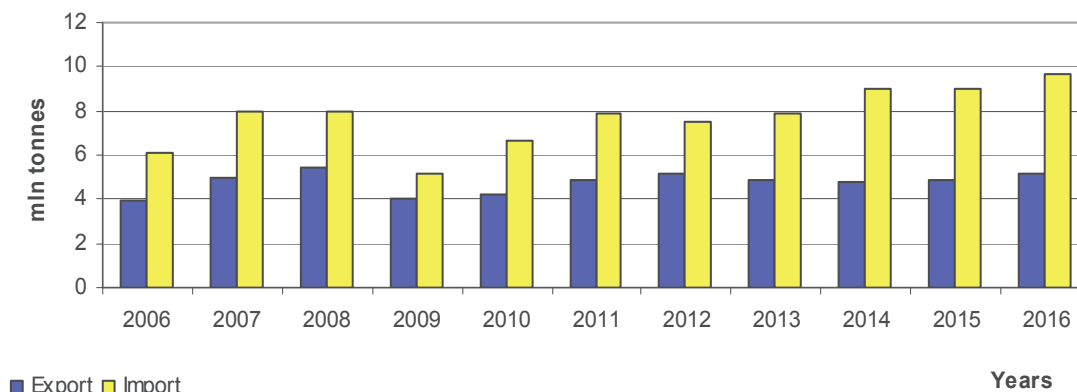


Figure 2 Export and import of steel products in Poland in 2006-2016 (million tonnes) [10]

Table 1 Apparent consumption of finished steel products in 2006-2016 (million tonnes) [10]

Years	Apparent consumption of finished steel products (mIn tonnes)			
	total	long products	flat products	tubes and hollow sections
2006	10.7	4.2	5.5	1.0
2007	12.0	4.8	6.1	1.1
2008	11.5	4.3	6.1	1.1
2009	8.2	2.9	4.4	0.9
2010	9.8	3.4	5.4	1.0
2011	11.0	3.8	6.1	1.2
2012	10.4	3.2	6.0	1.2
2013	10.3	3.4	5.9	1.1
2014	12.3	4.5	6.7	1.1
2015	12,5	4.6	6.9	1.0
2016	13.1	4.7	7.3	1.1

Table 2 Pearson correlation coefficients between apparent consumption of finished steel products in Poland and selected parameters in 2006-2016 [own study]

Economic parameters	Pearson correlation coefficients between volume of finished steel production in Poland and selected economic paramets			
	finished steel products total	long products	flat products	tubes and hollow sections
GDP value	0.350	0.616	0.086	0.029
p value	0.292	0.044	0.800	0.932
GDP per capita	0.384	0.042	0.625	0.326
p value	0.244	0.902	0.040	0.328
Gross value added	0.350	0.621	0.083	0.023
p value	0.291	0.041	0.808	0.946
Value added in industry	0.313	0.576	0.073	-0.065
p value	0.349	0.064	0.831	0.849
Value of omestic demand	0.466	0.723	0.201	0.019
p value	0.149	0.012	0.553	0.956
Value of export	0.508	0.551	0.411	0.227
p value	0.111	0.079	0.209	0.501
Value of import	0.565	0.669	0.413	0.159
p value	0.070	0.024	0.207	0.640
Inflation	-0.576	-0.533	-0.594	0.234
p value	0.064	0.091	0.054	0.489
Unemployment rate	-0.630	-0.581	-0.614	-0.004
p value	0.038	0.061	0.045	0.991
Value of investment	0.472	0.717	0.213	0.126
p value	0.143	0.013	0.529	0.712
Industry production	0.377	0.526	0.209	0.151
p value	0.253	0.970	0.537	0.658
Construction industry	-0.095	0.174	-0.319	-0.036
p value	0.781	0.609	0.339	0.916
Manufacture of metal products	0.368	0.452	0.239	0.351
p value	0.265	0.163	0.479	0.290
Manufacture of machin ery and equipment	0.380	0.562	0.167	0.055
p value	0,249	0.072	0.624	0.872
Manufacture of motor vehicles, trailers and semi-trailers	0,465	0.583	0.341	-0.015
p value	0,150	0.060	0.305	0.965
Manufacture of large domestic appliances	0,143	0.254	-0.002	0.245
p value	0,675	0.451	0.995	0.468
The Steel Weighted Industrial Production Index (SWIP)	0,307	0.576	0.073	-0.065
p value	0,358	0.064	0.831	0.849

The apparent steel consumption in Poland after the economic crisis of 2009 systematically increased (**Table 1**). This shows the growing needs of the economy. The largest demand was reported for flat products, followed by long products. Stable demand was for cold-formed pipes and sections and amounted to around 1 million tonnes. In 2016, flat products accounted for 55% of the total domestic finished steel apparent consumption. The share of long products in the total consumption was 36% while tubes & pipes and hollow sections took the remaining 9%.

Pearson's linear correlation coefficient was used to determine the correlation between Apparent consumption of finished steel products in Poland and selected measures of economic situation. The correlation coefficients were calculated for the period 2006-2016. **Table 2** 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 finished steel products total and for particular types of this products.

In the case of most parameters, no significant relationships were found, which indicates a weak relation between the apparent consumption of steel products and the economy. The greatest amount of dependencies occurred in the case of long products. The relations of this parameter of steel consumption with the value of GDP were significant (correlation $r = 0.616$, $p = 0.044$), gross added value ($r = 0.621$, $p = 0.041$), the value of domestic demand ($r = 0.723$, $p = 0.012$), import value ($r = 0.669$, $p = 0.024$), investment value ($r = 0.717$, $p = 0.013$). The correlation was strong and positive. This means that the apparent consumption of long products of steel was strongly correlated to economic situation. The correlations applied both to domestic economies and the economic situation in foreign markets. Detailed results for individual parameters are presented in **Table 2**. Interestingly, no significant relationship was found between apparent consumption of finished steel products 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 study shows that the apparent consumption of finished steel products was not strongly linked to the situation in the economy. The consumption of long steel products was the only type of consumption which depended on the economic situation. In the case of other product groups, such as flat steel products, cold-rolled steel pipes and profiles, there was no significant correlation with the market situation. There was no significant correlation between these parameters and for example Steel Weighted Industrial Production Index. Interestingly, no significant relationship was found between apparent consumption of finished steel products and industrial production. Steel was not a key element in these economy sectors. This result shows that the relationships between individual types of steel products and the economic situation should to be analyzed separately.

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