

## SITUATION OF THE STEEL INDUSTRY IN POLAND

ROKICKI Tomasz, BARAN Joanna

Warsaw University of Life Sciences, Warsaw, Poland, EU, [tomasz\\_rokicki@sggw.pl](mailto:tomasz_rokicki@sggw.pl), [joanna\\_baran@sggw.pl](mailto:joanna_baran@sggw.pl)

### Abstract

The aim of this article is to present the situation of the steel industry in Poland, and to show the impact of economic conditions on this sector. The study covered the period from 2006 to 2013. The Polish 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 rate of changes in the GDP, volume of demand and dynamics of industrial production. The only exception were hot-rolled steel products which did not indicate such a strong link. Employment was also heavily dependent on the economic situation. However, exports and imports of steel products, and the level of their consumption, were independent of the market situation. The only exception to this rule was consumption of long steel products.

**Keywords:** Steel industry, macroeconomic indicators, steel production and consumption

### 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 both in EU and national documents. In the Polish Classification of Activities, iron and steel industry involve production of pig iron, ferroalloys, iron, steel and steel products, manufacture of tubes, pipes, steel profiles and related fittings, and manufacture of flat cold-rolled steel products [2, 3].

Before the economic transformation of 1989, Polish steel and iron industry consisted of 26 steel plants, of which 18 started operations before the First World War. As a result, in 1990, amortisation of fixed assets amounted to 85%. This situation had a negative impact on the economic efficiency of the plants and their ability to compete with the steel industry in other countries. In subsequent years, efforts were made at restructuring Polish steel industry [4]. The restructuring process is mainly associated with employment reduction. In 1990, 145 thousand people were employed in the steel sector, and in 2006 - only 32 thousand. [5]. In addition, after the economic transformation, there were numerous technological investments. The activities focused on the modernisation of steel plants through the installation of equipment for continuous casting of steel [6]. The aim of such activities was to improve economic efficiency [7, 8, 9]. Investments in new equipment, modernisation of metallurgical processing and improvement of steel smelting and casting processes contributed to the reduction of negative impact of steel plants on the environment [10]. The problem of environmental protection is particularly important in Poland, which, along Germany, Austria and the Czech Republic, was the largest emitter of greenhouse gases in the steel industry [11]. The measures taken to improve the efficiency of the steel industry are significant because, in a market economy, companies should provide high-quality products, in appropriate quantities, to the relevant customer, and at the same time - at the lowest cost and with the lowest capital involvement [12, 13].

The restructuring process was successful. However, the steel industry was strongly dependent on the economic situation. The last great crisis began in the American financial market in September 2008, and quickly moved to European markets. In particular, the economic slump affected countries in the Euro zone [14, 15, 16]. The crisis of 2008 contributed to economic growth inhibition, and consequently, to the decrease in demand for steel products. The dynamics of sold production in the industry in 2009 was negative, similarly to

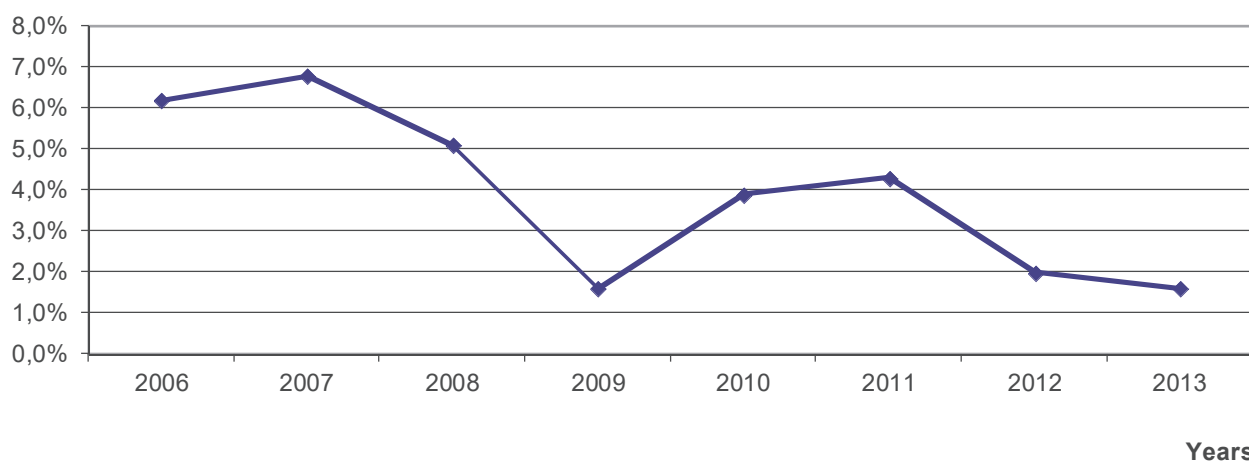
the rate of changes in exports, imports and investments [17, 18]. As a result, companies made decisions related to cost and employment reduction, liquidation of production lines or temporary shut-down of production capacity [19, 20]. In 2009, production capacities of Polish steel plants were used only in 54 %, and in the first half of 2010 - app. 62 % [21].

## 2. METHODOLOGICAL BASES

The main purpose of this paper is to determine the relationship between the Polish steel industry 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, determination of the condition and changes of the economic situation, and illustration of the influence of the market and economic situation on steel production in Poland. The period covered by the study is between 2006 and 2013, 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 Steel Chamber of Commerce and Industry. The following methods have been used in this paper: descriptive, graphic and correlation coefficient.

## 3. RESULTS

The global economic situation worsened in 2009. In most countries, GDP decreased. Poland was one of the few countries with positive GDP in 2009 (see **Fig. 1**). During the next two years the situation improved, and in 2012-2013, the economy slowed down again. The pace of changes in gross value added was the same as GDP. Gains in value-added manufacturing were larger than GDP. The market situation is reflected in domestic demand. Only in 2009 and 2012, the dynamics of changes in demand were lower than 100%. Economy is also characterised by such indicators as inflation rates, unemployment rate, export and import volumes, and investment levels. In the case of industry, it is possible to present detailed information on the volume of steel production and consumption, the rate of changes in producer prices, the rate of changes in prices of construction and assembly production, industrial production growth rates and Steel Weighted Industrial Production Index.

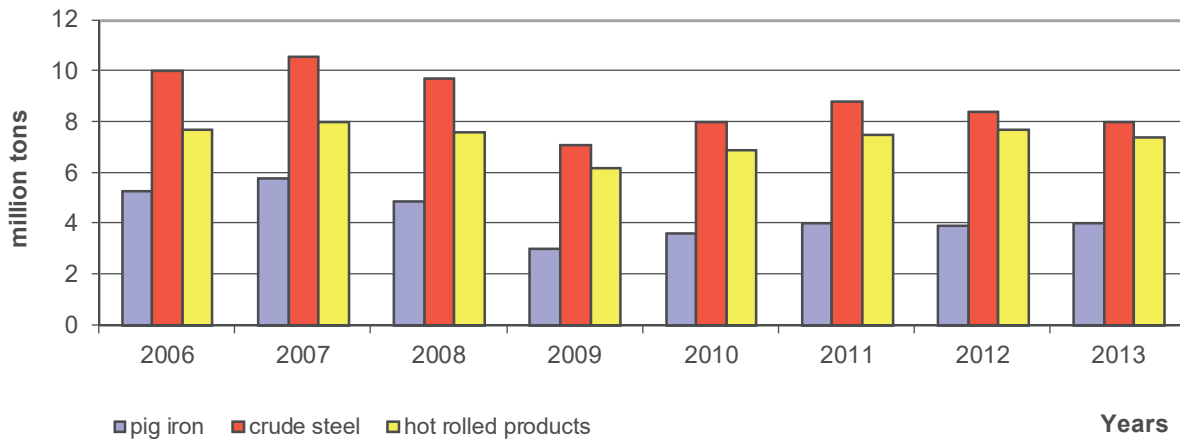


**Fig. 1** The rate of changes in the GDP in Poland in 2006-2013 (previous year = 100)

Source: Own analyses based on data of Central Statistical Office of Poland

In 2013, the share of steel produced in Poland accounted for about 5 % of the EU production. The majority of steel produced in Poland was crude steel. Its production significantly decreased in 2009 (see **Fig. 2**). Similarly, in the case of pig iron production. The manufacture of hot-rolled products amounted to app. 7.5 million tonnes, except for the years 2009-2010 when production fell below 7 million tons. There was a very strong positive correlation between the rate of changes in GDP and the production of pig iron (correlation  $r = 0.87$ ,  $p = 0.00$ ) and crude steel (correlation  $r = 0.91$ ,  $p = 0.00$ ). There was no significant correlation between changes in the

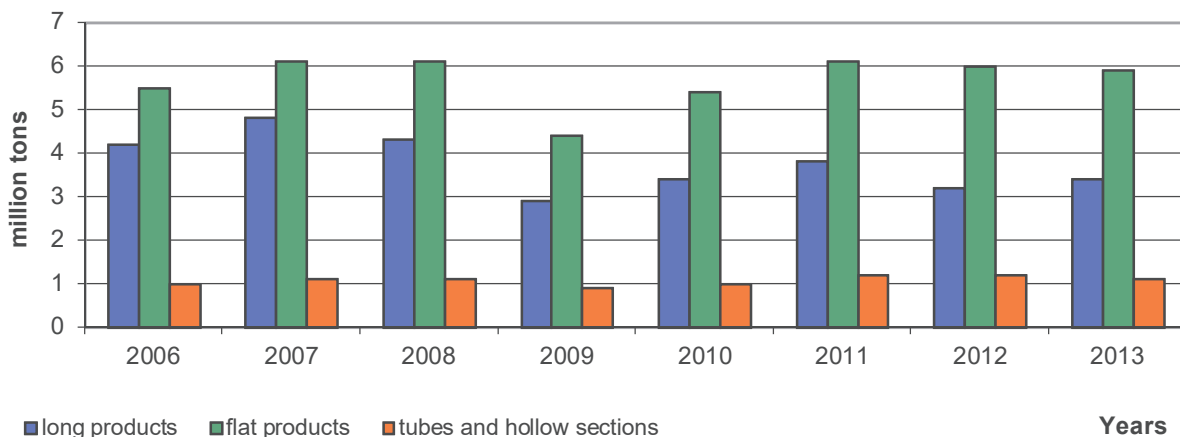
level of GDP and output of hot rolled products (correlation  $r = 0.60$ ,  $p = 0.12$ ). Similar results were reported in the case of correlation between domestic demand and production of pig iron (correlation  $r = 0.86$ ,  $p = 0.00$ ) and production of crude steel (correlation  $r = 0.89$ ,  $p = 0.00$ ). In this case, there was no significant relationship between domestic demand and the size of hot-rolled products (correlation  $r = 0.57$ ,  $p = 0.14$ ). Nearly identical results were obtained in the case of correlation between individual steel production values and the dynamics of industrial production.



**Fig. 2** Steel production in Poland in 2006-2013 (million tons)

Source: Own analyses based on data of Polish Steel Association

Domestic consumption of finished steel products was dominated by flat steel products (about 57 % in 2013) and long steel products (33% in 2013). The share of tubes and hollow section was low (see **Fig. 3**). There was a very strong correlation between the rate of changes in GDP and consumption of long steel products (correlation  $r = 0.93$ ,  $p = 0.00$ ). On the other hand, there was no significant correlation between the rate of changes in GDP and the volume of consumption of flat steel products (correlation  $r = 0.39$ ,  $p = 0.34$ ) as well as tubes and hollow section (correlation  $r = 0.06$ ,  $p = 0.89$ ). The correlation between domestic demand and investments and consumption of finished steel products was similar to the correlation with the rate of changes in GDP. The only consumption dependent on the market situation was the consumption of long steel products.

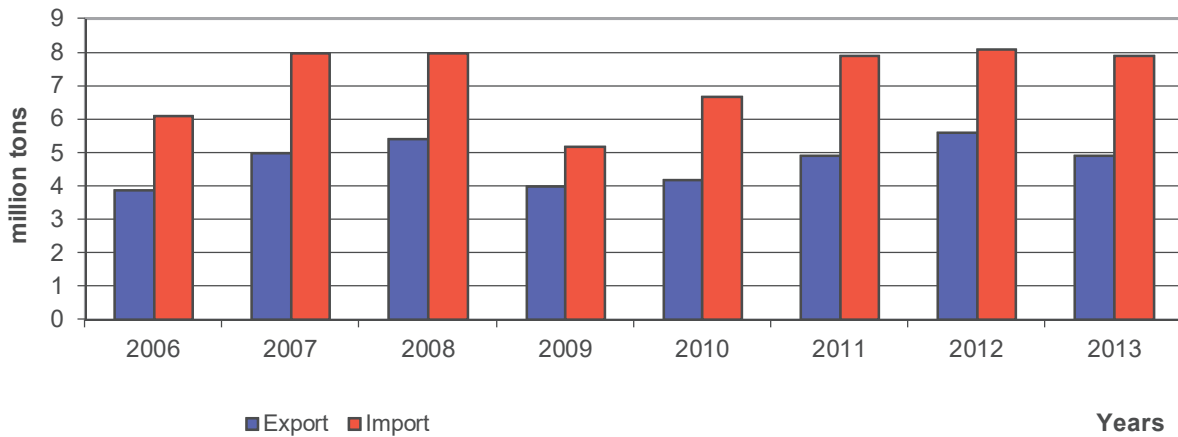


**Fig. 3** Apparent consumption of finished steel products in 2006-2013 (million tons)

Source: Own analyses based on data of Polish Steel Association

Steel imports significantly exceeded its exports, which shows negative features of the domestic industry. In 2013, the trade exchange balance was negative and amounted to 3.1 million tonnes - as per quantity, and EUR 2.8 billion - as per value. The biggest recipients of Polish steel products were Germany and the Czech Republic (56% of total exports). The lowest values of trade exchange were reported in 2009 (see **Fig. 4**). There

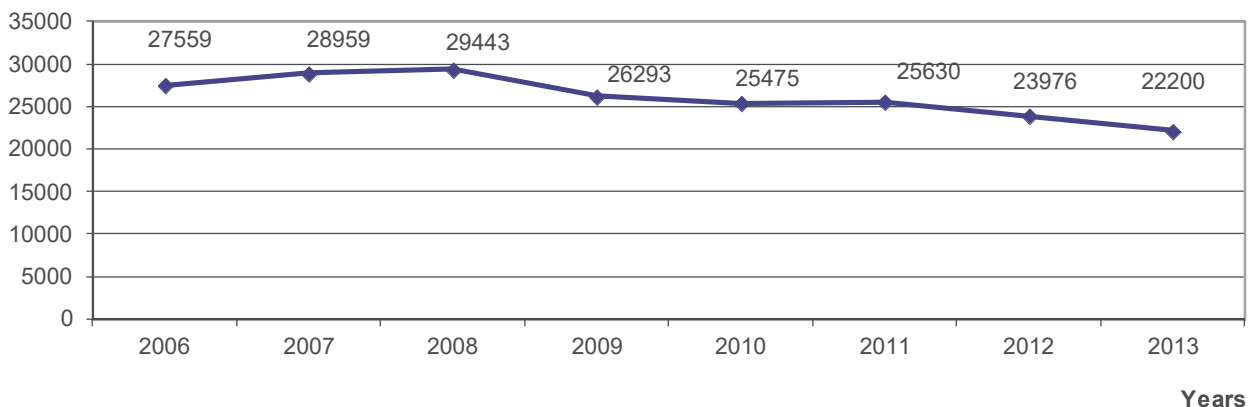
was no significant correlation between the rate of changes in GDP and exports of steel products (correlation  $r = -0.07$ ,  $p = 0.87$ ) and imports of these products (correlation  $r = 0.15$ ,  $p = 0.37$ ). Similarly, in the case of correlation between the growth of total exports and the volume of steel exports (correlation  $r = -0.04$ ,  $p = 0.92$ ), as well as the growth of total imports and the volume of steel imports (correlation  $r = 0.25$ ,  $p = 0.56$ ). There was no significant relationship between Steel Weighted Industrial Production Index (SWIP) and the volume of steel exports (correlation  $r = 0.07$ ,  $p = 0.87$ ) and the volume of imports of steel products (correlation  $r = 0.27$ ,  $p = 0.51$ ).



**Fig. 4** Export and import of steel products in Poland in 2006-2013 (million tons)

Source: Own analyses based on data of Polish Steel Association

In 2013, employment in the steel industry was at the level of 22,200 (see **Fig. 5**). In the domestic steel industry, there has been a long-term trend of downsizing, which is a result of plant restructuring and unfavourable taxation as compared to other EU countries. It also illustrates market needs in terms of steel production. There was a strong correlation between the rate of GDP and the level of employment in the steel industry (correlation  $r = 0.80$ ,  $p = 0.02$ ). Similarly in the case of relationship between employment levels and dynamics of domestic demand (correlation  $r = 0.77$ ,  $p = 0.03$ ), and dynamics of investments (correlation  $r = 0.75$ ,  $p = 0.03$ ). No significant correlations were found between the level of employment in the steel industry and the unemployment rate (correlation  $r = -0.58$ ,  $p = 0.13$ ).



**Fig. 5** Employment in the steel industry in 2006-2013 (number of people)

Source: Own analyses based on data of Polish Steel Association

The steel industry was the source of supplies for other sectors of the economy, such as construction, manufacture of metal products, manufacture of machinery and equipment, cars and household appliances. The situation in these sectors had a strong influence on the situation of steel plants. For instance, the

construction industry, where problems were related to limited contracts for residential buildings and the availability of capital. As a result, many economic entities were forced to close their businesses. Prices of construction and assembly production did not depend significantly on price changes in the economy (correlation  $r = 0.13$ ,  $p = 0.76$ ). A strong correlation was found between changes in producer prices of the industry, and changes in prices in the economy (correlation  $r = 0.73$ ,  $p = 0.04$ ).

#### 4. CONCLUSION

After 1990, the Polish steel industry underwent constant restructuring, which manifested itself in the reduction of employment and increased investment in technology. At the same time, steel industry operators had to adapt to the situation on the market. The study shows that steel production was strongly linked to the situation in the economy, measured by the pace of changes in GDP, volume of demand and dynamics of industrial production. Only in the case of production of hot-rolled products, this relationship was not confirmed.

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. The volume of exports and imports of steel products was not correlated with the economic situation. There was no significant correlation between these parameters and the rate of changes in GDP, growth of total exports and imports or Steel Weighted Industrial Production Index.

Employment in the steel industry was strongly associated with the rate of changes in GDP, and dynamics in domestic demand and investments. There was no significant relationship between the level of employment and the situation on the labour market as determined by unemployment rates. The situation of the steel industry is influenced by demand for products made of steel. There was a strong correlation between changes in producer prices in this sector and price changes throughout the economy. Prices of construction and assembly products did not depend significantly on the price changes throughout the economy.

#### REFERENCES

- [1] PADUCH J., SZULC W. Renesans przemysłu stalowego w Unii Europejskiej. Prace IMŻ, No 3, 2014, pp. 3-11.
- [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] Rozporządzenie Rady Ministrów z dnia 24.12.2007 r. w sprawie Polskiej Klasyfikacji Działalności (PKD) (Dz. U. z 2007 r., nr 251, poz. 1885 oraz z 2009 r. nr 59, poz. 489).
- [4] SZULC W., GARBARZ B., Paduch J. Przebieg i wyniki restrukturyzacji przemysłu stalowego w Polsce. Prace IMŻ, No 4, 2011, pp. 40-51.
- [5] MICZKA M. Procesy ewolucyjne w polskim hutnictwie. Prace IMŻ, No 3, 2008, pp. 29-34.
- [6] SZULC W., GARBARZ B., PADUCH J. Przebieg i wyniki restrukturyzacji przemysłu stalowego w Polsce. Prace IMŻ, No 4, 2011, pp. 40-51.
- [7] WYSOKIŃSKI M., BARAN J., GOŁASA P., LENORT R. Economic and Energy Efficiency of the Mining and Quarrying Sector in European Countries, In Metal 2014: 23th International Conference on Metallurgy and Materials. Ostrava: TANGER, 2014, pp. 1965-1971.
- [8] LENORT R., BARAN J., WYSOKIŃSKI M. Application of Data Envelopment Analysis to Measure the Efficiency of the Metal Production Sector in Europe. In Metal 2014: 23th International Conference on Metallurgy and Materials. Ostrava: TANGER, 2014, pp. 1795-1802.
- [9] WYSOKIŃSKI M., BARAN J., FLORKOWSKI W. J. Concentration of milk production in Poland, Economic Science for Rural Development, Economic Science for Rural Development: production and cooperation in agriculture / bioeconomy / finance and taxes. Proceedings of the International Scientific Conference, No 37, 2015 pp. 93-104.

- [10] GAJDZIK B. Ekologiczne aspekty restrukturyzacji hutnictwa żelaza i stali w Polsce. *Journal of Ecology and Health*, Vol. 17, no. 1, pp. 11-18.
- [11] GOŁASA P., LENORT R., WYSOKIŃSKI M., BARAN J., BIEŃKOWSKA-GOŁASA W. Concentration of Greenhouse Gas Emissions in the European Union. in *Metal 2014: 23th International Conference on Metallurgy and Materials*. Ostrava: TANGER, 2014, pp. 1691-1696.
- [12] BARAN J., ŻAK J. Multiple Criteria Evaluation of transportation performance for selected agribusiness companies. *Procedia - Social and Behavioral Sciences*, Vol. 111, 2014, pp. 320 - 329.
- [13] ROKICKI T. The importance of logistics in agribusiness sector companies in Poland, *Economic Science for Rural Development: production and cooperation in agriculture / finance and taxes*. Proceedings of the International Scientific Conference, Issue 30, 2013, pp. 116-120.
- [14] PIWOWARCZYK B., MATULEWICZ G., Mechanizm techniki sekurytyzacji aktywów w świetle kryzysu finansowego, [w:] *Zarządzanie przedsiębiorstwem w kryzysie*, Dembowska B. , Gonicka J. (red.), Wydawnictwo Akademii Humanistyczno-Ekonomicznej w Łodzi, Łódź 2011, pp. 11-18.
- [15] ZALEWSKI G. Skąd wzięł się kryzys finansowy, „Gazeta Prawna”, No. 197, 08.10.2008.
- [16] ROKICKI, T. Economic results of sheep farms in Poland, *Economic Science for Rural Development, Economic Science for Rural Development: production and cooperation in agriculture / bioeconomy / finance and taxes*. Proceedings of the International Scientific Conference, No 37, 2015, pp. 86-92.
- [17] Raport. Polski przemysł stalowy. Hutnicza Izba Przemysłowo-Handlowa, Katowice 2011, pp. 5-12.
- [18] Raport. Polski przemysł stalowy. Hutnicza Izba Przemysłowo-Handlowa, Katowice 2013, pp. 4-12.
- [19] GAJDZIK B. Restrukturyzacja przedsiębiorstw w warunkach destabilizacji otoczenia. Na przykładzie branży hutniczej, Difin, Warszawa 2012, pp. 173-201.
- [20] GAJDZIK B. Changes of action strategies in metallurgical enterprises in time of economic crisis. *Metalurgija*, No. 4, 2013, p. 569-572.
- [21] KWIATKIEWICZ A. Synteza raportu: Kwalifikacje zawodowe dziś I jutro - adaptacyjność przedsiębiorstw i pracowników w sektorze hutnictwa i stali. BPI Polska, Warszawa, 2011, pp. 1-4.