EFFECTS OF CHANGES IN STEEL INDUSTRY CONCENTRATION

The paper on a basis of completed mergers and acquisitions within global steel industry presents changes in steel industry concentration and analyzes its effects on world trade with steel products and on prices of input materials as well as of output products. The analyses performed for the 1990 - 2012 period revealed that increased concentration in global steel industry did not lead to more intensive world trade with steel products; however it is connected with increase of finished products as well as of input material prices.

Key words: global steel industry, changes, mergers and acquisitions, finished products, industry concentration

INTRODUCTION

Globalization of economy has pushed many companies to seek for quick ways of corporate growth especially through mergers and acquisitions (hereinafter also „M&A"). However, compared to other industries worldwide, steel industry has developed mostly on individual basis with relatively less pressure toward globalization [1]. Although small gradual movements for reorganization, motivated primarily by increase of competitiveness toward raw materials companies, occurred in each country. The situation in the steel industry turned especially during the last decade in connection with China´s high-speed growth and unprecedented M&A activities among steel companies. Although few previous big transactions were conducted, (e.g. merger of British Steel with Hoogovens or Krupp with Thyssen) as the beginning of M&A wave within steel industry, the establishment of Arcelor through merger of three large steel companies in 2002 is usually considered. Subsequent founding of Mittal and its growth through acquisitions (e.g. of US-based International Steel Group, Ukraine's Kryvorizhstal, China's Hunan Valin Steel) led finally to formation of the worlds' biggest steel company in 2006. This peak of cross-border M&A activity (as obvious from Figure 1) was followed by a number of smaller transactions (e.g. acquisition of Corus Group by Tata Steel, U.S.Steel's acquisitions of Stelco and Lone Star Steel Company in 2007). Rebound from the bottom of M&A activity was caused by series of rather smaller transactions such as consolidation of Hebei Steel Group with Handan Iron and Steel Group in 2010, merger of Nippon Steel Corporation with Sumitomo Metal Industries in 2012, merger of Pingxiang and Juijlang with Fangda Steel at the end of 2012, consoli-

dation of some Chinese companies to form Tianjin Bohai Steel in 2013 etc.

Extensive M&A activities typically lead to changes in industry concentration with consequences for strategy formation. As stated by Carr and Collis [2], one important factor to consider is the combined market share of the companies in the particular industry and its changes. Several indicators are used for the assessment of industry concentration. Presumably most frequently used is the concentration ratio (CR) that is the cumulative share of the m largest companies in the industry, where typical values of m are 1, 4, 8 and 25.

However, for the global concentration ratio, the CR_4 is considered. This is calculated as the sum of market shares of four largest competitors. The changes of concentration ratio in global steel industry are most obvious on the level of CR_{25} where the concentration increased by more than five percents in the analyzed period. The market power of first four largest companies measured by CR_4 changed modestly, too. Its average level exceeded the value of 13% and the highest values were achieved in 2006 and 2007.

There are several motives to undertake consolidation efforts within steel industry. Most significant ones include: universal nature of steel products that is able to create demand almost anywhere, fast development of metallurgical technologies through global learning and fast transfer of know-how implemented in steel producing companies or the need for huge capital expenses to cover modernization-related investment projects [4].

Survival and value creation also underscored the consolidation movements within steel industry. Companies expected to cut costs, maximize synergy and negotiate more favourable conditions of contracts at both ends of production chain, with international raw material suppliers and steel end users. Coupled with increasing investment in developing countries, merged companies are supposed to be able to bolster their ability to meet swelling demand from emerging markets [1]. For

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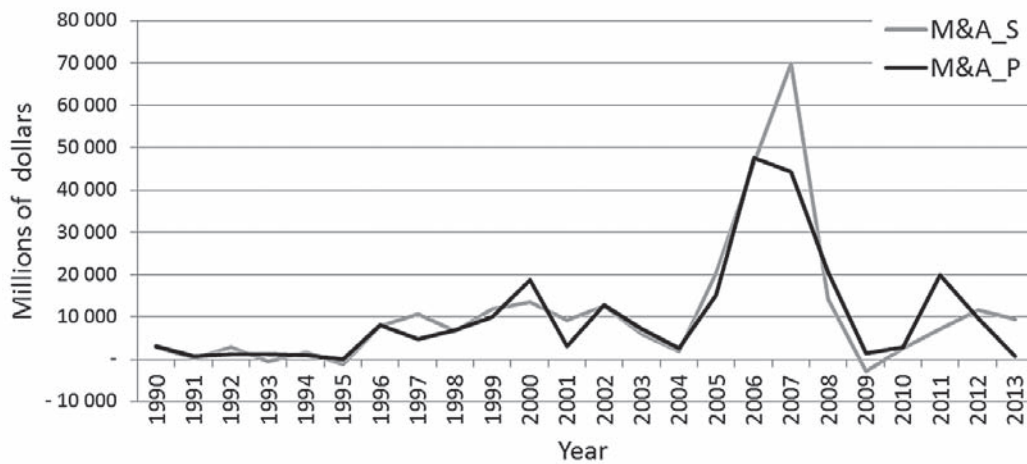
Figure 1 Value of cross-border M&A sales (M&A_S) and purchases (M&A_P) in steel industry based on data from *World Investment Report* [3]

example, Nippon Steel and Sumitomo Metal planned via the merger to primarily strengthen their position on emerging markets of countries such as China, Brazil, India and Southeast Asian nations [5].

The aim of the present paper is to verify the real effects of growing concentration within steel industry and on this basis to formulate implications for strategy creation of steel producing companies.

MATERIAL AND METHODS

The analysis of relationship between changes in global steel industry concentration and its effects measured by selected indicators was performed for the 1990 - 2012 period. The industry concentration was assessed on the basis of concentration ratio index (CR) that is working with a market share of firms in the particular industry. Market share calculation (s_i) was carried out on the basis of data on crude steel production volume by the following equation

$$s_i = \frac{x_i}{X}$$

where x_i represents the volume of crude steel production of the i-th firm in the steel industry, and X is the total volume of worldwide steel production. Information on volume of crude steel production on yearly basis was drawn from *World Steel in Figures* [6]. The concentration ratio index (CR_m) is calculated as the sum of the market shares of *m* largest firms and can be written in the following form:

$$CR_m = \sum_{i=1}^{m} s_i$$

where s_i represents the market share of the *i*-th firm in the sector and index *m* denotes the number of the investigated largest firms in the industry. The subject of the investigation may be a different number of firms. For the purpose of the present paper, the following numbers of firms were used: m = 1, 4, 25.

Besides the calculation of CR_1 (market share of the largest firm in the industry) and other CR indicators, the calculation of the value of the relative market share in-

dicator (*R*) for the largest firm in the industry was also performed. It is calculated as follows:

$$R = \frac{s_1}{s_2}$$

where s_1 represents the market share of the largest firm in the industry, s_2 market share of its nearest competitor. The firm is usually deemed to be reaching the dominant position in an industry if the value of the R exceeds a threshold of 1,5.

As the changes in industry concentration are generally supposed to be driven by M&A activity, this postulation has also been verified. Information on cross-border M&A sales (M&A_S) and purchases (M&A_P) published in *World investment reports* [3] was used as the measure of M&A activity within steel industry.

The effects of increased concentration within steel industry were measured by export activity, namely world trade (export share) of finished and semi-finished steel products (Exp_%), average yearly prices of cold rolled material (Cold-rolled steel - CRS) and average yearly prices of basic input materials, namely: iron ore, coal (Austria - A, South Africa - SA) and natural gas. Information on export activity was drawn from *World Steel in Figures* [6] and information on prices of cold rolled material and input materials prices are based on *Index Mundi* [7].

The analysis of relationship between changes in global steel industry concentration and its effects was performed through correlation analysis using Pearson correlation coefficient.

RESULTS AND DISCUSSION

The following Table 1 shows descriptive characteristics of studied variables.

It is obvious that the global steel industry cannot be on average considered to be concentrated. As stated by Carr and Collis [2], based on review of previous findings the industry is concentrated and the leading players need to adopt a global strategy when the global industry concentration reaches the point 40 %. It means that

Table 1 **Descriptive characteristics of studied variables**

Variable	Mean	SD	Median	Min	Max
CR_1	5,07	1,78	4,68	3,30	9,38
R	1,65	0,78	1,24	1,02	3,58
CR_4	13,39	1,90	13,67	10,84	16,97
CR_{25}	40,29	3,54	41,01	32,50	45,76
M&A_S	11 072	16 302	7 082	-2 953	69 740
M&A_P	10 547	12 879	6 878	105	47 613
Exp_%	34,03	4,16	35,50	26,20	39,20
CRS	561,33	180,14	511,25	299,14	900,00
Iron ore	38,36	46,94	14,05	11,45	167,79
Coal A	54,18	33,71	39,37	25,89	136,18
Coal SA	48,56	29,55	33,52	24,27	120,60
Nat. gas	4,00	2,26	3,65	1,45	8,86

within steel industry there is still large space for further M&A activities. It is also obvious that the average value of world trade of steel products was only around 34 % with relatively small differences between minimum and maximum value. The situation is completely different in case of cold-rolled steel prices and prices of input materials where big differences between minimum and maximum values were detected.

The results of correlation analysis among studied variables are presented in Table 2. It is obvious that increased concentration within industry is primarily driven by mergers and acquisitions where in all cases statistically significant results were achieved. On the other hand, it cannot be concluded that due to increased concentration, the world trade with steel products is more intensive. Interesting statistically significant strong correlations were achieved between industry concentration and finished products (cold-rolled steel) as well as input material prices.

Table 2 **Pearson correlation coefficients**

	CR_1		R		CR_4		CR_{25}	
M&A_S	0,66	***	0,64	***	0,58	***	0,48	**
M&A_P	0,74	***	0,72	***	0,66	***	0,60	***
Exp_%	-0,23		-0,22		-0,10		0,20	
CRS	0,68	***	0,65	***	0,53	**	0,38	*
Iron ore	0,52	**	0,54	***	0,40	*	0,36	*
Coal A	0,66	***	0,66	***	0,53	***	0,48	**
Coal SA	0,68	***	0,66	***	0,56	***	0,55	***
Nat. gas	0,67	***	0,56	***	0,76	***	0,67	***

Note: Pearson correlation coefficients, ***,**,* denote significance at 1, 5 and 10 % levels, respectively

The structural changes in the steel industry did not bring changes in dynamics of the world trade with steel products. The stagnation of the world trade with steel products can be attributed to economic crisis. On the other hand, dynamics of changes of input as well as of output prices of steel products are significant. It is generally stated that production in steel plants is complicated due to price fluctuation of raw materials and the increase of prices in energy production by decrease of prices for manufactured steel products. According to the theory of competitive forces [8], it is reasonable to

predict that with the increased concentration on the side of producers, the bargaining power of suppliers shall weaken and thus producers shall be able to negotiate better prices of input materials. The results of our analysis did not confirm this assumption. They rather showed that increase in global steel industry concentration is accompanied with increase of input material prices. This finding may be attributed to the fact that global steel industry is still not concentrated enough to face more significantly concentrated suppliers of raw materials. For example, in the iron ore market, 75 % of the world's resources are controlled by three concerns and similar trend occurs in the scrap market [9]. From this point of view, it is at least questionable if further consolidation in the steel industry will bring to the steel producing companies better bargaining positions in relation to their suppliers in the future or if it is necessary to seek for other ways to combat suppliers. On the other hand, increase of the global steel industry concentration is connected with increase of cold-rolled steel prices that is in accordance with theory of monopoly; however, the real reasons of final products' price increase requires deeper investigation. It is reasonable to assume that part of increased input costs had to be moved to the customers, so increased concentration in the industry itself could influence the final product prices only partially.

Although mergers and acquisitions are still the very popular means of corporate growth and there are reasonable predictions that the consolidation trend within steel industry will continue, there are plenty of authors that point to the dubious logic of global megamergers [10]. They indicate that when concentration happens in an industry it is often unclear whether the trend makes economic sense. Similarly, in case of global steel industry, our results suggest that increased concentration did not bring production costs reductions in the sense of price decrease of input materials but rather the opposite conclusions. What does the changing concentration mean for strategy creation of steel producing companies? As stated by Carr and Collis [2], companies in industries where changes are in motion and concentration, while modest, may be growing rapidly, should pay careful attention to the shift from local to global strategy. It means seeking for opportunities anywhere in the world. In this connection especially BRIC countries are mentioned and often evaluated separately in order to demonstrate the dynamics of "hunger" for the steel products [11].

CONCLUSION

It is reasonable to predict that further integration and concentration in global steel industry will continue. However, the effects of this process are rather contradictory. Steel producing companies shall carefully evaluate their own reasons for strengthening their position in the global market. Horizontal mergers and acquisitions can help top players to gain positions on prospec-

tive emerging markets. On the other hand, increased concentration in global steel industry was not accompanied with decrease of input material prices. From this point of view, vertical integration seems to be a better choice.

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