

DETERMINATION OF AN OPTIMAL MARKET SUPPLY CHANNEL BASED ON THE COMPARISON OF MARKET SUPPLY CHANNEL AND CONSUMPTION DYNAMICS

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Určovanie optimálnej distribučnej cesty ponuky na trhu založené na porovnaní distribučnej cesty ponuky na trhu a dynamiky spotreby

Abstract: Globalization affects a company's access to international markets since it is accompanied with the removal of trade barriers and booming information and communication with the emerging markets such as the Eastern Europe or China in the 20th century. While creating an internationalization strategy, the corporation faces a challenge to select the markets that could best comply with its goals, resources and have sufficiently large market potential. The article focuses on the market supply channels dynamics, which has to be considered when assessing the market capacity, and on the selection of market entry strategy. For that purpose, steel industry has been taken under scrutiny. The paper analyzes consumption, production, export and import data registered in the period spanning from 2004 to 2013 in 101 countries around the world. We group up the countries according to production volumes, export and import growth and make statistical inferences with the domestic dynamics of consumption. The results suggest the link between the market supply channel growth and its share in consumption volume to be present and significant. The paper provides recommendations for sustainability strategies of both individual companies and global steel industry.

Keywords: market gap, steel market, market supply channels, capacity, dynamics, international markets; corporate responsibility

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1 Introduction

The development of the domestic steel industry is considered as one of the major

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factors of economic growth. Practically, there is no company, which does not use steel products. Steel is the main construction material for manufacture tools and instruments of production, that affect directly on the quantity and quality of production, the level of development of productive forces, the temp and scale of technological progress.

The consequence of the lack of innovation and inventive activity, poor innovation policy of enterprises, lack of qualified specialists in marketing, insufficient implementation of corporate social responsibility is a weak competitive position at foreign and domestic markets.

Since the second half of the twentieth century globalization and integration of economies span up. Companies that have an ambition of fast growth search for new methods of entering foreign markets.

Overcoming challenges requires new approaches of influence on target market. These changes determine the necessity of forming methods and tools of forecasting steel market dynamics, which updates the topics of research.

T. Hirato [2], S. Kozawa [3], D. Müller [5], M. Porter [7], M. Yellishetty [9], etc. were world famous scientists, who devoted their work to theoretical and methodological basis of strategic planning. A. Mokiiv [4], F. Poklonsky [6], T. Yakhno [4], etc., conducted the research of the topic in Ukraine. However, despite the great interest to this problem, approaches to assessing countries and market entry strategies for steel industry are still not defined.

The purpose of the research is to develop the methodology of country selection, as a new market, and required market supply channel, that would be able to give a better effect in the particular country.

2 Methodology

Two groups of countries were selected by the criteria of existence of domestic steel production to analyze the dynamics of steel market. The criteria were chosen due to the different structure of market supply channels (MSC). The volume of MSC was expressed in million metric tons. A sum of produced and imported steel except volume of exported steel fulfils the consumption in countries with domestic production (formula 1). The consumption in countries without domestic production is equal to the volume of imported steel with the exception of exported steel (formula 2).

$$C(EDP) = P + I - E, \quad (1)$$

$$C(ADP) = I - E, \quad (2)$$

where: P – production; E – export; I – Import; – steel consumption in countries where domestic production exist; – steel consumption in countries where domestic production is absent.

Countries were ranked by the quantity of each market supply channels increase,

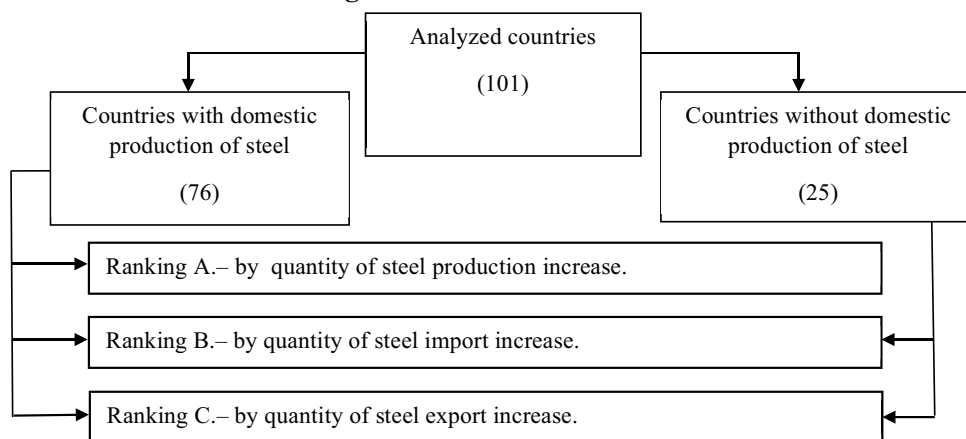
comparing the year before to determine tendencies. Then to summarize annual fluctuations in 101 countries during 2004 – 2013 three groups were determined by authors according to the quantity of market supply channel increase:

1. Group: Market supply channel increased in 100–70% of observations.
2. Group: Market supply channel increased in 70–30% of observations.
3. Group: Market supply channel increased in 30–0% of observations.

Groups were identified for countries with domestic steel production and without it separately. Countries with domestic production have 3 ranking by production, import and export, countries without domestic production have 2 ranking by import and export (Figure 1).

Figure 1

Scheme of countries ranking



Source: own processing.

The quantity of countries in every group is presented in Table 1.

Table 1

Distribution of the countries by groups

Number of group	Countries with domestic production of steel			Countries without domestic production of steel	
	production	import	export	import	export
Group 1	14	19	10	17	5
Group 2	52	54	61	8	18
Group 3	10	3	5		2

Source: own processing based on data. [10]

Determined countries groups are the basis for analysis of steel consumption fluctuation in the domestic market of a particular country and its' effect on market supply

dynamics. Steel consumption as a factor of analysis was selected due to the need for identifying market gaps [1].

Market gap is a market state, when the lag between demand on the product and the production capacity exists. It is caused by fluctuations and irregularity of the economy. Authors propose to point out open market gaps, when consumption tends to be higher than proposition and the closed one, when consumption tends to be lower than proposition. Open market gaps offer the opportunity to expand their customers' base. The correct and timely identification of market gaps enables the companies to improve their market share [1, 3]. High competition, bankruptcy, reforming of enterprises, which could not defend their market position, are features of closed market gaps.

Identification and forecasting of market gaps are essential components of the business strategy in steel industry because of a high production inertness. In case of a sharp rise in demand, production scaling could take from one to six month (if it does need to build a new production line). A decrease in demand on 30–40% is accompanied by significant technological costs. A complete stop to production is mostly impossible. As a result, it leads to a complete replacement of part of equipment.

To estimate market gaps and effect on market supply channels (domestic production, import, and export), the authors analyzed change in dynamics of steel consumption, as an identifier of demand. The model is built on the assumption that consumption volume of the product in the market of a particular country is equal to the sum of production and import minus export (formula 3).

$$C(t) = P(t) + I(t) - E(t), \quad (3)$$

where: C - consumption of steel; I - import; E - export; P - production; t - the analyzed year.

We assume that market mechanism balances ratio between market supply channels (production, import, export) every year. Next year a new consumption volume will exist, and it differs from the previous one (formula 4).

$$C(t + 1) = C(t) + C', \quad (4)$$

where: C - consumption; t - the analyzed year; C' - consumption change.

C' reflects the change in consumption in the year $(t+1)$ compared to year (t) and determines volume of a market gap. According to the assumption about market self-optimization in the year (t) exist optimal balance between market supply channels to face the requirements of consumption. The next year balance would be adjusted to correspond the change in consumption. As the result, market supply channels would be changed to match new consumption volume (formula 5, 6, 7).

$$P(t + 1) = P(t) + P', \quad (5)$$

$$I(t + 1) = I(t) + I', \quad (6)$$

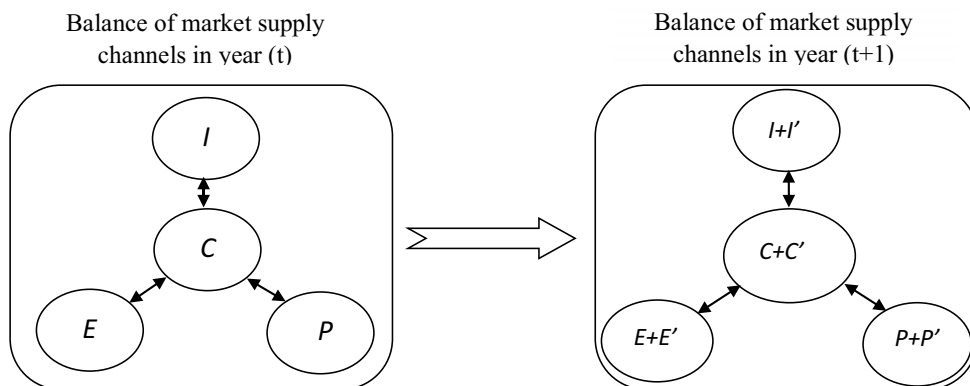
$$E(t+1) = E(t) + E', \quad (7)$$

where: I – import; I' – import change; E – export; E' – export change; P – production; P' – production change; t , $t+1$ – analyzed years.

Change of consumption and market supply channels is described in Figure 2.

Figure 2

Change of market supply channels

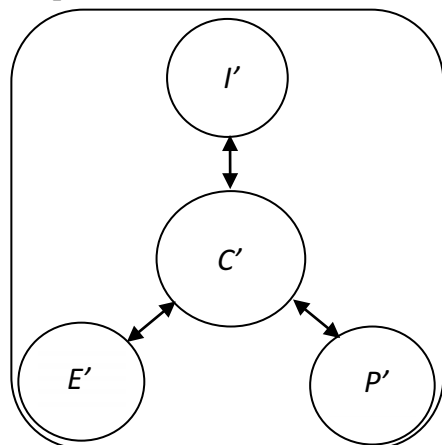


Source: own processing.

Determining changes in balance of market supply channels, as the result of consumption fluctuations allows us to analyze the stability of production, export, and import in terms of high competition during market contraction and in terms of a low competition during market upswing. To analyze reaction of supply channels on fluctuation in consumption, we have to determine the balance of change (Figure 3).

Figure 3

Balance of market supply channels changes corresponding to changes in consumption



Source: own processing.

The analysis was conducted in cases of increase and decrease in consumption. Using a factor of quantity of growth gives an ability to determine disposition of development of each market supply channel in favorable economic conditions – the growth of consumption in the country, and stress stability during negative conditions of reducing consumption. Arithmetic average was used to summarize data in groups of countries. Before the calculations data sieving was done. If in the country in the year t we observed that value of MSC change was in 10 times higher or in 10 times lower than the value of consumption this data was screened out. To test the methodology of selecting countries based on relative changes in market channels were used three hypotheses:

Average ratio of market supply channels change to consumption change is higher in groups of countries that have a higher quantity of market supply channels increase (formula 8). Data are tested separately in terms of consumption decline and growth.

$$\overline{\left(\frac{MSC'}{C'}\right)}(group1) \geq \overline{\left(\frac{MSC'}{C'}\right)}(group2) \geq \overline{\left(\frac{MSC'}{C'}\right)}(group3), \quad (8)$$

where: MSC' – change of market supply channel; C' – change of consumption.

As a consequence of the lower competition in terms of open market gaps, average ratio of import, the production change to the consumption change is higher when consumption is growing, than when it declines (formula 9)

$$\overline{\left(\frac{MSC'}{C'}\right)}(consumption\ increase) \geq \overline{\left(\frac{MSC'}{C'}\right)}(consumption\ decrease), \quad (9)$$

In the first groups average ratio of criteria market supply channel change to consumption change is higher than an average ratio of a not criteria channel change to consumption change (formula 10, 11). The hypothesis could be applied only to import and domestic production, as these channels have a direct influence on market supply.

$$\overline{\left(\frac{I'}{C'}\right)}(group1_I) \geq \overline{\left(\frac{P'}{C'}\right)}(group1_I), \quad (10)$$

$$\overline{\left(\frac{P'}{C'}\right)}(group1_P) \geq \overline{\left(\frac{I'}{C'}\right)}(group1_P), \quad (11)$$

where: I' – import change; P' – production change; C' – consumption change; group1_I – group no.1 of countries ranked by import; group1_P – group no.2 of countries ranked by production.

3 Results

3.1 Countries with domestic steel production

Hypothesis 1.

Production. Received data of the ratio of production change to consumption change is presented in Table 2.

Table 2

Ratio of production change to consumption change within groups

Number of group	Consumption increased	Consumption decreased	Total
Group 1	0.94	0.00	0.61
Group 2	0.16	-0.25	-0.11
Group 3	0.03	-0.24	-0.07

Source: own calculations.

During growing consumption, data fully corresponds to the first hypothesis. During decreasing consumption and in total ratio partly corresponds to the hypothesis:

$$0.00 \geq -0.25 < -0.24$$

$$0.61 \geq -0.11 < -0.07$$

The average ratio is the highest in the first group, but the ratio of the third group is higher than that of the second one. Overall, the data of the ratio of production to consumption changes within groups and this fact confirms the proposed hypothesis.

Import. Received data of the ratio of import change to consumption change are presented in Table 3.

Table 3

Ratio of import change to consumption change within groups

Number of group	Consumption increased	Consumption decreased	Total
Group 1	0.70	0.01	0.47
Group 2	0.75	-0.54	0.19
Group 3	0.19	-1.55	-0.50

Source: own calculations.

Data of ratio of import change to consumption change within countries with domestic production fully correspond to the hypothesis.

Export. Received data of the ratio of export to consumption change are presented in Table 4.

Table 4

Ratio of export change to consumption change within groups

Number of group	Consumption increased	Consumption decreased	Total
Group 1	0.19	0.42	0.27
Group 2	0.10	-0.28	-0.09
Group 3	-0.14	-0.63	-0.29

Source: own calculations.

Data of ratio of import change to consumption change within countries with domestic production fully corresponds to the hypothesis.

Hypothesis 2. Objective is to check the assertion that analyzed indicator has a higher tendency to decrease in terms of a closed market gap while the consumption of steel is reducing than in terms of open market gap while consumption of steel is increasing. The hypothesis is tested on the data of production and import, as factors, that directly supplies market consumption (Table 5).

Table 5

Comparison of production and import changes to consumption change during declining and growing consumption

Number of group	Ratio of production change			Ratio of import change		
	Consumption increased		Consumption decreased	Consumption increased		Consumption decreased
Group 1	0.94	\geq	0.00	0.70	\geq	0.01
Group 2	0.16	\geq	-0.25	0.75	\geq	-0.54
Group 3	0.03	\geq	-0.24	0.19	\geq	-1.55

Source: own calculations.

The analysis confirmed the hypothesis that countries with domestic production have a higher ratio of production, import change to consumption changes during the growing consumption than in times of decreasing consumption.

Hypothesis 3. The objective is to check if the selection of market supply channel based on the quantity of growth gives the optimal result. The hypothesis is tested on data of the first groups ranked by production and import.

In the first group of countries sorted by production increase, the ratio of production change to consumption change is 0.94; the ratio of import change to consumption change is 0.34

$$0.94 \geq 0.34$$

In the first group of countries sorted by import increase, the ratio of production change to consumption change is 0.03; ratio of import change to consumption

change is 0.70

$$0.70 \geq 0.03$$

As a consequence, selection of a country based on the methodology enables us not only to forecast a higher ratio of market supply channel growth, than in countries of other groups, but it proves that a selected market supply channel would have higher growth rate than other channels.

3.2 Countries without domestic steel production

The first and second hypotheses could be applied to countries without domestic production.

Hypothesis 1. Import and Export. Received data are presented in Table 6.

Table 6

Ratio of production and import change to consumption change within groups

Import			Export		
Consumption increased	Consumption decreased	Total	Consumption increased	Consumption decreased	Total
1.24	-1.01	0.46	2.47	0.74	0.52
0.04	-0.58	-0.64	-0.01	0.08	0.02
-	-	-	-0.01	0.01	0.00

Source: own calculations.

The data fully confirmed the hypothesis. It is worth mentioning that high rates of export growth in terms of consumption decrease. It indicates the effective operation of enterprises, which work as dealers in the international steel market, and confirms that a complete absence of domestic production does not prevent export operation.

Hypothesis 2. Received data are presented in Table 7. The hypothesis is tested on the data of ratio of import change to consumption change.

Table 7

Comparison of ratio of import change to consumption at the declining and growing consumption

Number of group	Consumption increased		Consumption decreased
Group 1	1.24	\geq	-1.01
Group 2	0.04	\geq	-0.58
Group 3	-		-

Source: own calculations.

Statistical data confirmed the hypothesis within groups of countries without do-

mestic production. Thus, the whole hypothesis confirms the role of import of products as the only channel that supplies the market directly within countries without domestic production. The direct change of import in cases of changing consumption also shows that in the consumption changes is balancing rather by import than export.

4 Conclusions

Hypothesis 1 confirms that the selection of countries based on the quantity of the growth of market supply channel is optimal. Selected groups of countries have a higher ratio of the change of chosen market supply channel to consumption change than other groups of countries. Hypothesis was confirmed in 89% of cases.

Hypothesis 2 confirmed that in one group of countries ratio of production or import to consumption is higher in terms of growing consumption than when the consumption decreases. It proves that increasing consumption is an effective engine of market supply channels growth. The hypothesis was confirmed in 100% of cases.

Hypothesis 3 confirmed that selection of the first group of countries maximizes the growth of market supply channels. Average growth of selected channel would be higher than that of others. So, for example, if countries were selected in the first group of countries ranked by production, allocating production capacities would be more profitable strategy than importing to the country.

Further research: Based on groups of countries, it is planned to identify economic characteristics that influence the growth of every supply channel, to determine factors of economic system that are critical and negatively affect the dynamics of market supply channels.

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