

**MEASURING THE IMPACT OF FOREIGN TRADE ON
PERFORMANCE GROWTH OF THE WOOD PROCESSING
INDUSTRY**

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ABSTRACT

A foreign trade indicates a success and competitiveness of a sector on foreign markets. Wood processing industry (WPI) is a sector based on renewable natural resources of wood and therefore capable of sustainable growth. The interest of the European Union is to build economy based on renewable natural resources, resulting in the need to pay increased attention to the development and support of the WPI. The aim of the paper is to evaluate the impact of foreign trade in WPI on the economic performance of the sector in Slovakia and the Czech Republic. To achieve the goal we have set up a system of indicators and tested a hypothesis: Increasing export performance of the sector has a positive impact on its economic performance. Achieved results have shown that although the WPI generates an active trade balance, sectoral performance during the analyzed decade declined due to changes in the net exports.

KEYWORDS: Foreign trade balance, net export, economic performance, multiplier, wood processing industry.

INTRODUCTION

A foreign trade presents the business activities of the country, sector and enterprises on foreign markets. Balance of foreign trade is one of the components of GDP; foreign trade therefore can positively or negatively influence the level of the GDP, as well as a performance of sectors and enterprises. The foreign trade balance is used as a starting base in clarifying the comparative advantages especially at the level of industries and sectors within the economic structure of the country. Effectiveness of implementation of the foreign trade relations relates to the ability of industry to succeed on international markets. (Han et al. 2009)

The paper deals with measuring impact of foreign trade on performance of wood processing industry and with comparison of results in Slovakia and the Czech Republic. The focus of the article on WPI has several reasons. The WPI is extremely multi-functional and provides a wide range of products and materials. It provides economic, environmental and social contribution based on use of renewable resources. Wood-based products are recyclable, re-usable either in new products, or as energy. They are biodegradable and can be used to replace materials from non-renewable resources. The WPI is an important part of developing economies, new prospective direction based on biotechnology. Production of wood-based products in conditions of the Czech and Slovak Republic has, in regard to sufficient supply of input wood material, long tradition and as one of the options for obtaining renewable resources it is closely connected with many sectors of the national economy. Wood processing industry is one of the sectors in which the Czech and Slovak economies can affect European markets by maximum use of their own resources. The need to deal with chosen theme of article is mainly due to the fact that the EU puts emphasis on the economic development based on renewable resources. WPI therefore belongs to the supported and prospective industries and the interest of the EU is to make this sector highly competitive industry on the world market. The performance of the WPI, which the paper deals with, is therefore highly topical and important. Despite these facts, there is insufficient attention paid to analysis of wood processing industry and its performance, by now no study in the subject has been published.

The aim of the article is on the basis of the suggested indicators to find out the impact of foreign trade on performance of wood processing industry for a period of ten years and to identify factors that have a significant influence on the performance of the sector.

MATERIAL AND METHODS

Required material for achievement of relevant outputs we obtained from a secondary research, on the basis of an analysis of available scientific literature dealing with influence of foreign trade on economic growth and on the basis of processing the foreign trade statistics and economic indicators of the wood processing industry in Slovakia and the Czech Republic.

In scientific publications several indicators for measuring impact of foreign trade on the economic growth at a macroeconomic level were suggested. Based on theoretical knowledge study we summarized indicators applicable at a sectoral level:

According to Breda et. al. (2007), Rojíček (2007) and Melíšek (2012), the most commonly used method of measuring the impact of foreign trade on economic growth (measured by GDP growth) at a macro level is the quantification by the so-called contribution to a growth. It expresses the contribution of net exports to GDP growth as a weighted difference between the growth of exports and imports, where the weights are the shares of export and import ratios to

GDP from the previous period.

Another possibility of measuring the impact of exports on economic growth is a quantification of the impact of export using input-output analysis based on the analysis of direct and indirect intensity of domestic production for imports. The contribution of foreign trade to economic growth is calculated as the contribution of net export after deducting evoked net import to intermediate consumption from gross export. (Hajnovičová 2008a, b).

An influence of foreign trade on the economic growth can be evaluated via multipliers of final use components. They show how much domestic production and import were evoked in that year by export, final consumption of households, government consumption and gross capital formation, respectively what value added and employment were generated at all stages of production. (Lábaj et al. 2008; Bayerl et al. 2008).

In the next step we proposed indicators measuring an influence of foreign trade on the sectoral performance, based on the modification of macroeconomic indicators as follows:

The contribution of foreign trade (CFI) to the growth of economic indicators expresses the contribution of net export to the annual growth rate in selected economic indicator of a sector:

$$CFI = \frac{\Delta X}{Y_{t-1}} = \left(\frac{EX_t}{EX_{t-1}} - 1 \right) \cdot \left(\frac{EX_{t-1}}{Y_{t-1}} \right) - \left(\frac{IM_t}{IM_{t-1}} - 1 \right) \cdot \left(\frac{IM_{t-1}}{Y_{t-1}} \right) \quad (1)$$

where: ΔX - net export of sector's commodities (gross export minus gross import),
 EX - export of sector's commodities,
 IM - import of sector's commodities,
 Y - economic indicator of the sector.

Based on the indicator CFI, we searched the effect of foreign trade on production, sales, value added and profit of a sector. For values FCI applies:

ak $PZO > 0$ foreign trade contributes to the sectoral performance growth

ak $PZO < 0$ foreign trade negatively affects the economic performance of the sector

To analyze the impact of exports on sector performance we also used **multipliers of import, export and net export** modified for use on selected economic performance indicators of a sector: sales, value added, production, profit. Multiplier (MX) is calculated by dividing the generated value of economic indicator by generated value of chosen foreign trade component. The formula for its calculation is:

$$M_X = \frac{\sum_{i=1}^n \Delta Y_i}{\sum_{i=1}^n \Delta X_i} \quad (2)$$

where: Y_j - an economic indicator of a sector „j“ and commodity „i“,
 X_j - a component of foreign trade (export, import or net export) of a sector „j“ and commodity „i“.

For values MX applies:

if $|MX| < 1$ foreign trade has no multiply effect on economic performance of sector's commodity

if $MX < 0$ foreign trade has an opposite effect on economic performance of the sector.

Accelerator of sectoral economy (AY) is the next variable, which we searched the impact of evoked economic results by export on a subsequent change in exports. This indicator we proposed as a modification based on macroeconomic accelerator GDP as follows:

$$A_Y = \frac{\sum_{j=1}^n \Delta X_j}{\sum_{j=1}^n \Delta Y_j} \quad (3)$$

where: Y_j - an economic indicator of a sector „j“ and commodity „i“,
 X_j - a component of foreign trade (export, import or net export) of a sector „j“ and commodity „i“.

For values A_Y applies:

ak $|A_Y| < 1$ sector economic indicator does not change the accelerated

ak $A_Y < 0$ sector economic indicator has the opposite effect to change in foreign trade

To analyse and correctly interpret the results achieved in the indicators it was necessary to compare them with the development of foreign trade components during an observed period representing by the change index (X_t):

$$X_t = \frac{X_t}{X_{t-1}} - 1 \quad (4)$$

where: X - a component of foreign trade (export, import or net export).

Calculation of individual indicators was applied in the wood processing industry of the Czech Republic and Slovakia. A characteristic feature of the WPI is processing of raw wood and wood products production at various stage of finalisation. WPI within the classification of business activities of the EU (NACE) consists of following sections:

- NACE 16: primary mechanical wood processing (timber industry),
- NACE 17: primary chemical wood processing (pulp and paper industry),
- NACE 31: secondary wood processing (production of furniture).

Enter data for evaluation of impact of foreign trade to sectoral performance was obtained from database of Statistics Bureaus, the Ministries of Economy of the Czech and Slovak republics and Eurostat with annual data on foreign trade of countries and commodity structure divided according to statistical classification of products by activity (CPA 2008) in million Euro (FOB/FOB) for the period 2003 - 2012. The selected database enabled to exclude from export and import values the trade in timber as for wood raw material, thus it was possible to analyze foreign trade of WPI according to the NACE. Next group of input data were economic indicators of each NACE group: production value, turnover in own products, value added, cost, profit before tax, number of enterprises obtained from database of statistical offices and ministries of economy.

For appropriate applications of mathematical and statistical methods we created application in MS Excel and by calculating variables we reached needed output data. Then we compared the results achieved in Slovakia and the Czech Republic. The final step was to test the hypothesis: Increasing export performance of the sector has a positive impact on its economic performance, based on a review of relations and connections between calculated indicators, foreign trade components and economic performance indicators and validated by statistical method of correlation and regression analysis.

RESULTS

When assessing the impact of foreign trade on sector performance we used the calculation of the indicators drawn up according to formukas described in the previous chapter. Existing

indicators measure the impact of foreign trade only at a macro level. Proposed indicators allow us to measure the impact of foreign trade at the level of industries and sectors within the economic structure of the country. In this part of the paper we present selected results of performed analysis that enabled to achieve needed findings.

The status of wood processing industry in the foreign trade of the country is characterized by the proportion of the sector in the foreign trade of country and its success on foreign markets is presented by export performance of the industry (see Tab. 1).

The data in the Tab. 1 show that WPI in Slovakia and the Czech Republic in the period of ten years continuously forms the active balance of trade, the export performance in Slovakia is much higher. In Slovakia, the formation of the positive trade balance is steadily decreasing, over the analyzed period has halved, and also a share in the export of the country decreased from 7.8 in 2003 to 3.6 % in 2012 representing a 50 % decrease. The same trend can be observed in the Czech Republic where the share of the sector in national exports gradually decreased from 6.2 to 3.9 %. However, the formation of an active trade balance declined as a result of the crisis in 2008 and 2009 and since 2010 it has been turned to rising trend.

Share of slovak WPI in the import SR is lower than in the export and gradually decreased from 4 to 2.9 %. In the Czech Republic the situation is similar, and the proportion of WPI in the Czech Republic is almost at the same level as in Slovakia.

According to data on the export performance of the industry can be concluded that it is in Slovakia high and moving at an average of 77 % of revenues and 95 % of production. In times of crisis can be seen higher value of exports than the production of WPI that may be due to the fact, that part of the exports was realized from import or export product prices rose. In the Czech Republic the export performance of WPI compared to SR is lower but with upward trend; share of exports in sales gradually increased from 31.2 to 64.5 % and in the production of WPI from 53.8 to 66.7 %.

Positive RCA index values mean a comparative advantage of the industry at the national level, however, over the analyzed period this advantage is gradually decreasing in both countries and drawing to zero. In Slovakia it is associated with decreased net export of the sector, but in the Czech Republic, despite an increase in net exports, a comparative advantage decreases.

Tab. 1: Status of wood processing industry in national foreign trade.

Indicator/ years	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
WPI SR:										
Trade balance (mil. €)	1133	937	1026	840	817	921	957	773	702	575
Share in export of SR (%)	7.8	6.9	6.5	5.7	5.1	4.8	5.4	4.5	4.0	3.6
Share in import of SR (%)	4.0	4.0	3.5	3.7	3.6	3.0	3.2	3.0	2.9	2.9
Share of exports in sales WPI (%)	89.85	79.77	77.73	80.00	77.19	69.66	64.57	87.42	68.54	74.08
Share of exports in production WPI (%)	94.94	89.16	83.86	88.96	84.29	89.64	110.7	102.8	102.0	99.22
RCA	0.666	0.553	0.605	0.430	0.367	0.451	0.514	0.395	0.329	0.208
WPI CR:										
Trade balance (mil. €)	786	921	1086	1143	1303	942	742	1087	1162	1236
Share in export of CR (%)	6.2	5.6	5.5	5.0	4.8	4.5	4.6	4.3	4.0	3.9
Share in import of CR (%)	4.1	3.9	3.9	3.6	3.6	3.6	4.0	3.4	3.2	3.2
Share of exports in sales WPI (%)	31.2	31.9	55.6	55.3	56.7	57.2	57.6	61.0	62.9	64.5
Share of exports in production WPI (%)	53.8	57.7	59.2	58.0	58.7	56.4	57.7	62.2	64.4	66.7
RCA	0.406	0.358	0.346	0.330	0.306	0.230	0.148	0.239	0.230	0.197

Source: Bureau of Statistics of the Czech Republic, the Slovak Republic and own calculations.

Achieved results of individual indicators that reflect an influence of foreign trade on a performance of the wood processing industry in Slovakia and the Czech Republic are given in Tab. 2.

The analysis of data shown in Tab. 2 brought us several findings. Net export was in plus values throughout the period under review. In Slovakia it increased in 2005 by simultaneous increase in imports and exports, then in 2008 and 2009 due to higher decline in imports than in exports. In other years a net export fell due to a higher increase in imports than exports in 2006, 2007, 2011, 2012 and due to decline in exports by import growth in 2004 and 2010.

Indicators CFI (contribution of foreign trade) showed that the decrease in the amount of positive net export caused a decline in sales, profits and value added. Net export has a more significant impact on the formation of value added mainly by a sharp rise in imports. The greatest influence of foreign trade is noticed on profit, excluding the years of economic crisis (2009 – 2011). Impact on revenues is the smallest, changes in a net export cause minor changes in sales as the change size in the foreign trade.

By export multipliers we found out a multiple effect of export on sales and production in the same direction, which means that the increase in exports evokes a multiple increase in sales and production. Multiple effect on revenues is gradually increasing, except of crisis years, from 1.4 to 6-fold sales growth. In case of production there is more than 3-fold effect. Multipliers of net export showed the reverse multiplier effect on sales and production when the increase in the value of positive net export causes a multiple decline in sales and production and the largest double-digit effect is by very small changes in the amount of net export. This effect may be due to changes in import. When calculating import multipliers, a significant multiple effect of imports was not found. However, import growth has a significant impact on the decline in industry profits and small size of the change in import has a multiple effect on sales and production in the same direction.

Values of accelerator showed that value added has an influence on generating higher exports when the value added growth evokes a greater decline in net exports.

Results in indicators of czech wood processing industry are essentially similar to those in Slovakia. However, there is different development in the value of net export which fell only in 2008 and 2009 at a time of crisis due to higher decline in commodity exports than in import fall. Therefore, a foreign trade had a positive impact on sales, production and profit in the most years of analyzed period with the largest impact of the net export on profit and value added. Multiplier effect of export to sales is larger than in Slovakia. An interesting finding is that in the Czech Republic an effect of net exports is equal to that of export, net export growth evokes a multiple growth in sales and production. When calculating accelerator of value added, there was also found acceleration effect of value added on the growth of exports and net exports. Comparing the results in Slovakia and the Czech Republic can be seen that foreign trade has the influence on the same performance indicators of the sector and the effects are stronger in Slovakia.

The results led us to a more detailed analysis of correlations and successions in influence of foreign trade on economic performance of wood processing industry. Development of indicators for foreign trade impact measuring in Slovakia indicates the following chain of effects: Export growth ($\uparrow EX$) evokes a multiple increase in sales (S) and production (Q), then the effect is reflected in value added (VA) and profit (P) rising and after that value added growth accelerate an export rise. Net export has an opposite effect following that growth in imports ($\uparrow IM$) has the same effect on the economic performance of the sector as the growth of commodity exports. Relationship can be written as follows:

$$\uparrow EX \text{ or } \uparrow IM = \uparrow M_x \cdot S + \uparrow M_x \cdot Q \Rightarrow \uparrow VA + \uparrow P \Rightarrow \uparrow VA = \uparrow A_y \cdot EX$$

Tab. 2: Indicators of impact of foreign trade on performance of WPI SR and ČR.

Indicator/ years	2004	2005	2006	2007	2008	2009	2010	2011	2012
WPI SR:									
Export index	-0.03	0.05	0.08	0.04	-0.03	-0.10	-0.01	0.04	0.01
Import index	0.10	0.02	0.27	0.07	-0.09	-0.17	0.11	0.10	0.08
Net export index	-0.17	0.10	-0.18	-0.03	0.13	0.04	-0.19	-0.09	-0.18
CFI to sales	-0.08	0.03	-0.07	-0.01	0.03	0.01	-0.08	-0.03	-0.05
CFI to value added	-0.41	0.18	-0.33	-0.04	0.17	0.07	-0.37	-0.13	-0.23
CFI to profit	-2.74	1.87	-3.30	-0.26	0.70	0.00	-0.01	0.00	-1.21
Multipliers of export									
Sales	1.4	1.4	0.9	2.7	5.9	2.5	2.6	4.8	6.2
Production	0.9	1.6	0.8	2.9	4.3	3.0	4.4	1.2	3.6
Multipliers of net export									
Sales	-0.5	-1.8	-0.9	-11.8	-4.1	-18.1	-0.4	-5.7	0.9
Production	-0.3	-2.1	-0.8	-12.9	-3.0	-21.9	-0.6	-1.4	-0.5
Accelerator VA									
Export	6.8	1.7	4.2	15.7	1.1	5.2	0.6	12.5	0.1
Net export	-18.8	-1.3	-3.9	-41.7	-1.7	-0.7	-4.6	-10.5	-0.5
DSP ČR:									
Export index	0.21	0.11	0.10	0.16	-0.08	-0.10	0.16	0.04	0.05
Import index	0.23	0.08	0.12	0.17	0.00	-0.06	0.08	0.03	0.05
Net export index	0.17	0.18	0.05	0.14	-0.28	-0.21	0.47	0.07	0.06
CFI to sales	0.044	0.007	0.034	0.022	-0.035	-0.015	0.034	0.009	0.006
CFI to value added	0.172	0.027	0.131	0.081	-0.135	-0.060	0.136	0.035	0.025
CFI to profit	0.769	0.097	0.566	0.276	-0.423	-0.230	0.657	0.161	0.110
Multipliers of export									
Sales	1.60	5.73	3.54	2.26	1.88	3.25	0.96	3.50	
Production	1.14	1.31	2.07	1.57	0.87	2.17	0.83	0.02	0.52
Multipliers of net export									
Sales	11.49	21.87	11.43	5.74	1.86	3.76	1.77	0.59	
Production	4.70	2.83	12.54	6.06	1.84	4.35	1.44	0.04	
Accelerator VA									
Export	2.16	6.60	1.54	2.92	1.79	2.57	5.73	1.75	
Net export	0.52	3.05	0.26	0.76	1.84	1.28	3.33	0.82	

The relationship of variables in the wood processing industry in Slovakia shown in Fig. 1 confirms our claim. Our statement has been also verified by statistical correlation analysis method via coefficients of correlation (see Tab. 3) that showed the highest direct dependence between export and production (0.8238) and consequent correlation between export and value added (0.9108).

Such an effect of foreign trade was not found in the sector of the Czech Republic, where the growth in imports causes a decrease in sales and profit sector, but on the contrary, growth of value added and production. Components of foreign trade have a significant impact on production evoking a consequent rise of value added. High dependence between those variables was also confirmed by correlation coefficient higher than 0.8, given in Tab. 3.

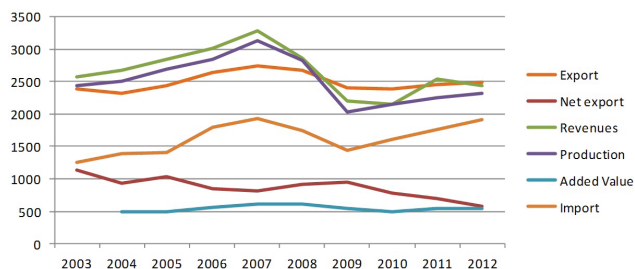


Fig. 1: Trend of foreign trade and economic indicators of WPI in SR.

Source: database of Statistical Bureau and Ministry of Economy in SR.

Tab. 3: Coefficients of correlation.

Correl (X/Y)	Sales	Production	Value added	Profit
WPI SR				
Export	0.7776	0.8238	0.9108*	0.8087
Import	0.6077	0.5100	0.8249	0.5220
Net export	-0.0032	-0.03128	-0.4988	-0.1066
WPI CR				
Export	0.4432	0.9589	0.8213	0.1669
Import	-0.4839	0.9408	0.7567	-0.3086

*Coefficient calculated by values: EX_t a PH_{t-1}

Source: own calculations.

DISCUSSION

Evaluating the impact of foreign trade on performance of wood processing industry was based on the findings of previous studies in which the authors of the paper (Sujová 2011, Sujová and Rajnoha 2012; Hlaváčková and Šafařík 2014) and other professionals (Jelačić et al. 2012; Merková et al. 2012; Šafařík 2013; Lagaňa et al. 2008) have been dealing with qualitative analysis of competitive factors of wood processing industry. Previous analyses led to the following conclusions:

- Wood processing industry has a high export performance compared to other sectors of industry and a significant share within production of processing industries.
- It is an independent industry on imported raw wood material due to sufficient supplies of raw wood in the national economy.
- There are new trends in the use of wood-based products in other industrial sectors.
- There is a high interest of international investors and high FDI inflows.
- Use of wood raw material is not effective, in the export of products still dominate the products of low added value.
- Business activities of wood processing enterprises and promotion of the wood-based products use are insufficient.
- Current policies of national governments prefer to provide for a high level of finalization of wood processing in the State of raw wood production.
- Given the distribution of mineral resources is a wood processing industry important from

the perspective of regional development of SMEs with good possibilities to use changes in production technology and results of innovation processes and it can support the development of employment with relatively low capital input.

- Main competitive advantage of the industry consist in the price.

In previous work, the authors also highlighted the fact that comparative advantage and competitive advantage based on lower prices the wood processing industry in Slovakia and the Czech Republic over the past decade gradually loses. However, previous qualitative studies confirmed the competitive ability of the industry and potential to be successful on the international market, thus increase their performance and contribute to the sustainable growth of the national economy.

Nevertheless, the industry still faces problems in low-performing and the unfavorably developing economic situation influenced by several factors. In this paper we have shown the impact of foreign trade of the sector on its economic performance. Achieved results brought the interesting findings. The first finding is that the growth performance of the sector is affected primarily by positive growth in net exports and net export decrease has an opposite effect. The second finding is that in Slovakia the growth in export and also in import affects growth in sales and production and consequently in value added and profit. The growth of net exports due to lower imports, however, causes a multiple decrease of monitored sectoral economic indicators. It follows that dominating imported commodities are intermediate products in the production sector allowing to generate higher production and export, with a positive multiple effect on the performance of wood processing industry in Slovakia.

When analyzing the wood processing industry in the Czech Republic, we have come to a different finding in influence of imports on the economic performance. Import of commodities relates to the growth of value added and production, while the sales and profit affects negatively. This may mean that the import mostly consists of final products for resale, or imported commodities are not able to contribute to the formation of higher sales and profits. An interesting fact is the finding that changes in the amount of net export have opposite effects on economic indicators in Slovakia as in the Czech Republic; while in Slovakia its growth affects a decrease in economic indicators, in the Czech Republic is causes their growth.

The facts presented in the analysis therefore can not be generalized to the sectore of any country. Subject of further scientific studies will be analyzing the structure of imports and exports by commodity groups of each subsector within wood processing industry which allows to design and optimize the structure of foreign trade in wood processing industry to increase industrial performance.

CONCLUSION

The wood processing industry has the potential to create an active trade balance and contribute to economic growth of sectors and countries. Presented analysis of the influence of foreign trade on the growth performance of the sector over the past ten years showed that changes in development foreign trade have a significant impact on sectoral economic performance. The wood processing industry creates a positive foreign trade balance, but a performance of the sector is declining. Therefore, we have proposed indicators to find out what changes in foreign trade act on changes in selected economic indicators of the industry: the contribution of foreign trade to growth in sales, production, value added and profit; multipliers of export, import and net export; accelerators of sales, value added, production and profit.

Determined values of indicators showed that the performance growth of the sector is affected by the changes in value of net export, mainly due to changes in the level of imports and that a growth in value added has a positive effect on the generation of additional exports. Values of multipliers confirmed multiple effect of the change in exports on achieved sales and production. The impact of import was approved in the growth of value added and profit. Our arguments were also verified and confirmed by the statistical method of correlation analysis, where the correlation coefficients indicate high dependence between the components of foreign trade on the one hand and sales, production and value added on the other.

The achieved results lead us to conclusion that a performance of the sector is affected by changes in the structure of a trade balance in the industry, but reducing imports in aim to increase net exports and thus a performance of the industry is not a right solution because the effect would be an opposite one.

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