

SECTORAL ANALYSIS OF COMPETITIVENESS OF WOOD PROCESSING INDUSTRY IN THE CZECH REPUBLIC

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Abstract

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Wood processing industry (WPI) is a sector based on renewable natural resources of wood raw material. It is therefore able of sustainable growth and be competitive on the international markets. 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 level and development of competitiveness of WPI in the Czech Republic in subsectoral structure for a period of ten years through the establishment of indicators based on foreign trade data of industry using mathematical and statistical methods. To reach the goal we set up a system of indicators measuring sectoral competitiveness. Achieved results in indicators have shown that, despite the WPI creates active foreign trade balance and contributes to surplus balance of country, it achieves low value of indicator revealed comparative advantage (RCA) with a negative, decreasing trend, thus industry gradually loses its competitive ability. Analysis was also found, that the reason for low competitive ability of WPI is low specialisation of country in the commodity group, which was confirmed by statistical method of correlation analysis.

Keywords: competitiveness, revealed comparative advantage, competitive advantage, foreign trade balance, wood processing industry

INTRODUCTION

Competitiveness by material of EU is defined as the ability of the firms, industries, regions, nations and transnational regions generate a high level of income and employment, while exposure to foreign competition. The competitiveness of countries and industries on the world markets today forms the basis for theory of international trade and economic growth, while in comparison with classical and neoclassical economic theory of international trade it highlights innovative, realistic sources of trade and economic development. In the approaches to competitiveness an alternative term to comparative advantage a competitive advantage is. In describing comparative advantage it can be seen as quantitative understanding of production factors and goods, on the other hand,

competitive advantage is primarily defined from qualitative view of factors and goods.

In professional literature, however, there is no universally valid and generally accepted definition for the competitiveness of the sector. In the case of sectoral competitiveness it is going on the macro-economic evaluation of the competitiveness on a sectoral approach, thus there is an overlap of macro and meso level view on competitiveness. By its clarifying as the reference basis serves the balance of foreign trade and it is therefore based on analysing comparative advantage of the industry. At the sectoral level is also taken account of the international trade.

The paper deals with the analysis of competitiveness of wood processing industry (WPI) in the Czech Republic in subsectoral structure and comparison with WPI EU as a whole. 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 an 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 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 economy 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 industry and it is in the EU interest to make WPI highly competitive industry on the world market. The competitiveness 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 competitiveness development of WPI, by now, no study in the subject has been published.

The aim of the article is on the basis of the competitiveness analysis to evaluate the competitiveness development of the wood processing industry subsectors in the Czech Republic for a period of ten years and to assess the effectiveness of foreign trade structure.

MATERIALS AND METHODS

Required material for obtaining relevant outputs we obtained from a secondary research, on the basis of an analysis of available scientific literature dealing with competitiveness problem of sectors and countries and on the basis of processing the foreign trade statistics of the wood processing industry.

Current research of competitiveness is based on using statistical methods to assess revealed and anticipated comparative and competitive advantages. In fact, there is not only one indicator comprehensively expressing level of competitiveness, whether economy as a whole or its individual parts of the structure. Some indicators are applicable only to the whole economy, some may measure competitiveness at both, country as a whole as well as at lower levels of economic structure. (Oustrata, 2000, p. 11). In practice there were designed and are used several indicators for identifying and measuring competitiveness which can in a specific combination characterize competitiveness of selected industrial sector or also country (Han, Wen and Edge, 2009; Dieter, Englert,

2007). The indicators can be classified into two basic groups: to result-oriented and determinant-oriented indicators (Gries and Hentschel, 1994; Dieter, Englert, 2007).

Result-oriented indicators enable to detect a competitive situation in ex-post perspective and they are used for determining competitiveness in the sector and in international markets. Based on study of literature and methodologies of international organizations dealing with the evaluation competitiveness at the macro and meso levels we created a system of indicators for competitiveness evaluation of the sector and its internal structure:

- Revealed comparative advantage (RCA) is the most used indicator and it exists in several modifications:
 - RCA indicator as logarithm of quotient of export and import commodity groups in that country to total export and import of the same country expresses competitiveness at national level (under Klodta, 1993 and methodologies Austrian Institute for Economic Research – WIFO Vienna). This variable can be modified to detect competitiveness of commodity groups within the industry, i.e. to determine intrasectoral competitiveness.
 - Competitiveness growth index (RCA1): the comparison of export rate in the sector of country with total export share of country or integration group or world in the sector on the total export of integration grouping or world. Variable RCA1 allows to find out the competitiveness of industry on the international and world market.
 - Index of net business performance RCA 2 (Balassa, 1965, p. 90–124) defined as proportion of the difference between export and import of commodity groups and the sum of export and import of these commodity groups. It expresses rate in which the industry contributes to formation of active trade balance.
 - RCA index of cross-sectoral specialisation (in accordance with the methodology ITC – International Trade Center UNCTAD and WTO processing analyses in the area of trade development) analyzes difference between observed net exports, existing specialisation, trade deficit and the theoretical net exports.
- Index of contribution to the trade balance CTB (Melíšek, 2012) as the difference between the actual and the expected balance of industry. It measures contribution made by the industry to the national trade balance.
- Michaely index (Michaely, 1962) analyzes the share of the commodity group in the total national export and share of the commodity group in the national import. It enables to demonstrate the certain rate of specialisation of country in the commodity group, or in the industry.
- Grubel-Lloyd index (GLI) analyzes level of representation of commodities with intrasectoral

character of foreign trade, higher levels of representation is symptomatic of higher level of national competitiveness.

- Index of kilogram export and import prices (KPI) is calculated as the ratio of export value to one commodity unit and import values to one commodity unit. It highlights the relationship between price and qualitative competitiveness of the product or commodity group.
- Indicator of revealed price elasticity (REVELAST approach) developed by K. Aiginger and Y. Wolfmayr-Schnitzer (1996) analyzes competitiveness in price and qualitative distinction. On the base of relationship between export and import unit values and the amount of export and import, the industrial groups can be divided into certain characteristic segments differing by price and qualitative competitiveness and their impact on trade balance (Bobáková, Hečková, 2007).

Real competitiveness of wood processing industry, its sections and commodities we analyzed through the application of selected abovementioned methods of competitiveness measurement at the level of industry in aim to validate correctness of the achieved results and the relevance of characteristics.

Indicators found on the basis of the literature study we modified and their calculation were adjusted in order to provide subsectoral competitiveness analysis. In relations to calculate them, abbreviations are used as follows:

x_{ij}export value of commodity group „i“ within industry „i“ in country „j“,

m_{ij}import value of commodity group „i“ within industry „i“ in country „j“,

X_{ij} export value of industry „i“ in country „j“,

M_{ij}import value of industry „i“ in country „j“,

X_jvalue of total export from country „j“,

M_jvalue of total import to country „j“,

X_iworld export or export of integration group (e.g. EU) in commodity group „i“,

Xtotal world export or total export EU.

Indicator RCA presents comparative advantage or disadvantage of export and its competitive ability. Its calculation was made at two levels, national (N-RCA) and sectoral (S-RCA):

$$N - RCA = \ln \left[\frac{(x_{ij} / m_{ij})}{X_j / M_j} \right], \quad (1)$$

$$S - RCA = \ln \left[\frac{(x_{ij} / m_{ij})}{(X_{ij} / M_{ij})} \right]. \quad (2)$$

For variable RCA applies:

$RCA < 0$ induces revealed comparative disadvantages in the commodity,

$RCA > 0$ indicates that there are in the country for export commodities of that industry

or commodity revealed comparative advantages,

$RCA > 1$ identifies the commodity and industry as internationally competitive.

Index of competitiveness growth (RCA1) is calculated as follows:

$$RCA1 = \frac{x_{ij} / X_j}{X_i / X} \quad (3)$$

If $RCA1 > 1$ there is revealed comparative advantage of industry on worldwide market.

If $RCA1 < 1$ a commodity group has no competitive ability on relevant market.

Indicator of net trade performance (RCA 2) evaluates a comparative advantage of export of industry or commodity and its competitive ability. The formula for calculating RCA2 is:

$$RCA2 = \frac{x_{ij} - m_{ij}}{x_{ij} + m_{ij}} \quad (4)$$

For variable RCA2 applies:

$RCA2 = -1$ means that export doesn't exist ($x_{ij} = 0$),

$-1 < RCA2 < 0$ induces comparative disadvantage,

$RCA2 = 0$ export = import

$0 < RCA2 < 1$ induces revealed comparative advantage,

$RCA2 = 1$ means that import doesn't exist ($m_{ij} = 0$).

Michaely index (MI) highlights the degree of specialisation, or the lack of specialisation in specific commodity groups. Calculation of the index has been adjusted into two levels, sectoral (S-MI) and national (N-MI):

$$N - MI = \frac{x_{ij}}{\sum_{i=1}^n X_j} - \frac{m_{ij}}{\sum_{i=1}^n M_j}, \quad (5)$$

$$S - MI = \frac{x_{ij}}{\sum_{i=1}^n X_{ij}} - \frac{m_{ij}}{\sum_{i=1}^n M_{ij}}. \quad (6)$$

For Michaely index applies:

$0 < MI < 1$ points to a certain degree of specialisation of country in the commodity group,

$-1 < MI < 0$ indicating insufficient specialisation of country in the commodity group.

Index of contribution to trade balance (CTB) we have adjusted in order to find out competitiveness of sections within WPI its calculation was provided by formulas:

$$N - CTB = \frac{x_{ij} - m_{ij}}{X_j + M_j} - \frac{X_j - M_j}{X_j + M_j} \times \frac{x_{ij} + m_{ij}}{X_j + M_j} \times 100, \quad (7)$$

$$S - CTB = \frac{x_{ij} - m_{ij}}{X_{ij} + M_{ij}} - \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \times \frac{x_{ij} + m_{ij}}{X_{ij} + M_{ij}} \times 100. \quad (8)$$

Left-hand part of the equation represents a real balance of trade industry weighted its shares in the total foreign trade of country which is a cross-sectoral trade and right part of the equation measures expected trade balance in the sector (commodity group) provided that each commodity contributes to the overall trade balance according to their weight in total trade. The difference between the actual and the expected trade balance measures a specific contribution to the total trade balance. For CTB applies:

$CTB > 0$ means that actual surplus is higher than expected and the relative trade deficit is less than expected, the industry has a positive contribution to the overall trade balance,

$CTB < 0$ industry has a negative contribution to the total trade balance, actual results are in comparison with the expected negative or insufficient.

The original *Grubel-Lloyd index (GLI)* measures export ability on the macroeconomic level. For the evaluation at level industry it has been modified and its calculation indicates level of commodity representation in intrasectoral foreign trade of country. The formula for its calculating is:

$$GLI = 1 - \frac{\frac{x_{ij}}{X_j} - \frac{m_{ij}}{M_j}}{\frac{x_{ij}}{X_j} + \frac{m_{ij}}{M_j}} \quad (9)$$

Values of GLI are in interval from 0 to 1 ($0 < GLI < 1$). Comparing value should be an average value GLI for all industries in country or GLI value of EU or world trade in the commodity group.

Calculation of individual indicators was applied in the wood processing industry and its individual sections in both, the Czech Republic and the EU 27. 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).

Input data for evaluation of the competitiveness of individual WPI sections we obtained from database of Statistics Office, the Ministry of Industry and Trade the Czech Republic 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 competitiveness of WPI according to the NACE.

For appropriate applications of statistical methods we created application in MS Excel and by calculating statistical variables to measure competitiveness we analyzed WPI competitiveness and its individual sections at several levels: at international level EU, at national level and subsectoral competitiveness of individual sections WPI. Then we compared the results obtained in the Czech Republic with the WPI EU as a whole. Moreover a trendline analysis of competitiveness development has been performed.

Dependences among the selected data were analyzed using statistical method of correlation analysis. Strength of mutual dependence between selected relations was found out by calculating coefficient of correlation (r).

RESULTS

When evaluating the competitiveness at the sector level, we came out from the definition under which the competitiveness of the industry can be characterized as promote the industry in a competitive battle with other equivalent sectors in other economies in placing their products on the domestic and foreign markets, provided efficient use of production factors.

The status of czech wood processing industry and its sections 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. I).

The data in the Tab. I show that WPI CR in ten years continuously forms the active trade balance, while under sections of WPI only pulp a paper industry (NACE 17) creates a negative net exports. The highest positive balance has been reached in furniture industry that is favourable because it is a trade in the products with the highest added value within WPI.

WPI CR represents the country's export share of 5% at an average, while this proportion in ten years nearly halved. As for export performance of WPI CR, the data show that export of commodities is constantly rising, it is over 60% of sales and the production of WPI.

Looking at the representation of WPI sections in export of industry it can be concluded that the highest share at an average of 40% presents furniture manufacturing and the least share, about 25%, has a timber industry, which can be considered a positive structure. More than 52% of imports of the WPI goods is formed by products of pulp and paper industry causing a negative trade balance of this sector. However, on the other hand, the export performance of pulp and paper industry gradually increased and reached 70% of production and 66% of total sales. Negative development in export performance can be seen in furniture industry. There is a decrease in exported production but at the same time export share in sales increases

I: Status of Czech wood processing industry in national foreign trade

indicator/years	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
WPI CZ:										
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
NACE 16										
trade balance (mil. €)	340.5	443.8	462.4	558.0	630.8	499.2	446.4	555.9	585.4	606.2
share in export of WPI (%)	26.22	27.42	25.66	27.39	27.56	26.31	26.53	26.14	25.63	25.28
share in import of WPI (%)	18.89	18.94	18.15	18.44	19.06	18.48	18.23	17.80	17.02	16.91
export/sales (%)	29.47	33.17	32.05	31.43	32.79	31.17	31.21	34.18	34.08	
export/production (%)	30.10	34.87	32.29	32.45	33.80	30.43	31.04	34.66	34.63	36.19
NACE 17										
trade balance (mil. €)	-186	-238	-196	-144	-91	-186	-164	-228	-221	-165
share in export of WPI (%)	32.6	31.0	31.3	32.8	34.6	35.8	36.8	36.3	35.8	35.8
share in import of WPI (%)	56.8	54.2	53.1	51.8	51.6	52.1	51.4	55.4	54.8	53.1
export/sales (%)	25.34	24.42	52.27	59.54	62.79	66.54	68.27	65.93	65.91	
export/production (%)	55.95	54.07	58.15	61.25	65.00	67.49	70.65	67.38	69.53	70.08
NACE 31										
trade balance (mil. €)	632	715	819	730	763	628	459	759	798	795
share in export of WPI (%)	41.2	41.5	43.1	39.8	37.8	37.9	36.6	37.6	38.6	38.9
share in import of WPI (%)	24.4	26.8	28.7	29.8	29.4	29.4	30.4	26.8	28.2	29.9
export/sales (%)	38.3	23.8	48.4	47.5	48.0	50.5	54.7	53.1	60.1	
export/production (%)	97.2	66.1	54.1	52.9	50.1	49.0	53.3	54.5	59.7	60.4

Source: Czech Statistical Office and own calculations

indicating a more favorable export prices of products. The smallest share in foreign trade of WPI has the sector timber industry representing 26% of the WPI export with a decreasing trend. However, there is a gentle rise in share of exported production and also in export share in sales of timber industry sector representing one third of the power wood processing industry.

Analysis of Competitiveness of the Wood Processing Industry

Choosing indicators of competitiveness at the sectoral level was inspired by efforts to determine whether the wood processing industry and its sections have succeeded in the domestic and foreign markets. Evidence of the success is higher volume of products placed by the domestic industry on the foreign market than the volume of products placed by the same foreign sectors on the domestic market. Information on these facts we gained via the coefficient of RCA and its various modifications, coefficients CTB, GLI and Michaely index. The achieved results of individual parameters are given in Tab. II.

The values of the indicators follow that wood processing sector has a comparative advantage within the industry of the country, as well as on

international markets. 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 inspite of net export increase. The highest values, higher than the entire WPI are reached in subsector of timber industry and its competitiveness is at a steady high level. Slightly less successful is furniture industry but his competitiveness gradually decreased to less than half the value at the beginning of the period, but is still higher than in the WPI. Comparative advantage doesn't exist only in pulp and paper industry and disadvantage of the sector is still deepening. The same results were also confirmed by sectoral RCA indicator in assessing the comparative advantages of subsectors at the industry level.

Index of competitiveness growth (RCA1) is much higher than value one in all subsectors of WPI that presents a high competitiveness of czech subsectors within the EU, even pulp and paper industry. Positive values of net trade performance indicator (RCA2) say that WPI contributes to the positive trade balance of the sector, the level of indicator is at almost the same level. The same results are achieved by the subsectors of timber and furniture industries, however, there is a gradual decline. RCA2 values of pulp and paper industry are the negative, as follows

II: Indicators of competitiveness of WPI

indicator/year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
WPI CR										
RCA	0.406	0.358	0.346	0.330	0.306	0.230	0.148	0.239	0.230	0.197
RCA1	1.895	1.812	1.793	1.707	1.659	1.613	1.659	1.621	1.614	1.587
RCA2	0.177	0.170	0.182	0.173	0.169	0.128	0.110	0.143	0.148	0.150
MI	0.021	0.017	0.016	0.014	0.013	0.009	0.006	0.009	0.008	0.007
GLI	0.800	0.823	0.829	0.836	0.848	0.886	0.926	0.881	0.886	0.902
CTB	0.137	0.044	-0.040	-0.033	-0.069	-0.051	-0.152	-0.089	-0.119	-0.181
N-RCA										
NACE 16	0.73	0.73	0.69	0.73	0.67	0.58	0.52	0.62	0.64	0.60
NACE 17	-0.148	-0.201	-0.184	-0.126	-0.093	-0.145	-0.185	-0.184	-0.197	-0.198
NACE 31	0.932	0.795	0.752	0.621	0.559	0.483	0.335	0.576	0.546	0.459
S-RCA										
NACE 16	0.328	0.370	0.346	0.395	0.369	0.354	0.375	0.385	0.409	0.402
NACE 17	-0.554	-0.558	-0.530	-0.456	-0.399	-0.375	-0.333	-0.423	-0.427	-0.395
NACE 31	0.525	0.438	0.405	0.290	0.253	0.253	0.187	0.337	0.316	0.262
RCA1										
NACE 16				2.889	2.839	2.736	2.998	2.931		
NACE 17				1.059	1.126	1.134	1.150	1.075		
NACE 31				2.198	1.908	1.820	1.889	1.974		
RCA2										
NACE 16	0.329	0.342	0.342	0.356	0.341	0.296	0.289	0.324	0.340	0.338
NACE 17	-0.098	-0.107	-0.081	-0.054	-0.028	-0.059	-0.056	-0.067	-0.064	-0.046
NACE 31	0.414	0.371	0.368	0.309	0.289	0.250	0.201	0.303	0.298	0.275
N-MI										
NACE 16	0.008	0.008	0.007	0.007	0.007	0.005	0.005	0.005	0.005	0.004
NACE 17	-0.003	-0.004	-0.003	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003	-0.003
NACE 31	0.015	0.013	0.012	0.009	0.008	0.007	0.005	0.007	0.007	0.006
S-MI										
NACE 16	0.073	0.085	0.075	0.089	0.085	0.078	0.083	0.083	0.086	0.084
NACE 17	-0.241	-0.232	-0.219	-0.190	-0.170	-0.163	-0.146	-0.191	-0.191	-0.173
NACE 31	0.168	0.147	0.144	0.100	0.085	0.085	0.062	0.108	0.105	0.090
T-GLI										
NACE 16	0.649	0.651	0.667	0.652	0.675	0.716	0.744	0.698	0.691	0.709
NACE 17	1.074	1.100	1.092	1.063	1.046	1.073	1.092	1.092	1.098	1.098
NACE 31	0.565	0.622	0.641	0.699	0.728	0.763	0.834	0.720	0.734	0.775
T-CTB										
NACE 16	0.033	0.013	-0.007	-0.006	-0.015	-0.010	-0.033	-0.018	-0.025	-0.038
NACE 17	0.052	0.013	-0.021	-0.017	-0.032	-0.025	-0.069	-0.043	-0.056	-0.081
NACE 31	0.051	0.019	-0.012	-0.010	-0.022	-0.016	-0.050	-0.027	-0.039	-0.062

Source: own calculation

from the deficit of trade balance during the analyzed period.

The indicator RCA2 is related to index of contribution to trade balance (CTB) indicating the contribution of the sector to the formation of active national trade balance. The achieved negative values CTB in WPI as a whole and also in its subsectors since 2005 show that the contribution of the sector to the overall trade balance is negative

and there is no real surplus, which exceeded the expected, quite the contrary. This in turn means that the relative trade deficit is smaller than expected. Significantly worse results in this indicator are reached in pulp and paper industry.

Obtained positive Michaely index values confirm competitiveness of WPI, but showed a very poor country specialization in the commodities of timber and furniture industries. The country specialization

III: Correlations coefficients

X/Y	RCA	RCA1	RCA2	CTB	MI
MI	0.9793	0.9378	0.8207	0.9331	...
GLI	-1.0000	-0.8539	-0.8990	-0.8903	-0.9784
export WPI/CR	0.8568	0.9765	0.6139	0.9039	0.9395
RCA	...	0.8562	0.8980	0.8916	...

Source: own calculation

IV: Average values of indicators

indicator	RCA	RCA1	RCA2	GLI	CTB	MI
WPI CR	0.279	1.696	0.155	0.862	-0.055	0.012
NACE 16	0.652	2.88	0.330	0.685	-0.006	0.011
NACE 17	-0.166	1.109	-0.066	1.083	-0.028	-0.003
NACE 31	0.606	1.958	0.308	0.708	-0.017	0.009
WPI EU 27	1.070	-	0.159	0.776	0.154	1.028

Source: own calculation

in pulp and paper products doesn't exist at all, but according to decreasing negative values of Michaely index a change in forthcoming years is expected. Within WPI subsectors may be under Michaely index concluded focus of foreign trade on furniture commodities but the opposite rising trend of the index in a timber industry shows increasing specialization of WPI in timber products. We consider this trend negative.

On the other hand, the Grubel-Lloyd index (GLI) values show a high degree of representation commodities of intrasectoral character of foreign trade and the share of individual subsectors WPI is increasing. GLI values of WPI in comparison with the average values of the processing industry CR (0.868) and EU-27 (0.776) are higher what means WPI contribution to the competitiveness of economy as a whole.

In further analysis we dealt with the finding of dependency between the selected indicators using statistical correlation and regression methods to find out the factors affecting the competitiveness of wood processing industry. Found dependences based on the correlation coefficients are shown in Tab. III.

The results show that the sector's competitiveness is strongly influenced by following factors:

- specialization of the country for commodities of the sector,
- high rate of intrasectoral foreign trade of country,
- the export performance of the sector at the national level,
- the share of the sector in the country's export affecting mainly a positive contribution of the sector to active trade balance of country.

Comparative and Trendline Analysis of Competitiveness of the Wood Processing Industry

Competitiveness of the wood processing industry of the Czech Republic at EU level, we further

evaluated by comparing the average values of indicators to WPI EU as a whole. Results are shown in Tab. IV.

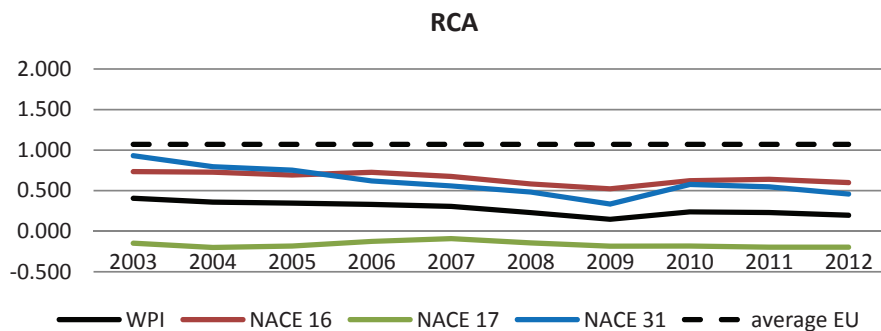
The comparison showed that, except indicators RCA2 in the furniture industry and GLI in WPI as a whole, in other indicators the Czech Republic shows lower competitiveness as the WPI EU and the most important indicators of competitiveness: RCA, MI and CTB are deeply under the EU average.

To assess a competitiveness of the sector, in addition to finding whether or not the sector is competitive on foreign markets, a closer analysis of development in indicators of sectoral competitiveness is needed. Development trend of competitive abilities of wood processing industry based on the most important indicators are shown in Figs. 1–3.

From the development of indicators RCA of WPI and its individual sections, showed in Figure 1, can be seen that furniture industry closed in the competitiveness level of WPI EU the most, but a downward trend of development affects gradual losing its competitive ability on foreign markets and by continuation of this trend furniture products can become uncompetitive. Other subsectors of WPI are keeping a steady value of RCA. The negative decreasing trend can be seen in pulp and paper industry.

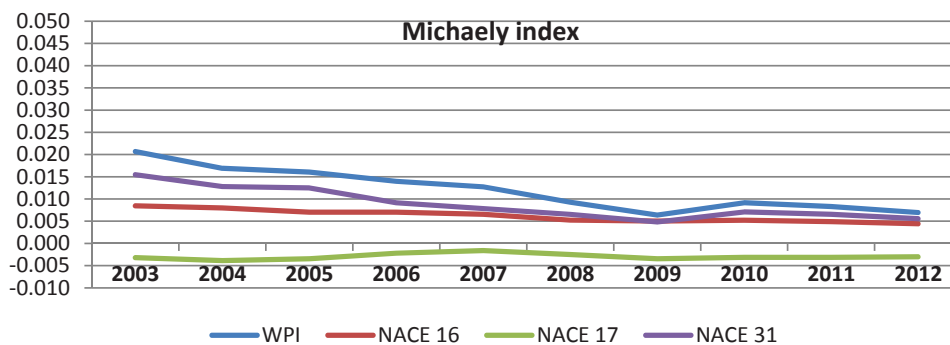
Development of Michaely index values in Fig. 2 indicates a gradual reduction of country specialization on commodities of wood processing industry and its individual sectors assuming its demise in the coming years. The unfavourable situation in the pulp and paper industry will be without change.

Looking at the development of CTB indicator in Fig. 3 indicating the ability of the sector to contribute to the formation of active trade balance, and thus to economic growth of country and sector we can also observe a negative trend. Despite a higher positive value of net trade performance (RCA2) achieved in



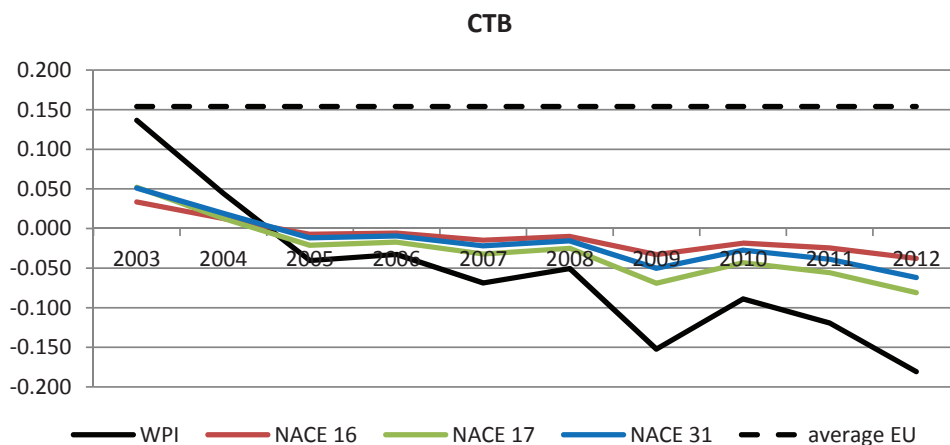
1: Trend of Revealed Comparative Advantage (RCA)

Source: authors



2: Trend of Michaely index

Source: authors



3: Trend of Contribution to trade balance index (CTB)

Source: authors

sectors of furniture and timber industries values of CTB have been since 2005 negative, indicating a loss of their ability to create surplus of national trade balance and further decline trend is expected.

DISCUSSION

Evaluating the competitiveness of the wood processing industry was based on the findings of previous studies in which the authors of the paper (Sujová, 2011 a 2012; Hlaváčková, 2014) and other professionals (Parobek, 2014; Šafařík 2013) 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 ensure 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.

Quantitative analysis of the evolution of intrasectoral competitiveness of wood processing industry in the Czech Republic for a period of ten years in this paper showed that the industry is competitive on a national and international level as well as at EU level. That follows from the industry's ability to generate trade balance surplus of industry, but on the other hand, its real contribution to the formation of active national trade balance is negative. Previous qualitative studies confirmed the competitive ability of WPI and potential to be successful on the international market, thus increase their performance and contribute to the sustainable growth of the national economy. According to the presented quantitative analysis,

a competitiveness of the industry increases with the growth of positive net exports values. However, this capability the Czech WPI has been losing, that can be caused by several factors: lower prices, decrease in the quantity of exported commodities or increase in imports of commodities WPI.

In the way of achieving and demonstrating competitiveness there is a conflict between the desire of the Government to maximize utilization of domestic timber commodities and competitiveness on international markets based on foreign trade. The solution is a specialization of the country in foreign trade to creation of positive balance by means of sector's products with the highest added value. Competitiveness analysis showed that the structure of foreign trade in Czech WPI is positive, the largest share of exports present furniture and paper commodities with the highest added value. However, the evolution of the structure is negative because of decreasing trend in export performance of furniture industry and an increasing trend in commodities with the lowest added value. Problem seems to be pulp and paper sector creating a negative trade balance, but its export performance is growing.

Low specialization of country in the WPI by foreign trade and inability of industry to actively contribute to national trade balance confirmed by the analysis results in a decrease of existing comparative advantages of industry on international markets and the gradual growth of the industry focus on commodities of timber industry could further lower its competitiveness. Subject of next scientific studies will be therefore a proposal how to optimize the structure of foreign trade in wood processing industry to increase the sector's competitiveness.

CONCLUSION

The wood processing industry has the potential to achieve a high competitiveness on international markets, to create an active trade balance and to contribute to economic growth of the sector and the country. The goal of the paper was to evaluate the level and development of competitiveness of wood processing industry in the Czech Republic in subsectoral structure for a period of ten years. Needed material for achieving relevant outputs we obtained from a secondary research, on the basis of an analysis of available scientific literature dealing with competitiveness problem of sectors and countries and on the basis of processing the foreign trade statistics of the wood processing industry. To reach the goal of the paper we set up a system of indicators measuring sectoral competitiveness. Input data were processed using mathematical calculations and statistical method of correlation analysis. Established system of indicators for analyzing the level and evolution of competitiveness of the industry for a period of ten years enabled to find out achieved comparative advantages and the ability to create a positive trade balance by czech wood processing industry, but this ability does not occur in the formation of active trade balance of the country where the contribution is much lower than expected. Within intrasectoral analysis, it was found that the pulp and paper sector has no comparative advantage, is not competitive on international markets and status of furniture industry is gradually getting worse.

As for the competitiveness level of wood processing industry, the analysis showed existing comparative advantages but achieved level of competitiveness is at a low level, lower than the EU average and the potential of the industry. The status and development trend is negative due to the fall of net exports, low specialization of the country in the commodity and a negative contributions to the formation of an active national trade balance. In order to influence trade balance in positive way, it is necessary to optimize the structure of intrasectoral foreign trade, to increase attention to supporting export of paper and furniture products and exploit the potential of the industry to create

a competitive advantage based on quality and innovation. Success of wood processing industry therefore consists in the active creation of new comparative advantages, because the results of analysis showed losing original comparative and competitive advantages based on the costs and price.

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