Ján Parobek, Hubert Paluš, Martina Kalamárová,
Erika Loučanová, Anna Križanová, Katarína Repková Štofková

COMPARATIVE ANALYSIS OF WOOD AND SEMI-FINISHED WOOD PRODUCT TRADE OF SLOVAKIA AND ITS CENTRAL EUROPEAN TRADING PARTNERS

The aim of this paper was analyse the competitiveness of wood and semi-finished wood products in Slovakia in comparison with selected Central European countries. The research applied the commonly used competitiveness index, the Revealed Comparative Advantage (RCA) index, to analyse the position and changes in trade competitiveness of Slovakia during the period 2009-2013. Additionally, the Comparative Price Level (CPL) index was used to evaluate the differences in foreign trade prices for industrial roundwood and selected semi-finished wood products in order to examine the position of the Slovak wood and wood product trade. The results showed that Slovakia had the strongest comparative advantage in the trade in industrial roundwood due to its sufficient wood resources and competitive prices.

Keywords: CE countries, competitiveness, revealed comparative advantage, wood and semi-finished wood product trade, comparative price level

Introduction

The use of domestic renewable resources is significantly influenced by political, social and economic changes. Wood production has a long tradition in the Slovak Republic and wood as a significant renewable resource is closely linked to many other sectors of the national economy. The competitiveness of each sector depends on the process of restructuralisation and modernization of production facilities, as well as the process of the specialization of production [Šupín 2013]. The most recent theory of the competitiveness of countries on

Ján Parobek[✉] (*parobek@tuzvo.sk*); Hubert Paluš (*palus@tuzvo.sk*), Martina Kalamárová (*martina.kalamarova@tuzvo.sk*); Erika Loučanová (*loucanova@tuzvo.sk*); Technical University in Zvolen, Zvolen, Slovak Republic, Anna Križanová (*anna.krizanova@fpedas.uniza.sk*), Katarína Repková Štofková (*katarina.repkova@fpedas.uniza.sk*), University of Žilina, Žilina, Slovak Republic

world markets is based on international trade and economic growth. This theory represents new aspects of innovation, the real utilization of resources and economic development.

Wolff et al. [2007] state that the concept of competitiveness is rather complex as the term is used at different levels of aggregation with different meanings. The concept of competitiveness can be distinguished at product level, business unit or firm level, at industry level and at regional or national level. In a broader context, Latruffe [2010] defines competitiveness from two perspectives: (i) as the ability to face competition and to be successful when facing competition, and (ii) as the ability to sell products that meet demand while at the same time ensuring profits over time which enable the firm to thrive.

Forest industry companies must continually strive to improve or at least maintain their market share [Oblak and Glavonjić 2014]. One phenomenon of the development of the forest industry is the placement of products on the global market, increasing added value and more efficient utilization of wood [Paluš et al. 2015; Ambrušová and Šulek 2014]. The forest industry has several clear comparative advantages in comparison with other sectors: for instance, sufficient input based on renewable resources, or the possibility of using recycled material. Forest wood of poor quality and dimensional parameters, side products (residues) from wood processing, post-consumer wood, and wood from fast-growing tree plantations are the most accepted energy carriers both politically and socially, the use of which contributes to a reduction in the share of coal in electric and thermal energy generation [Ratajczak et al. 2012]. In the case of environmentally sensitive markets, the competitiveness of forest products can be influenced by factors related to the origin of the wood material from sustainable and renewable sources [Kaputa 2013]. From the perspective of the national economy, this sector is able to utilize a high proportion of input based on domestic resources [Lagaňa et al. 2008].

Due to a growing global demand for wood and wood products, it is crucial to be competitive on the international market in order to make use of the potential gains of increased demand. A country that best utilises its given resources within a particular sector may enjoy a significant comparative advantage. According to Noor et al. [2008], the concept of comparative advantage is derived from the traditional theory of international trade, while the term competitiveness goes beyond comparative advantage, as no country can be competitive in every economic activity. Porter [1990] claims that productivity is the only meaningful concept of competitiveness. According to Kagochi [2007] some of the underlying factors that influence competitiveness include technology, human capital, product quality and differentiation, exchange rate, and other external factors.

Traditional trade theory explains international competitiveness in terms of the comparative advantage of nations: a nation engages in trade and gains a comparative advantage not because it can produce a good or service much

more cheaply, but because it is relatively more efficient than other nations in producing this good or service [Ricardo 1911]. The theory proves that each nation would benefit from specializing in the product in which it enjoys a comparative advantage, that way raising the total global output of each product and improving the situation of all participating nations [Carvalho et al. 2009]. Several indicators have been developed to measure the competitive situation of a specific sector or country. According to Gries and Hentschel [1994], these can be classified into result-oriented indicators and determinant-oriented indicators. Many studies using the result-oriented indicators to evaluate the competitiveness of forest-based sectors and related agricultural sectors have been elaborated in different countries [Prasad 2004; Dieter and Englert 2007; Gonuguntla 2007; Noor et al. 2008; Carvalho et al. 2009; Zhang et al. 2012; Song and Gazo 2013, Loučanová et al. 2014; Paluš et al. 2014]. The application of generally applicable rules for measuring the competitiveness of the wood processing industry at meso and macro level provides new insights to support the sector in order to maximize the optimal use of domestic renewable resources.

The forest industry is one of the sectors in which the Slovak economy may at least partly influence European markets with the maximum utilization of its own resources. There is an effort to increase added value and to support the domestic consumption of wood commodities. This effort and the development of the forest industry depends in the broader context on society-wide interest, and in the narrow context on different stakeholders entering the wood product chain. The wood market in Slovakia is constantly developing, and the demand for roundwood changes depending on the possibilities of its use. There are many factors influencing production and consumption patterns. On the one hand, timber production is subject to the available resources, which are the result of long-term forest management and long-term planning. On the other hand, timber production tries to adapt to rapidly changing market conditions and the requirements of wood processing sectors which vary over a relatively short period of time. According to Parobek et al. [2014a], besides the pulp and paper industry, the forest industry producing final higher added value wood commodities such as furniture, wood construction, etc. is, in many cases, still unable to compete on the European market. Therefore, the production and export of wood and semi-finished products is an important part of the Slovak forest industry's revenue.

The aim of this paper was analyse the competitiveness of the wood and semi-finished wood product sectors compared to other sectors in the national economies of Slovakia and selected trading partners. The research applied the commonly used RCA index to analyse the position and changes in competitiveness in selected Central European countries during the period 2009-2013. Additionally, it evaluated the differences in foreign trade prices for industrial roundwood and selected semi-finished wood products in order to

examine the position of the Slovak wood and semi-finished wood product trade in comparison to traditional trading partners.

Research methodology

Result-oriented-indicators revealing the competitive situation in the sector from an ex-post perspective were used to determine the competitiveness of the forest-based sector, to compare the development of export performance and competitiveness in international markets. The most commonly used method is the calculation of the Revealed Comparative Advantage (RCA) index. A modified version of the RCA index using a mathematical logarithmic function [Bobáková and Hečková 2007] was used in this paper in order to analyse the competitiveness of the forest-based sector and trade in wood and semi-finished wood products compared to other sectors in a specified period, 2009-2013, within the national economy of the Slovak Republic.

$$RCA_{it} = \ln \left(\frac{\dfrac{EX_{it}}{IM_{it}}}{\dfrac{\sum_{i=1}^{n} EX_{it}}{\sum_{i=1}^{n} IM_{it}}} \right) \qquad (1)$$

where: EX_{it} – exports (in USD) of wood and semi-finished wood products from the selected country in the period t,

IM_{it} – imports (in USD) of wood and semi-finished wood products to the selected country during the period t,

$\sum_{i=1}^{n} EX_{it}$ – total exports (in USD) from the selected country during the period t,

$\sum_{i=1}^{n} IM_{it}$ – total imports (in USD) to the selected country during the period t.

Another tool used in comparative analysis is the Comparative Price Level (CPL) index, which is defined as the ratio of purchasing power parities of the market in each of the analysed countries [Parobek et al. 2014a]. The comparative price level is calculated as:

$$CPL = \frac{P_f}{P_d} \qquad (2)$$

where: P_d – expresses the price of wood and semi-finished wood products produced in the selected country,

P_f – expresses the price of wood and semi-finished wood products produced in a country other than the selected country.

In this case, the following categories of wood and semi-finished wood products were analysed:

1. total industrial roundwood
2. coniferous industrial roundwood
3. non-coniferous industrial roundwood
4. coniferous sawnwood
5. non-coniferous sawnwood
6. wood-based panels
7. paper and paperboard

Slovakia's main trade partners in Central Europe are Austria, Poland, Germany, Hungary and the Czech Republic. The research was therefore focused on these countries. The CPL indices for the Slovak Republic trade partners were expressed relative to the price level for the Slovak Republic. If the price level index of a given country was above 100%, then the prices in that analysed country were, on average, higher than in the Slovak Republic as a whole. Conversely, if a price level index was below 100%, then the prices were, on average, lower than in the Slovak Republic as a whole:

- if CPL ≤ 1 (or 100%) the competitiveness of a partner country was higher than the competitiveness of the Slovak Republic
- if CPL ≥ 1 (or 100%) the competitiveness of the Slovak Republic was higher than the competitiveness of a partner country.

Data from Comtrade [2015] and Faostat [2015] were used as background data for the analysis of the current state of the wood processing industry and competitiveness index calculation.

Results and discussion

In this research the RCA competitiveness index was calculated to reveal the competitive advantage of the different semi-finished wood products traded internationally compared to the other sectors of the national economy. The calculated RCA values for industrial roundwood during the period 2009-2013 are shown in table 1. The positive RCA values for Slovakia, Hungary and the Czech Republic clearly revealed a competitive advantage for the industrial roundwood trade, showing only slight changes over the examined time period.

In general, Slovakia had one of the highest RCA values (2.23 in 2010) thanks to the strong export of coniferous industrial roundwood. According to Faostat [2015], an export volume amounting to 1.97 Mio. m^3 was approximately 53% of the total coniferous industrial roundwood production. There was a notable difference between the international trade of coniferous and non-coniferous industrial roundwood. In 2013, the RCA index for coniferous roundwood was 20 times higher than for non-coniferous roundwood. This situation reflected the high demand for coniferous industrial roundwood, especially sawlogs, from surrounding countries, in particular from Austria.

Slovakia was followed by Hungary in showing a strong competitive advantage. According to data from the Comtrade [2015] database, there were significant exports of non-coniferous industrial roundwood compared to other sectors, reaching a total of 46.07 Mio. USD. Imports of industrial roundwood were approximately 4.6 times lower.

Table 1. RCA competitiveness indices for industrial roundwood (coniferous and non-coniferous) for Central European countries in period 2009-2013

		2009	2010	2011	2012	2013
Industrial Roundwood	Austria	-2.08	-2.03	-2.02	-2.12	-2.25
	Czech Republic	1.22	0.42	0.67	0.65	0.71
	Germany	-0.13	-0.66	-0.64	-0.70	-0.92
	Hungary	1.25	1.33	1.27	1.32	1.40
	Poland	-0.11	0.24	-0.15	0.51	0.69
	Slovakia	1.69	2.23	1.81	1.09	1.32
Industrial Roundwood (C)	Austria	-2.14	-2.05	-2.03	-2.14	-2.28
	Czech Republic	1.60	0.67	0.62	0.69	0.82
	Germany	-0.24	-0.87	-0.95	-1.08	-1.34
	Hungary	0.71	0.55	0.43	0.75	1.33
	Poland	0.77	1.02	0.42	1.18	1.31
	Slovakia	2.63	3.38	3.26	1.24	2.51
Industrial Roundwood (NC)	Austria	-1.81	-1,92	-2.00	-2.03	-2.10
	Czech Republic	-0.71	-0.87	1.08	0.35	-0.34
	Germany	0.20	0.08	0.28	0.55	0.58
	Hungary	1.77	1.83	1.77	1.64	1.44
	Poland	-2.39	-1.28	-1.56	-0.36	-0.50
	Slovakia	0.36	0.50	0.32	0.43	0.12

Germany and Austria were dependent on major imports of industrial roundwood and their RCA values were negative. The analyses confirmed a negative development of the RCA indicators except for Hungary and Poland. The RCA values for the former increased by 11% during the monitored period.

Table 2 shows the results of the competitiveness analyses of trade in semi-finished wood products. Austria had the strongest competitive advantage from among the Central European countries in all products except for the production of non-coniferous sawnwood. This country obviously had a low production of non-coniferous sawnwood due to a lack of non-coniferous wood resources. Coniferous forests cover ca 74.8% of the total forest area [Faostat 2015]. In spite of sufficient coniferous wood resources, imports of industrial coniferous roundwood were relatively high (6.8 Mio. m^3) and thus the comparative advantage was weak. However, the RCA index for coniferous sawnwood was 0.98.

Table 2. RCA competitiveness indices for sawnwood (coniferous and non--coniferous), paper and wood-based panels for Central European countries in period 2009-2013

		2009	2010	2011	2012	2013
Sawnwood	Austria	1.08	0.97	0.80	0.82	0.80
	Czech Republic	0.85	0.96	0.90	0.83	0.88
	Germany	0.21	0.18	0.16	0.12	0.14
	Hungary	-0.56	-0.50	-0.34	-0.06	-0.22
	Poland	-0.31	-0.14	-0.44	-0.31	-0.22
	Slovakia	1.24	0.89	1.09	0.72	1.03
Sawnwood ©	Austria	1.30	1.19	1.02	1.04	0.98
	Czech Republic	0.00	1.46	1.21	1.12	1.17
	Germany	0.30	0.24	0.21	0.15	0.16
	Hungary	-2.94	-2.58	-2.48	-2.67	-3.17
	Poland	-0.26	-0.14	-0.51	-0.34	-0.17
	Slovakia	1.57	0.68	1.18	0.93	0.99
Sawnwood (NC)	Austria	-0.31	-0.37	-0.52	-0.42	-0.41
	Czech Republic	0.00	-0.50	-0.21	-0.50	-0.45
	Germany	-0.10	-0.07	-0.06	-0.03	0.09
	Hungary	1.33	0.82	0.64	1.03	0.90
	Poland	-0.38	-0.15	-0.32	-0.28	-0.30
	Slovakia	0.79	1.52	0.78	0.50	1.13
Wood-based panels	Austria	1.22	1.06	1.00	1.07	1.08
	Czech Republic	0.00	0.43	0.50	0.46	0.36
	Germany	0.43	0.29	0.14	0.10	0.14
	Hungary	-0.12	0.11	-0.08	-0.11	-0.19
	Poland	0.33	0.33	0.39	0.54	0.47
	Slovakia	-0.38	-0.28	-0.46	-0.53	-0.61
Paper and paperboard	Austria	1.03	0.86	0.79	0.94	0.83
	Czech Republic	0.00	-0.49	-0.37	-0.48	-0.53
	Germany	0.03	0.12	0.12	0.09	0.06
	Hungary	-0.65	-0.45	-0.41	-0.38	-0.35
	Poland	-0.39	-0.34	-0.30	-0.30	-0.35
	Slovakia	0.57	0.66	0.21	0.22	0.15

The situation in sawnwood competitiveness was very similar in Germany and the Czech Republic, even if the values of the competitiveness indices were several times lower compared to Austria, and the RCA indices for non-coniferous sawnwood showed negative trends. In terms of time, the development of the competitiveness indices was relatively stable and the variability of the values depended on the country and the product.

Among the analysed countries, Slovakia recorded the highest RCA values in sawnwood (1.03) in 2013, in particular for non-coniferous sawnwood (1.13). This country had positive RCA values during the analysed time period in all commodities except for wood-based panels. The wood-based panel trade in Slovakia was characterized by a revealed comparative disadvantage and a significant intra-industry specialization with imports prevailing over exports as a result of specialisation in domestic production. According to Faostat [2015], the value of wood-based panel imports (210 Mio. USD) were twice as high as the exports.

Negative values of the RCA competitiveness indices were revealed for coniferous and non-coniferous sawnwood as well as paper traded by Poland.

The results show that Slovakia had the strongest comparative advantage in the trade of industrial roundwood (coniferous in particular) due to its sufficient wood resources and competitive prices. A similar situation, however with non-coniferous roundwood, was found for Hungary. These results confirmed the Heckscher-Ohlin theorem [Ohlin 1933] which assumes that it is mainly the relative allocation of production factors, such as the natural resources, that determines a nation's comparative advantage. Austria used much more industrial roundwood than it produced domestically. Its domestic industry depended on imports of industrial roundwood mostly from neighbouring countries. However, the trade in products such as sawnwood, wood-based panels and paper and paperboard was competitive. There were significant differences between these two countries in terms of export competitiveness. While in Austria the forest industry was competitive in the export of value added products, comparative advantages were revealed for Slovakia in low value products (roundwood and coniferous sawnwood).

In addition, the foreign trade price level of the analysed semi-finished wood product categories were used to calculate the CPL indices based on the Faostat [2015] data (tab. 3). The price levels of Slovakia's main trade partners in the Central European region were expressed relative to Slovakia's price level. The prices of the Slovak products thus represented the average price levels, in this case the absolute number "1" (or 100%).

Table 3. CPL indices of roundwood and semi-finished wood products in 2013

Commodity	Austria	Czech Republic	Germany	Hungary	Poland
Industrial roundwood	1.74	1.51	1.57	0.98	1.30
Industrial roundwood (C)	1.56	1.54	1.42	0.84	1.18
Industrial roundwood (NC)	3.25	1.09	1.87	1.09	2.50
Sawnwood (C)	0.85	0.70	0.79	0.66	0.81
Sawnwood (NC)	0.81	1.45	0.66	0.39	0.95
Wood-based panels	0.88	1.24	1.05	0.95	1.02
Paper and paperboard	1.34	0.73	1.36	1.15	0.95

The values greater than 1 indicated that the export prices of the given commodities in the respective country were higher than the Slovak export prices and vice versa. With the exception of non-coniferous industrial roundwood and paper products, Hungary had the lowest prices amongst all the other exported commodities compared to Slovakia. In line with the RCA results revealing a comparative disadvantage in the trade of industrial roundwood for Austria, the CPL indices also indicated the highest prices for this commodity. This was one of the reasons for the high imported volumes of industrial roundwood to this country with a significant share also from Slovakia. On the other hand, the prices of coniferous sawnwood, which were 15% lower than the Slovak prices may indicate a higher technological efficiency in the sawmilling industry in Austria. Similarly, coniferous sawnwood prices were lower than in Slovakia in all the other analysed countries.

The results of this single CPL analysis clearly supplemented the RCA analysis and confirmed that the Slovak Republic had the lowest prices of raw wood material (roundwood) compared to most of the analysed countries, which supports the export of these commodities and the higher prices of higher value added products such as sawnwood and,to a certain extent, paper products.

An understanding of the differences in price levels is important in connection with other economic indicators, such as economic growth and gross domestic product, because higher relative prices can make the economy look healthier than it really is and, therefore, the prices alone are not sufficient for competiveness analyses. A combination of RCA and CPL indices can help to clarify the competitiveness of the analysed sector. In Austria, for instance, the prices of wood-based panels were 1.5 times greater than the prices in Slovakia but the RCA index had the greatest value (the strongest competitiveness). These differences occurred for the following three reasons. Firstly, in spite of the higher prices of the wood-based panels, foreign trade was stronger and there was strong competition in this sector compared to other industries within the Austrian economy. Secondly, the greater value of the CPL index reflected a better economic situation in this country and thus a higher price level. Finally, there were significant differences in the structure of the wood-based panel qualities (and thus prices) which both countries traded internationally.

The above-mentioned results emphasise the complexity involved in understanding the term competitiveness as defined by Wolff et al. [2007] and the necessity to understand it in a broader context as mentioned by Latruffe [2010]. Therefore, if the competitiveness of the forestry and forest-based sector in Slovakia is linked to trade with industrial coniferous roundwood, it is important to understand it, in a broader context, in connection with the low level of wood processing.

Conclusions

A nation's competitiveness can be evaluated through the ability of a nation to produce goods and services which meet the requirements of international markets. Such requirements include, for example, technology, human capital, the quality of the product and other factors.

Development of the forest-based sector depends on the production and utilisation of raw wood material. Raw wood material is an important renewable and sustainable source and can be considered one of the competitive factors of products placed on environmentally sensitive markets. This research applied the commonly used competitiveness indicators, RCA and CPL, to analyse the competitiveness of the wood and semi-finished wood product sectors compared to other sectors in the national economies of the selected countries and among the countries.

Slovakia had the strongest comparative advantage in the trade of industrial coniferous roundwood due to its sufficient wood resources and competitive prices. The competitiveness of the forestry and forest-based sector reflects the low level of wood processing, which is generally not appropriate from the viewpoint of long-term sustainable development.

The latter part of the research highlighted the comparative foreign trade prices for industrial roundwood and selected semi-finished wood products. In general, the development of competitiveness indices depends on the resources and trends in the analysed sector, as well as on trends in the other sectors of the national economy. Therefore, the results of the comparative price analysis should be understood in a broader context.

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Acknowledgements