

## INTERNATIONAL COMPETITIVENESS OF THE POLISH WOOD INDUSTRY FROM THE MESOECONOMIC<sup>1</sup> PERSPECTIVE

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### Abstract

The competitiveness of the Polish forest and wood industry, in particular the wood market itself, is determined by many factors which are shaping – to a various extent – its basic measure, i.e. a share of the industry or each of its sectors in the open international market. Due to a significant share of the wood industry in the generation of Poland's GDP, constant measurement and verification of this sector's competitiveness, both *ex-ante* and *ex-post*, seem to be of extreme importance. Next to a traditional research model, it is considered important and practical to include a new approach which takes into account the heritage of economic sciences, in particular one of new disciplines, i.e. mesoeconomics. A discussion on the mesoeconomic approach against the traditional model justifies the search for new analytic methods that would enable both a diagnosis of industry's competitiveness in international markets, including the emerging ones, as well as creation of efficient tools of the economic policy in this scope.

**Key words:** wood market, competitiveness, multivariable analysis, mesoeconomic approach.

### INTRODUCTION

Competition is one of the fundamental economic mechanisms of a market economy. In the contemporary theory of economics, competition is often defined as a "a process by means of which participants of the market, in pursue of their own goals, try to make offers more profitable than their competitors' ones in terms of price, quality and other features that affect purchase decision" [Kamerschen, McKenzie, Nardinelli 1991].

On the other hand, competitiveness derives directly from competition and is one of its elements [Skawińska 2002]. According to Adamkiewicz [1999], market competition is a process, whereas competitiveness is a condition (level) of competition; one of the features that characterises it.

The importance of both these phenomena has been building up at individual stages of economic development, particularly in the context of progressing globalisation processes. Presently, they play key roles in both the operations of single companies and the functioning of national economies or individual sectors in a domestic or international market. In face of the big number of competitiveness-determining factors, there are different possibilities of an empirical analysis of this phenomenon. From a classical point of view, competitiveness verification can be conducted among others by comparing prices. However, this view seems to be insufficient.

The competitiveness of the Polish wood market, including its individual sectors, is affected by a series of factors. Hence, an important element of a diagnosis is to identify what factors and to what extent influence the position of Poland in the international market as regards trade of wood materials and products. When analysing economic decisions that may influence a change in the value of a given factor with high probability, we may be expecting how this will affect competitiveness of the industry, including the importance of such a decision [Lis 2008].

### 2. STARTING POINT – THE TRADITIONAL MODEL OF MARKET COMPETITIVENESS

In the traditional approach, a general form of multiple regression is formulated for research purposes. The basic function has a classical form of a multinomial. This function's explanatory variables are partial measures which include the specificity of companies from the wood and forest sector and the severity coefficients accompanying them. They can be specified based on a series of regression equations with the method of least squares provided that a sufficient number of initial data are used in the calculations, which serves to verify the possibly lowest share of the so-called random factor. For the analysed forest and wood market, it is as follows:

$$Y_i = a_0 + \sum_{w=1}^0 a_w X_w + \delta,$$

where:

$Y_i$  – value of the response variable, i.e. a share of the wood market's "i" sector in the international market, i

$i \in \langle 1, n \rangle$

– number/designation of class of goods in market trade.

<sup>1</sup> *Mesoeconomics – is a sub-discipline of economic sciences, which deal with the description and analysis of phenomena related to structural changes, especially changes in relations between branches and sectors of production, employment and regions. An example of classical mesoeconomic research would be a sectoral analysis (eg. of a regional or sectoral type of activity).*

In the proposed model, the  $Y_i$  response function is a share in the trade of the  $i$  class of goods in the international market, which in this approach can be assumed as a fundamental measure used to describe the level and changes of competitiveness of a given country [Szczawiński 2006]. It is as follows:

$$Y_i = \frac{P_{ei}}{\sum_{i=1}^n P_{eji}}$$

where:

$P_{ei}$  – quantity or value of domestic exportation of the “ $i$ ” class of goods,

$P_{eji}$  – quantity or value of exportation of the “ $i$ ” class of goods in country  $y$ ,

$$j \in \langle 1, m \rangle$$

– number/designation of a country that participates in the exchange of the “ $i$ ” wood product,

$a_0$  – value of the absolute term in the multinomial  $Y_i = f(X_w)$ ,

$a_w$  – severity coefficient of the  $w$  explanatory variable, i.e. a factor that has a quantitative and specific influence on the value of the response variable,

$$w \in \langle 1, o \rangle$$

– number of the explanatory variable,

$X_w$  – relative value of the explanatory variable, i.e. a coefficient which expresses a relative value of the factor that affects a share of the “ $i$ ” sector of the wood industry in EU market,

$\delta$  – value of the random factor.

From the traditional perspective, the multiple regression function can be used successfully. This function binds explanatory variables, i.e. measures of the most important factors that have a direct (quantitative) influence on the value of the criterion function. In this case it is the share of the wood industry (or a given sector of the industry) in the international market. The measures of explanatory variables are accompanied by importance coefficients. These coefficients need to be determined based on a collection of data sets which illustrate all variables of the regression model. Their correct selection enables verification of the measure which is used to identify the influence of unknown factors that determine the value of the industry's market shares, i.e. the response variable of the model [Zeliaś, Pawełek, Wanat 2003].

### 3. INDUSTRY COMPETITIVENESS MEASURES IN THE TRADITIONAL MODEL

In the traditional model presented herein, it is essential to specify the measures which have a significant influence on the share of the “ $i$ ” group

of goods in the international market [Biernacka 2007]. This way it is possible to specify the values of explanatory variables. The above-described choice is vital, especially due to the fact that the forest and wood market, or even each of its segments, has its unique specificity. The following variables may serve as the starting point, which does not exhaust all possible cases:

3.1. The relationship of exports and imports value in the “ $i$ ” group of goods for a given market:

$$X_1 = \frac{P_{ei}}{P_{impi}}$$

where:

$P_{impi}$  – quantity or value of domestic imports in the “ $i$ ” group of wood products.

3.2. The index of pro-export orientation of the “ $i$ ” wood product production:

$$X_2 = \frac{P_{ei} \cdot \sum_{j=1}^m P_{ji}}{P_i \cdot \sum_{j=1}^m P_{eji}}$$

where:

$P_{ji}$  – quantity or value of domestic production of the “ $i$ ” wood product marked with letter “ $j$ ”,

$P_i$  – quantity and value of total production sold of the “ $i$ ” wood product domestically.

3.3. The Grubel-Lloyd index of intra-industry trade [Grubel, Lloyd 1975]:

$$X_3 = \frac{\sum_{i=1}^n (P_{ei} + P_{impi}) - \sum_{i=1}^n |P_{ei} - P_{impi}|}{\sum_{i=1}^n (P_{ei} + P_{impi})}$$

where:

$$X_3 \in \langle 0, 1 \rangle$$

3.4. The index of import share in domestic consumption of the “ $i$ ” wood product:

$$X_4 = \frac{P_{impi}}{P_i - P_{ei} + P_{impi}}$$

3.5. The index of import and internal prices relationships in the trade of the “ $i$ ” wood product:

$$X_5 = \frac{1}{C_i} \cdot \sum_{j=1}^m C_{ji} \cdot \frac{P_{eji}}{\sum_{j=1}^m P_{eji}}$$

where:

$C_{ji}$  – price of the “ $i$ ” wood product in the internal market of country  $j$  (EU member state),

$C_i$  – price of the “ $i$ ” wood product in Poland.

Hence, the  $X_5$  index represents a relationship in which the numerator expresses the weighted mean price of the “ $i$ ” product in another

country examined (a group of countries, e.g. EU), whereas the denominator constitutes the domestic price of the "i" wood product. Therefore, the  $X_5$  index may be referred to in the research of the industry as the "price index" [Jagiello, 2003].

3.6. The effectiveness index of trade with abroad:

$$X_6 = \frac{C_{\text{expi}} - C_{\text{impi}}}{C_{\text{impi}}}$$

where:

$C_{\text{expi}}$  – export price of the "i" product from Poland,

$C_{\text{impi}}$  – import price of the "i" product to Poland.

3.7. The value added index in the production of the "i" wood product in Poland against other countries:

$$X_7 = \frac{1}{P_{di}} \cdot \frac{P_{ji}}{\sum_{j=1}^m P_{dji} \cdot P_{ji}}$$

where:

$P_{di}$  – added value in the production of the "i" wood product in Poland,

$P_{ji}$  – quantity or value of the domestic production of the "i" wood product in country "j",

$P_{dji}$  – added value in the production of the i wood product in a given state marked with letter "j".

3.8. The index of export and import prices dynamics (terms of trade) of the "i" wood product:

$$X_8 = \frac{\Delta C_{\text{expi}}}{\Delta C_{\text{impi}}}$$

It is recommended that the value of the presented terms of trade index in a given group of goods should not be lower than 1 [Szczawiński 2006]. Otherwise, such a situation indicates an unfavourable for a given state trend of changes in the prices of a given product, not always of the highest quality, which happens from time to time in case of import.

#### 4. THE PREREQUISITES FOR THE COMPILATION OF AN ALTERNATIVE MODEL – MESOCOMPETITIVENESS MEASURES

Evaluation of competitiveness may be carried out *inter alia* by means of comparing prices. However, according to Piskorz [1998], this concept has many flaws. Factors which cause that a product with an absolute price advantage is not successful in international trade may exist. Export expansion may be hindered by unsatisfactory quality, delivery terms or existing trade barriers. The actual status of comparative advantages of individual branches of the Polish forest and wood sector is reflected by the level and structure of sales in foreign trade of these products, including in particular the wood and furniture industry [Biernacka 2007].

The problem of resulting competitiveness is connected with the necessity of proposing certain measures of a particular system, i.e. the industry. They were defined in a synthetic manner by W. Jakóbiak [2000] and attempts can be made to apply them in an analysis of the forest and wood market.

In such experiments, the following selected measures of competitiveness in a mesoeconomic view may be applied:

4.1. The import penetration ratio in domestic production (MP), which describes the level of a domestic offer's competitiveness against imported goods. From the mesoeconomic perspective, this index can be determined by dividing import production in the "i" market by total production of the "i" market. Obviously there are many variants of this index (import penetration ratio);

4.2. Export specialisation index (SI);

4.3. Export/import coverage ratio (CR);

4.4. The ratios of revealed comparative advantages, including the index of export relative comparative advantage (XRCA), based on the RCA method (revealed comparative advantage);

4.5. The index of relative absorption of import (MRCA) and the index of relative trade advantage (RTA),

4.6. The Grubel-Lloyd intra-industry trade index (IIT), which describes simultaneous export and import in the "i" market.

A detailed discussion about the criteria of selecting indexes, calculation formulas and methods of result interpretation was conducted among others by Pawlak [2005]. It needs to be underlined that the indexes of revealed comparative advantage and intensity of economy share in intra-industry trade are interrelated. The competitiveness of products from a given market should not be determined only and exclusively by the credit balance of trade in relation to particular products. It is important to determine the intensity of simultaneous export and import within a given branch. If the value of exports and imports is similar, such a situation is referred to as the so-called "partner competitiveness" [Jankowska 2005]. It is worth noticing that when the value of the Grubel-Lloyd IIT index totals 0 (0%), we are dealing only with inter-industry trade. On the other side, if the value of IIT amounts to 1 (100%), only internal trade is observed. The Grubel-Lloyd index is mathematically related with one of the revealed comparative advantage indexes (RCA). In this case, the zero value of RCA means that exchange of the "i" industry takes place only internally. Whereas if the value is 1 or -1, inter-industry trade is observed. When  $RCA > 1$ , a comparative advantage is noticed in the "i" industry; the greater the value of the index, the higher the advantage.

Adequate adaptation of the proposed measures to the selected groups of wood market products (or branches) is yet another essential research decision that has to be made. The typology of product groups can be performed by utilising the Ward's method from the group of hierarchical agglomeration methods of data clustering. This method enables combining objects in subsequent data clusters based on the value of the similarity function. The more similar certain objects are, the earlier they are combined with one another. Clusters are serialised hierarchically, hence lower grade clusters become a part of higher grade clusters in accordance with the hierarchy of similarity observed between the objects [Marek 1989]. Euclidean distance formula may be used when forming clusters and the variance analysis approach can be applied.

At the same time, Leszczyńska [1999], following Piskorz [1998], emphasises that with this type of competitiveness classification, a certain dose of caution needs to be kept. It turns out that a possible failure in export can result from the instruments of trade policy used by partners rather than from the low competitiveness of domestic goods. For example, in some markets, during the pre-accession period, a factor that weakened the competitive position of Polish products in foreign markets was exportation subsidies implemented by EU member states. An analogous analysis of the need of applying support tools for the forest and wood industry would have to be incorporated in this case.

Coming back to the Ward's method proposed to be used in the analysis, it needs to be underlined that its application is aimed at minimising the square sum of standard deviations of two clusters which can be formed at every stage (e.g. with the help of Statistica PL 2006 software package). This method is commonly considered the most effective rule of agglomeration [Sokołowski 2002]. Its potential application as supplementation of the initially proposed model of multiple regression can eventually provide grounds for a more detailed diagnosis of competitiveness in such a specific industry as the Polish wood industry closely combined with forest management.

## 5. EXAMINATION OF WOOD INDUSTRY'S COMPETITIVENESS – FROM A SYSTEMIC PERSPECTIVE TO STRATEGIC MANAGEMENT

The previously presented approach, which includes the *ex-post* approach in the research of international competitiveness of the wood market, was firstly depicted by costs and prices, including among others the terms of trade index, relative prices index, unit prices and costs index, real foreign exchange index, as well as the DRC method (domestic resource cost). The quantitative

approach, which included not only the share in international trade and balance of trade, but also indicators of export/import relationships leading to the identification of comparative advantages, was presented subsequently. On the other hand, the *ex-ante* approach requires the application of computational methods or advanced mathematical models. Examining international competitiveness of the Polish wood industry with the use of the general balance model is an interesting project which is under way (GTAP – Global Trade Analysis Project).

As a starting point, assuming the systemic perspective and making use of the strategic management approach, it is also possible to look at the industry not through a product, but through the fact that it is an economic system (consists of companies connected by means of regular and real relationships). In this case the use of resulting measures of an economic system functioning can be proposed [compare: Sink 1985, Jankowska 2005]:

- effectiveness;
- efficiency;
- quality;
- profitability;
- productivity;
- quality of work life;
- innovation.

Besides the resulting measures which refer directly to quality, the remaining can be successfully applied in the examination of international competitiveness of a market. Due to the fact that they are based on the data collected from participants of this market, they can be considered partial measures which influence synthetic measures, e.g.: CCPI, EI and EE (see: Table 1).

Partial measures are important for single participants of the market. Based on them, it is possible to identify weaknesses as compared with strategic competitors in the areas where improvement is necessary. The level of partial measures is, to a large extent, a result of internal competition. Meanwhile, synthetic measures seem to be more practical in the shaping of economic policy. They provide information on the level of inter-industry competitiveness (see: Table 2).

This approach can be applied when examining the forest and wood market, which is characterised by both natural monopoly of State Forests – the main supplier of raw material – as well as the share of typical market players, i.e. companies that operate in a free market.

Table 1. Model measures of the international competitiveness of the industry

| SYMBOL | MODEL                         | A DESCRIPTION OF THE MEASURE  |
|--------|-------------------------------|---|
| CCPI   | "country-country plus import" | confrontation of competitiveness of production of a given industry with importation to a domestic market (demonstrates similarity to the index of import penetration) |
| EI     | "export-import"               | The share of export production of an industry in the imports from abroad  |
| EE     | "export-export"               | the share of export to a given foreign market in the total export of a given industry   |

Source: Own elaboration based on [Jankowska, 2005].

Table 2. Linking partial measures and synthetic measures in research of international competitiveness of the industry.

| PARTIAL MEASURES | SYNTHETIC MEASURES   |  |
|------------------|--|--|
| effectiveness    | <b>CCPI</b><br>"country-country plus import"<br><b>EI</b><br>"export-import"<br><b>EE</b><br>"export-export" | INTERNATIONAL<br>COMPETITIVENESS<br>OF<br>THE INDUSTRY |
| efficiency       |  |  |
| profitability    |  |  |
| productivity     |  |  |
| innovation.      |  |  |

Source: Own elaboration based on [Jankowska, 2005].

## 6. CONCLUSIONS

The competitiveness of the Polish forest and wood industry, in particular the wood market itself, is determined by many factors which are shaping – to a various extent – its basic measure, i.e. a share of the industry or each of its sectors in the open international market. Due to a significant share of the wood industry in the generation of Poland's GDP, constant measurement and verification of this sector's competitiveness, both *ex-ante* and *ex-post*, seem to be of extreme importance.

Carrying our research on the competitiveness of the wood market can eventually:

- facilitate selection of various instruments of the economic policy, including the severity and influence of the factors that shape the level and dynamics of changes in Poland's share in foreign markets (including especially EU) concerning specific groups and ranges of wood products,
- enable more precise determination of importance levels and severity coefficients of influence of particular factors on the share of the wood industry in the international market.

A problem with collecting necessary data in a comparable period makes it slightly difficult to build and analyse the model of international competitiveness of the wood market. It is possible to make an attempt and find a solution to this problem by selecting such product groups for experiments which already have the necessary documentation and modelling remaining groups based on their level of importance in order to ensure a full diagnosis of the entire sector and its individual branches.

Next to the traditional research model, it is considered important and practical to include a new approach, which takes into account the heritage of economic sciences, in particular one of new disciplines, i.e. mesoeconomics. A discussion on the mesoeconomic approach against the traditional model justifies the search for new analytic methods, which would enable both a diagnosis of industry's competitiveness in international markets, including the emerging ones, as well as creation of efficient tools of economic policy in this scope.

In the proposed research approach, two sets of measures can be used to carry out evaluation of international competitiveness of the wood market:

- the so-called partial measures, which are estimated based on the data collected from single companies operating in the wood market; and
- the so-called synthetic measures, which are based on aggregate data concerning exports, imports and production volume of the examined industry.

Therefore, it is worth mentioning that a need for such research studies is determined by the necessity of ensuring a coherent approach of EU and domestic institutions aimed at strengthening the competitive position of the wood and furniture industry. It is particularly important in the face of growing problems in the access to wood. Why? One of the key challenges the forest and wood industry has to face are high subsidies for the energy sector as regards energy production from renewable energy sources. It is predicted that Europe's demand for the so-called green energy generated from wood will grow in the nearest future (presently, the growth of biomass and wood

utilisation in energy production amounts to more than 20% per annum). This may lead to some disturbing consequences for the industry.

The wood and furniture market in Poland is an important branch of the economy as well as one of the leaders in environmentally friendly economy development owing to the use of a renewable raw material (wood) and striving for sustainable development. However, the legal and economic environment is a serious threat for the existence of this sector. Companies and internal interactions within the industry shape in a significant way the international competitiveness of the market. Meanwhile, companies have to struggle for wood with the renewable energy sources sector and, at the same time, need to face various investment difficulties in their production plants as well as problems with research and development, training issues and attracting young workers. New legislative barriers result in additional costs for entrepreneurs. In their current form the regulations in force limit economic growth in the wood market; the actions undertaken by EU promote energy from renewable sources and the use of biomass as substitute for fossil fuels. However, the unintentional side effect of such an approach is the fact that burning wood is more profitable than its utilisation by the industry.

Moreover, the global economy is becoming more open to free trade, hence the wood and furniture industry has to deal with more severe competition from the side of emerging economies where costs are significantly lower. In this context, a reliable diagnosis of international competitiveness of the Polish wood industry within the Community, with the help of the proposed models of research, seems to be of exceptionally significant importance for taking fundamental decisions in the scope of economic policy.

## 7. REFERENCES

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