Article

Identification of the Relationships between Competitive Potential and Competitive Position of the Food Industry in the European Union

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Abstract: The competitiveness of the food industry, which is among the most important areas in the Central European economy, is a significant and topical research area in economics. The sector is particularly important for long-term sustainable growth in Central European national economies. Its high competitiveness is an important stabiliser in an environment of global economic instability. This study aimed to assess the relationships between elements of competitive potential and the competitive position of the food industry in E.U. countries. The relationships between these categories were examined using econometric models with the use of panel data. The results of the spatial-temporal modelling of the panel data confirmed the significant impact of production potential on the share of exports, profitability and the synthetic competitive position index, the impact of labour productivity on all analysed competitive position ratios, the impact of labour costs on the trade coverage, profitability and overall competitive position and the positive impact of innovation on profitability. It was found that labour productivity was of the greatest importance in building a competitive position. The results of the research can be used by food industry companies and government authorities in creating competitive advantages for the food industry in international markets.

Keywords: competitive potential; competitive position; food industry; panel models

1. Introduction

The food industry, which provides resources necessary to meet basic human needs, is one of the most important sectors in all European national economies. Regardless of the structural changes taking place in these economies, related, among other things, to the increased share of the service sector, and the increased importance of the high-tech sector in creating added value, the food industry is, and will remain, a strategic sector. This is primarily related to ensuring food security on a national and global scale and the importance of this sector in the food chain (as the main element connecting agriculture with food producers and trade). However, the food industry plays a particularly important role in the countries of Central Europe. Over the last thirty years, the economies of these countries have undergone a transformation towards efficient, stable and growing markets. Trade liberalisation, elimination of border controls on the movement of goods and technical and fiscal barriers to accessing the single market as a result of E.U. enlargement have triggered a trade creation effect and an increase in food production in many countries of the "new" European Union. Earlier studies confirm that in these countries the food industry plays an important role in national economies and shows comparative advantages in intra-E.U. trade [1]. The high level of competitiveness of the food industry in Central European countries will therefore become an important element in stimulating economic processes and sustainable development in the long term.

Scientists' interest in research issues related to the competitiveness of the food industry is high and takes place at many levels of analysis. The first level is to assess the

competitiveness of groups of countries and individual countries on the global market. The research in this area has aimed at cyclic assessment of the competitiveness of E.U. countries on the global market of food producers carried out for the European Commission [2,3]. They show that the competitiveness of the European Union food industry in the global market is relatively low compared with countries such as the United States and Canada, and at a similar level to Australia and Brazil. Similar conclusions can be drawn from the research conducted by Bojnec and Fertő [4] and Carraresi and Banterle [5]. The work of many economists has also been devoted to research on the competitiveness of domestic food products on world markets (see: [6–12]). Their findings indicate that the Netherlands, France and Germany, after the United States, are the largest exporters of food to the world market.

The next level of analysis involves the assessment of the competitiveness of the food industry of individual E.U. countries on the domestic market. Research [1,4,13–15] has shown that Germany, France and the Netherlands also have the largest share in the export of food and agricultural products on the intra-community market. A significant number of the studies devoted to the competitiveness of the food industry also concerned changes in the competitiveness of the E.U. food industry in the context of the enlargement of the Community (see e.g., [5,16,17]). Since the food industry is not a homogeneous sector, the research also concerns the competitiveness of its sub-sectors (e.g., [18–21]).

To assess the international competitiveness of the food industry, selected sub-indices were used in the cited articles, referring to the factor or resultant dimension of competitiveness, whereas analyses of the cause–effect relationship between these categories were conducted much less frequently. This relationship is important from both a scientific and an application point of view. Depending on economic development, different competitive factors can be used. They directly influence the resulting competitiveness, i.e., the competitive position in the market. This kind of information is not only of cognitive value. It can also contribute to improving the competitive performance of companies and industry from different countries. This article attempts to fill the gap in empirical knowledge on the subject. Therefore, this study aimed to assess the relationships between the elements of competitive potential and the competitive position of the food industry in E.U. countries. Econometric panel models were considered to be an appropriate formal tool to be used in this situation. They are used to describe the relationships between variables when statistical data are of a cross-sectional and temporal nature. In this article, it is a set of data covering all E.U. countries in the period 2007–2018.

A further part of the considerations in the article is as follows. The literature review discusses competitiveness-related issues at the mesoeconomic–sectoral level. The main focus is placed on the discussion of theoretical premises of the relationship between competitiveness factors and the results of competition. The next section presents the methodology of the research. Next, the research results are discussed and juxtaposed with the findings of other authors. Conclusions resulting from the research and research limitations, as well as suggestions for future research, are presented in the last part of the article.

2. Literature Review

Competitiveness is a relative, multidimensional category and one that can be interpreted based on different economic theories as well as on different levels of analysis (e.g., [22–27]). This results in numerous interpretative and definition-related approaches to the concept [28–31]. The considerations presented in this article concern the assessment of competitiveness at the mesoeconomic level of the food industry sector. The definition of competitiveness at this level was formulated by Devine [32] after Singh [33]. According to these authors, an efficient (i.e., competitive) sector is able not only to satisfy the demand on the domestic market but also on foreign markets, generating funds from this activity to cover the necessary import expenditures, while maintaining socially acceptable levels of production, employment and exchange rates. These definitions refer to the theory of

economic growth and international trade, in which competitiveness is seen as the ability to maintain or increase international market shares. The presented approach to the international competitiveness of the sector has been applied in many other studies [34–38]. They stress that competitiveness studies at the sectoral level indicate that competition is not only met in the national but also the international market. This interpretation of the approach to the sector competitiveness definition has been implemented in the food industry sector. Wijnands et al. [2] and Wijnands and Verhoog [3] claim that the competitiveness of the food industry may also be defined as a sustained ability to achieve profitable gain and a market share in domestic and export markets in which the industry is active. The perspective of such a definition of sectoral competitiveness was accepted by the authors of this article.

In consequence of the aim of the research, it was necessary to clearly define the concept of competitive potential and competitive position. The operationalisation of such an approach to competitiveness fits into the model proposed by Buckley et al. [39], who took a systemic and holistic approach to the essence of competitiveness. The 3-P model presented by the authors distinguishes three aspects of competitiveness, i.e., competitive performance, competitive potential and competitive process. This model has been repeatedly referred to and used in empirical research by many economists (e.g., [40,41]). Competitive potential is associated with competitive ability (factorial competitiveness—contribution to the competitive processes), competitive position determines the outcome of the competitive processes on the market and the processes of managing the ways of competing include activities that enable the transformation of potential into a competitive position. There is feedback between the presented categories. Competitive potential determines how the processes of competition on the market are managed and leads to the achievement of specific competitive results. The competitive position, in turn, determines the size and quality of the competitive potential and influences the way a competitive strategy is managed. In this context, it is important to discuss the theoretical aspects of the relationship between the elements of competitive potential (competitiveness factors) and a competitive position (competitive outcomes).

The international competitiveness of the sector is affected by many factors that determine the level of competitive potential [42]. This article focuses on the factors most often emphasised in the literature. These include the concentration of production resources, productivity and efficiency advantages, labour costs and prices and the level of innovation. The degree of concentration of economic activity of food industry entities determines their economic potential in individual regions of the Community. The production potential of national economy sectors can be determined by the number of entities involved in food production and the labour resources involved [43]. The degree of concentration of the sector is also important, as its high level allows strong companies to control the sector. They can influence the price, production volume, commercial conditions and behaviour and elimination of competitors. It is also worth referring in this context to the concept of Porter [44], who developed a theory of competitiveness based on "clusters" of related companies and industries. The author claims that cooperation with suppliers and related industries creates opportunities to improve competitiveness through synergy. He notes that this may result from the following premises: increasing the efficiency of his enterprises, increasing the propensity to undertake an innovative activity and improving its level, and thus increasing the efficiency and creating new companies, which favours efficiency improvement and enlarges the number of producers. Taking into account the above considerations, the first hypothesis was formulated as follows:

1. An increase in the production potential has a positive impact on the competitive position of the food industry in E.U. member states on the Community market.

Productivity and efficiency advantages are also an important competitive factor [45]. They are related to the efficiency of production resources. Productivity is the basic category describing this dependence. According to the most general definition of productivity [46], it is a relation of a quantitative measure of production to a quantitative measure of inputs. The theoretical relationship between productivity and competitiveness has already been

emphasised in classical economic concepts and theories [47]. The importance of productivity in the context of economic growth and improving competitiveness is also present in other concepts of economic growth, including the neoclassical, neo-Keynesian or endogenous models (e.g., [48,49]). Porter [44] identified productivity directly with competitiveness. According to the author, the only sensible understanding of international competitiveness is related to national productivity. He also emphasised that the competitiveness of a country's economy depends on the competitiveness of specific sectors and industries of that economy. As part of the so-called new trade theory, Melitz [50] pointed out that only those with the highest productivity can compete in export markets. The second hypothesis is therefore as follows:

2.   An increase in labour productivity has a positive impact on the competitive position of the food industry in E.U. member states on the Community market.

Production costs are another element of the competitive potential that can form the basis of competitive advantage, of which labour costs are the most important component. It has been pointed out that the average labour costs in a given country depend primarily on the conditions of its development, its demographic structure and the prices of production factors. In particular, it has been observed that lower labour costs occur as a rule in the so-called new member states (literature). Low labour costs can be an important factor affecting the competitiveness of the economies and sectors of this European region. However, a clear assessment of this competitiveness can only be made when the productivity is taken into account. These relationships are referred to as the Unit Labour Cost (ULC). It provides information on the degree of coverage (financing) of the remuneration for labour by its efficiency. It is considered to be the most synthetic measure of cost competitiveness and rationality of the sector or economy management [51,52]. Felipe and Kumar [53] stress, however, that such a generalisation is only justified if the aggregated unit labour costs are the same as the average unit labour costs for all companies in a given sector or economy. Labour costs influence the level of another important factor of competitiveness, i.e., prices. Deardof [54] points out that, at the sector level, high domestic prices and high relative export prices significantly decrease its competitiveness at the international level. Analyses of the food industry have focused mainly on determining the level of differentiation of these economic categories in E.U. member states. The third hypothesis was defined as follows:

3.   An increase in unit labour cost has a negative impact on the competitive position of the food industry in E.U. member states on the Community market.

The changing environment in which business entities operate makes them seek new forms of competition with market rivals [55]. Conducting innovative activities is the key area of activity in this respect. The concept of innovation was first formulated by Schumpeter [56] who presented the concept of the so-called punctuated equilibrium. According to this thesis, the sector remains in a static equilibrium until it is stimulated by innovation. Thus, it is an equilibrium punctuated by periods of change that lead to a new point of equilibrium. Innovations knock the sector out of balance, while imitations are a balancing force. Although not popular with economists at the time, Schumpeter's work had a significant impact on the shape of innovation theory in later periods. Based on his work, Krugman [57] (the new trade theory) and Grossman and Helpman [58] (the endogenous growth theory) were the first to point out the relationship between innovation and economic/sector competitiveness. In both theories, the authors stressed that the level of innovation determines the size of the technological gap and thus the competitive advantage that an innovative country has over a less innovative one. A similar approach was presented by Fragerberg [59]. The impact of innovation on the development and maintenance of a highly competitive position of business entities is currently emphasised by many economists (among others [60–63]). On this basis, the fourth hypothesis was formulated:

4.   An increase in innovation has a positive impact on the competitive position of the food industry in E.U. member states on the Community market.

The factors of competitive potential that affect the competitive position of sectors are constantly changing. The analysis of these dependencies in the food industry sector of E.U. countries on a geographical and temporal basis is a research problem that is always current and requires in-depth analysis. It was a premise for researching a comprehensive approach to the assessment of cause-and-effect relationships between elements of potential and the competitive position of the food industry in E.U. countries.

3. Materials and Methods

The following four ratios were used to measure the individual components of the competitive potential (Equations (1)–(4)):

1. Production potential (PP)

$$PP = \frac{LP}{\sum_{i=1}^{n} LP_i} \tag{1}$$

where: LP—number of food industry enterprises, n—number of countries under analysis.

2. Labour productivity (LP)

$$LP = \frac{V}{Z} \tag{2}$$

where: V—food industry production output sold, Z—average employment in the food industry.

3. Unit labour costs (ULCs) [64].

$$ULC = \frac{LC}{V} \tag{3}$$

where: LC—cost of labour in the food industry

4. Innovation (I)

$$I = \frac{P_I}{P} \tag{4}$$

where: P_I—number of food industry enterprises within Community Innovation Survey (CIS), which implemented innovations of any kind during the period under analysis, and P—number of all food industry enterprises in a country analysed as part of CIS during the time t.

The applied indicators of the competitive position result from the adopted definition of competitiveness, which emphasises the shares in domestic and foreign markets and the achievement of profitability. A competitive position of the industry was determined by three partial ratios (Equations (5)–(7)) and a synthetic index created from them (Equation (8)):

1. Export market share (EMS) [65]:

$$EMS = \frac{E}{\sum_{i=1}^{n} E_i} \tag{5}$$

where: E—food industry export to the Community market.

2. Trade coverage (TC)

$$TC = \frac{E}{IM} \tag{6}$$

where: IM—the value of food industry imports by a country from the E.U. market.

3. Profitability (P) [29]:

$$P = \frac{GOS}{T} \tag{7}$$

where: *GOS*—gross operational surplus of the food industry in a country and *T*—food industry turnover in a country.

4. Synthetic competitiveness position index (SCP)

Using a synthetic index, individual attributes describing a competitive position (export market share, trade coverage and profitability) were replaced with one aggregate value. The Hellwig method was used in its construction. This method involves creating a standard object with respect to the attributes under consideration, which describe the phenomenon under study. In the case in hand, i.e., a hypothetical country with the highest competitiveness in the industry, each object (country) would later be compared with the standard in accordance with Equations (9) and (10) [49]:

$$S_{CP} = 1 - \frac{d_{i0}}{d_0} \tag{8}$$

$$d_0 = \overline{d_0} + 2S_{s0} \tag{9}$$

$$d_{i0} = \sqrt{\sum_{j=1}^{m} \left(z_{ij} - z_{0j}\right)^2} \tag{10}$$

where: d_{i0}—Euclidean distance of a country i from the standard object, d_0—critical distance between the entity and the standard, $\overline{d_0}$—arithmetic average of taxonomic distances, S_{s0}—standard deviation of taxonomic distances and z_{ij}—standardised value of attribute j. The relationship between competitive potential and position was investigated with econometric models using panel data. The panel data are a combination of cross-sectional data and time series, enabling a much more complete analysis of the relationships under consideration. Simultaneous inclusion of information about countries as well as their characteristics over time allowed us to reduce measurement errors and to increase the information power of the models. The econometric models presented in this study were estimated for the years 2007–2018 for 26 E.U. member states (the analysis leaves out Malta because of the lack of statistical data). Therefore, the data set created contained 312 observations for each competitiveness indicator under analysis, describing potential and competitive position. The food industry was determined on the basis of the Statistical Classification of Economic Activities in the European Community(NACE), division 10—Manufacture of food products and the Standard International Trade Classification (SITC) Rev 3.—aggregation of divisions 01–09, 4. The data were obtained from EUROSTAT.

Three econometric models were considered in the panel data analysis: the classic least squares estimation model (CLSM), the fixed-effect model and the random-effect model. In the first case, regression was performed on all available observations as if they were cross-sectional data. The construction of the model is based on the assumption that the study units (countries) differ from each other by certain characteristics, which for a particular entity remain constant over time. The model took the following form (Equation (11)), [66]):

$$y_{it} = x_{it}\beta + v_{it} \tag{11}$$

where: *y*—indicators of competitive position (EMS, TC, P, S_{CP}), *x*—indicators of competitive potential (PP, LP, ULC, I), *i*—objects (EU member states, $i = 1, \dots, 26$), β—model structural parameters and *t*time units (years, $t = 1, \dots, 12$). When the objects are not uniform, individual effects may occur: permanent or variable in time. The Breusch–Pagan test was performed to determine whether such effects occur and whether a panel model can be

estimated with the CLSM. The test is used to verify the assumption of the constant nature of the random component variation. The test statistic has the following form (Equation (12)):

$$\lambda = \frac{NT}{2(T-1)} \left(\frac{S_1}{S_2} - 1 \right)^2 \tag{12}$$

Statistic λ has the following distribution: χ^2 with one degree of freedom. If the test does not provide the basis for rejecting the zero hypothesis, individual effects do not have to be introduced as they result in insignificant changes in the variation.

The fixed-effects model, along with the structural parameters common to all countries (vector β), also takes into account country-specific parameters u_i, which can be treated as an absolute term in the model for each unit. They are responsible for the action of individual effects in these units. The model has the following form [66] (Equation (13)):

$$y_{it} = x_{it}\beta + u_i + \varepsilon_{it} \tag{13}$$

where: y—indicators of competitive position (EMS, TC, P, S_{CP}), x—indicators of competitive potential (PP, LP, ULC, I), u_i—individual effect and ε_{it}—pure random error. In the panel model with variable effects, each unit was assigned a certain random variable, whose realisation was responsible for an individual effect in a given period. In the previous model, individual effects could be interpreted as an individual absolute term, different for each unit, but fixed over time. For the random-effects model, individual effects are not the same in subsequent periods. The general form of this model is as follows [67] (Equation (14)):

$$y_{it} = \alpha_i + x_{it}\beta + u_{it}, \ \alpha_i = \alpha + v_i \tag{14}$$

where: y—indicators of competitive position (EMS, TC, P, S_{CP}), x—indicators of competitive potential (PP, LP, ULC, I) and v_i—random variable. It means that an individual effect α_i is a random variable. The choice between fixed effects and random effects was based on the Hausman test [67]. The occurrence of correlations between explanatory variables and random effects was investigated using this test. According to the zero hypothesis, individual effects are independent of explanatory variables. This means that the estimator for the model with random effects is more effective. The alternative hypothesis assumes that the fixed-effects model estimator is unloaded and the model estimator with random effects is loaded. This means that a fixed-effects model is more appropriate. The hypotheses were verified with the test statistic with the distribution χ^2 with k degrees of freedom (k—number of explanatory variables) as expressed by the following formula (Equation (15)):

$$q = \hat{\beta}_{FE} - \hat{\beta}_{RE} \tag{15}$$

The calculations were performed with the GRETL statistical package.

The proposed methodology is an original approach to examining the relationship between the industry's potential and competitive position. The use of panel data regression, which is a combination of cross-sectional data and time series, enabled a relatively complete assessment of the relationships under consideration. It should be stressed, however, that the analysis was performed for selected competitiveness indicators and does not exhaust all aspects of either competitive potential or position.

4. Results

The panel data were used to estimate the model parameters with four competitive position parameters as explanatory variables: export market share (EMS), trade coverage (TC), profitability (P) and a synthetic competitive position index (SCP).

First, the impact of the competitive potential components on a country's share in the intra-community food export was determined. The Breusch–Pagan test was performed. The Lagrange multiplier (LM) statistic for the test was 6.41157 with a *p*-value of 0.0113379. This meant that the zero hypothesis had to be rejected in favour of the alternative hypothesis.

Therefore, individual effects had to be taken into account in the model. It was then checked which type of effect should be incorporated in the model. According to the Hausman test results, the zero hypothesis had to be rejected in favour of an alternative one, which assumes that an estimator with established effects would be better. A model in which all structural parameters were statistically significant was considered. Its results are shown in Table 1. The share in the export ratio was described by two variables: labour productivity and production potential. The slope value estimates were positive. Therefore, both the labour productivity and the production potential had a positive impact on the share in export. The determination coefficient R2 was 0.538539 and it was statistically significant. This meant that these two categories explained over 53.85% of the variation in the food export market share in E.U. member states during the period under analysis.

Table 1. Panel data estimation results for export market share (EMS) (fixed-effects model).

Variables	Coefficient	Standard Error	t-Student	*p*-Value	Significance
const	1.12993	0.754914	1.497	1.3561×10^{-1}	***
PP	0.414005	0.0389986	10.62	2.22×10^{-22}	***
LP	0.0208361	0.00166419	12.52	6.46×10^{-29}	***

Determination coefficient R^2 = 0.538539
Akaike information criterion AIC = 1717.091
Statistic F(2, 283) = 157.28 (*p*-value = 1.17462×10^{-46})
Breusch-Pagan test Lagrange multiplier (LM) = 6.41157 (*p*-value = 0.0113379)
Hausman statistic $\chi^2(3)$ = 2.68999 (*p*-value = 0.441931)

***—statistical significance at α = 0.01. Source: own study based on EUROSTAT.

Subsequently, relationships between selected ratios of competitive potential and trade coverage were analysed. It was concluded based on the Lagrange multiplier (LM) statistic of the Breusch–Pagan test of 6.08613 with a *p*-value of 0.01362475 that individual effects should also be taken into account in this model. The Hausman test, in turn, with the statistic of 2.49028 and the *p*-value of 0.477051, provided grounds for approving the fixed-effects model (Table 2). The study shows that an increase in labour productivity and a reduction in relative labour cost resulted in an improvement in food industry profitability. Negative cause-and-effect correlations were also observed between innovation and TC. This means that the trade coverage was lower/higher in countries with a higher/lower degree of innovation. Combined, these three variables, describing the competitive potential, explained nearly 59.10% of the TC variance.

Table 2. Panel data estimation results for trade coverage (TC) (fixed-effects model).

Variables	Coefficient	Standard Error	t-Student	*p*-Value	Significance
const	1.5787	0.087051	18.14	2.98×10^{-49}	***
LP	0.002638	0.000182	14.48	6.44×10^{-36}	***
I	−0.0144671	0.00165	−8.768	1.75×10^{-16}	***
ULC	−0.00337062	0.000497	−6.781	7.01×10^{-11}	***

Determination coefficient R^2 = 0.590957
Akaike information criterion (AIC) = 197.1552
Statistic F(2, 282) = 14.55049 (*p*-value = 5.44×10^{-40})
Breusch–Pagan test Lagrange multiplier (LM) = 6.08613 (*p*-value = 0.0136247)
Hausman statistic $\chi^2(3)$ = 2.49028 (*p*-value = 0.477051)

***—statistical significance at α = 0.01. Source: own study based on EUROSTAT.

In the next step, the cause-and-effect relationships between the competitive potential and the profitability of the food industry were examined. The model created by CLSM (Table 3) was used for the estimation. Based on the Breusch–Pagan test, it was concluded that the introduction of individual effects was unnecessary. The constructed econometric model described the examined phenomenon sufficiently well. On the basis of Student's

t-test, it was found that all coefficients in the model were statistically significant at the assumed level of significance. The standard errors were relatively low. The increase in labour productivity and innovation and the decrease in relative labour costs were associated with increased profitability. Negative cause–effect relationships were also observed between the size of production potential and profitability. This means that the industry profitability was lower/higher in countries with higher/lower production potential. It is noteworthy that this model rather poorly describes the variability in R. The determination coefficient R2 was 16.85%. This may indicate that other factors exist that affect the food industry profitability.

Table 3. Panel data estimation results for P (least squares method).

Variables	Coefficient	Standard Error	t-Student	*p*-Value	Significance
const	8.44425	0.766476	11.02	5.37×10^{-24}	***
PP	−0.121393	0.029711	−4.086	5.62×10^{-5}	***
LP	0.003212	0.001587	2.024	4.39×10^{-2}	**
ULC	−0.0202202	0.004412	−4.583	6.67×10^{-6}	***
I	0.042319	0.014035	3.015	2.8×10^{-3}	***

Determination coefficient R^2 = 0.168474
Statistic F(4, 306)= (*p*-value = 15.49955)
Breusch–Pagan test Lagrange multiplier (LM) = 0.00832668 (*p*-value = 0.927293)

, *—statistical significance at α = 0.05 and α = 0.01, respectively. Source: own study based on EUROSTAT.

In the last stage of the study, the impact of ratios describing the competitive potential of the food industry on the overall assessment of the competitive position of this industry measured by a synthetic indicator was estimated. Based on the Breush–Pagan test, as well as the Hausman test, it was concluded that a model with variable individual effects would be the most appropriate (Table 4). Based on this model, was concluded that there are cause-and-effect relationships between production potential, labour productivity, unit labour costs and competitive position. Slope coefficients indicate that an increase in production potential and labour productivity, as well as a reduction in relative unit costs, resulted in a higher competitive position measured by a synthetic index.

Table 4. Panel data estimation results for S$_{POZ}$ (fixed-effects model).

Variables	Coefficient	Standard Error	t-Student	*p*-Value	Significance
const	0.314354	0.022013	14.28	8.37×10^{-36}	***
PP	0.002157	0.000848	2.544	1.14×10^{-2}	**
LP	0.000515	4.53×10^{-5}	11.37	3.24×10^{-25}	***
ULC	−0.000961378	0.000126	−7.649	2.64×10^{-13}	***

Akaike information criterion (AIC) = −672.5643
Breusch–Pagan test Lagrange multiplier (LM) = 3.87126 (*p*-value = 0.0491196)
Hausman statistic $\chi^2(4)$ = 13.5617 (*p*-value = 0.00883375)

, *—statistical significance at α = 0.05 and α = 0.01. Source: own study based on EUROSTAT.

5. Discussion

The results of the spatial-temporal modelling of the panel data confirmed the significant impact of production potential on the export market share ratio, profitability and synthetic competitive position indicator. However, cause-and-effect relationships between the production potential and the TC were not confirmed. Therefore, the first hypothesis was not corroborated. The relationship between the spatial concentration of entities and the competitiveness of industries was also analysed [68]. The author referred to the example of the Swedish export industry, where the concentration of entities had a positive impact on trade results, but to a relatively small extent.

The created models indicate that the impact of labour productivity on competitive performance was broad and covered all analysed aspects of competitive position. Labour

productivity had a significant positive impact on all the analysed ratios that describe competitive performance (EMS, TC, P, SCP). Higher efficiency of labour resources use was associated with a higher export market share, higher trade coverage, higher profitability of the food industry and a higher synthetic competitive position indicator. Therefore, the second hypothesis can be considered to be confirmed. The relationship between productivity and competitive performance was also presented in the studies conducted by Aghion et al. [69], Baltagi et al. [70], Bernard and Jensen [71] and Aw et al. [72].

The research also shows that the increase in relative labour costs translated into a decrease in the trade coverage, lower profitability and a lower level of the synthetic competitive position index. However, no statistically significant correlation between labour costs and share in food export was found. Therefore, the third hypothesis was not confirmed. Research conducted by other authors has usually treated relative labour costs as a determinant of price competitiveness [64]. The interdependence between labour costs and productivity is also emphasised. Ark, Stuivenwold and Ypma [73] indicate that countries with lower labour costs also have lower labour productivity. However, there is a need to further investigate the direct relationship between labour costs and foreign trade performance or industry profitability.

The research has shown no clear impact of innovation on the competitiveness of the food industry. Positive, statistically significant relations were observed only between innovation and the profitability in the industry. The fourth hypothesis was therefore rejected. There are conflicting research results in the literature on the issue of relations between innovation and competitiveness. Research in this area concerning the food industry was carried out, among others, by Frick et al. [74], Juchniewicz [43] and Acosta et. al. [75]. These studies have shown that there is some connection between innovation and the competitiveness of the food industry. Some analyses have also confirmed the positive impact of innovation on productivity, often identified by authors with the competitiveness of economic sectors and entities [76,77]. Results of other empirical studies, in turn, have indicated that the relationship is not so obvious [78–80].

6. Conclusions

The created econometric models provided the basis for empirical verification of relations between selected components of competitive potential and competitive results. The analysis shows that the competitive position of the food industry in the European Union was primarily and significantly affected by labour productivity. Some relationships—but to a lesser extent—were also observed for production potential and labour costs. The least obvious relationship was between innovation and competitive position. The conclusions presented here may provide important information to owners of food industry enterprises in terms of building a competitive advantage on the international markets, as well as to state authorities in terms of building the competitiveness of national economies.

It is important to stress that the discussion on competitiveness factors should be continued. It should be noted that this study analysed selected factors that could be supplemented in further research. In future research, various measures of the adopted components of competitive potential can be taken into account, e.g., in terms of innovation expenditure or production potential measured by the number of people employed.

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