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THE COMPETITIVE POSITION OF THE POLISH AGRI-FOOD SECTOR ON THE WORLD MARKET

POZYCJA KONKURENCYJNA POLSKIEGO SEKTORA ROLNO-SPOŻYWCZEGO NA RYNKU ŚWIATOWYM

Key words: competitiveness, agri-food products, world market, trade liberalization, Global Trade Analysis Project

Słowa kluczowe: konkurencyjność, produkty rolno-spożywcze, rynek światowy, liberalizacja handlu, Global Trade Analysis Project

Abstract. The aim of the paper was to assess some changes in the competitive position of Polish agri-food products on the world market in the conditions of potential liberalisation of the world agricultural trade and absence of further action taken in this direction. Selected ex post and ex ante measures were used in the research, including the computable general equilibrium model Global Trade Analysis Project.

Introduction

Traditionally the agri-food trade occupies an important position in the structure of foreign trade in Poland. The export value of agri-food products from Poland in 2009 was 11.2 bln euro, whereas the import value reached 9.1 bln euro, that makes respectively about 10 and 7% of total export and import [Analiza wybranych... 2010]. The capacity of the agri-food sector to comply with the changing requirements of competitiveness, as well as facing the more aggressive competition of producers from countries of low production costs, especially if further liberalisation of agricultural turnover takes place, is a fundamental condition for Poland to actively participate in the regional and global agricultural markets. Besides the level of economic development, production and economic results, effectiveness of production factors and both cost and price and quality determinants, further processes of liberalisation of the agricultural trade will be significant for the development of the competitive capacity of Poland on the world agri-food market. The implementation of proposed liberalisation of access to agricultural markets, which are called for at the WTO forum, in order to increase the competition intensity may cause the producers and exporters from Poland to lose some of the markets and worsen their competitive position on the global market. In this context, the aim of the article is to assess some changes in the competitive position of agri-food products made in Poland on the world market in the conditions of potential liberalisation of the world agricultural trade and absence of further action taken in this direction.

Research method

The mathematical model of general equilibrium Global Trade Analysis Project (GTAP)¹ was used in the research. The models of general equilibrium are based on the neoclassical assumption that the prices of products, services and production factors run freely on the market and balance the demand and supply [Shoven, Whalley 1984]. The main point of such models is the premise that

¹ Besides the models of general equilibrium the models of partial equilibrium are also distinguished. The latter describe the analysed problem or market in separation from the rest of the economy, which enables thorough research, but causes certain doubts when generalising the conclusions. On the other hand, the former treat the economy as a whole and allow for the interbranch flow, but they are less detailed than the models of partial equilibrium [Orłowski 2000]. In order to achieve a coherent and complete image of production feedback, income, consumption and increase in the mid-term and long-term perspective the models of general equilibrium are widely used.

Table 1. The population, GDP, production of basic farm products and productivity of land resources and labour in agriculture in Poland, the EU-26 countries and in other countries around the world in 2008 and the forecast for 2015

Specification	Unit	2008	2015	
		absolute values	2008=100	
Poland				
Population	people [mln]	38.1	37.8	99.2
GDP	USD [mld]	527.0	672.1	127.5
Cereals production	tons [mln]	27.6	26.4	95.7
Oil seeds production		2.1	1.7	81.0
Meat production		3.5	3.6	102.9
Milk production		12.4	12.6	101.8
Land productivity		th. USD/ha	2.0	2.3
Labour productivity	th. USD/employee	14.4	15.2	105.5
Other EU countries				
Population	people [mln]	459.5	464.9	101.2
GDP	USD [mld]	17 727.4	18 925.8	106.8
Cereals production	tons [mln]	284.3	275.6	96.9
Oil seeds production		23.0	23.1	100.4
Meat production		40.0	41.0	102.5
Milk production		136.3	138.8	101.8
Land productivity		th. USD/ha	3.2	3.4
Labour productivity	th. USD/employee	54.4	61.3	112.7
Other countries				
Population	people [mln]	6 252.5	6 799.5	108.7
GDP	USD [mld]	42 332.6	53 461.8	126.3
Cereals production	tons [mln]	2 213.2	1 995.0	90.1
Oil seeds production		271.7	329.9	121.4
Meat production		236.5	238.0	100.6
Milk production		372.1	437.9	117.7

Source: Agriculture in the European... 2010, FAPRI 2010, Prospects for agriculture... 2009, World agriculture... 2002, Agricultural outlook... 2006, Rynek zbóż... 2009, Rynek rzepaku... 2009, Rynek mięsa... 2009, Rynek mleka... 2009, www.fao.org, web.worldbank.org, epp.eurostat.ec.europa.eu, www.nbp.pl, own calculations.

in a long period the economy develops in consequence of constant adjustments of the demand and supply, which take place as a result of changes in the structure of the prices of products and production factors running freely, which informs consumers of the costs of production of particular products and services and which forces manufacturers to allocate the production factors according to the consumers' decisions [Devarajan, Go 1998, Orłowski 2000, Robinson, Roland-Holst 1988]. This means that the models of general equilibrium are based on restrictive assumptions concerning the rationality of entities' behaviour and flexibility of markets.

The GTAP model, which was used in the research, was built by Hertel in 1992 and it is successively developed². The model database comprises 113 regions characterised by the open economy structure and 57 sectors (groups of products or products) of national economies³. The use of the model for forecasting the results of trade policy changes consists in constructing simulation scenarios and

² Thomas W. Hertel is a professor at the Department of Agricultural Economics, Purdue University, USA and executive director at the Center for Global Trade Analysis, which works at the University.

³ For more information about the structure of the GTAP model see [Hertel, Tsigas 1997, Narayanan, Walmsley 2008, Pawlak 2009]. For analyses it is possible to assume the aggregation suggested by the author of the model or other users, or to create one's own aggregation adjusted to the needs of the conducted research. The analysis uses an original aggregation of groups of products and countries around the world, making the research of Poland's and the other EU countries' competitive position in intra-EU, as well as in the world trade possible.

Table 2. Average bound MFN rates and the formula of customs tariffs reduction for the analysed groups of products according to the provisions of the Doha Round

Product groups	Average bound MFN rate ^a	Customs tariff reduction forecast [%]
Cereals	41.5	57.0
Fruit, vegetables	16.0	50.0
Oil seeds	0.0	0.0
Vegetable oils and fats	13.1	50.0
Sugar	150.2	70.0
Meat, offal and meat preparations	38.2	57.0
Dairy products	70.9	64.0
Other plant raw materials	23.1	57.0
Other non-processed animal products	29.8	57.0
Other food products	20.4	57.0

a – arithmetical average for the subitems of the Combined Nomenclature charged with a customs tariff; for specific duties the ad valorem equivalent was calculated
Source: own calculations based on Revised draft... 2008.

determining the influence of simulated exogenous variables on the volume of import and export of specific products, as well as competitive position of the country or sector of domestic economy. Before the realisation of the research plans simulation scenarios were formulated, where the exogenous variables were: the population, GDP value and the production volume of basic farm products in Poland, in the other countries of the European Union (EU-26) and in other countries around the world, productivity of land resources and labour in Polish agriculture and in the EU countries (Tab. 1) and the value of customs tariffs and export subsidies in the world agricultural trade⁴.

As far as the liberalisation of the foreign exchange is concerned, there were two simulation variants differing in the degree of reduction of customs tariffs. In the first variant a reduction of customs tariffs was assumed, which resulted from the last modalities negotiated at the WTO forum

in December 2008⁵ and a total abolishment of all subsidies in the agri-food export [Revised default... 2008]. In the second variant the absence of further liberalisation of trade exchange was assumed. A band formula of customs tariffs reduction was applied⁶, which provides for division of all tariffs into four reduction bands, depending on their value. For each of the bands a different reduction coefficient is to be applied – the higher the level of customs tariffs, the higher the coefficient (Tab. 2).

The extrapolation of values of trade turnover in the Polish agri-food sector was made by means of Gragg's nonlinear estimation⁷. Due to the fact that the chief currency of the model is the US dollar while Poland and other EU countries realise about 3/4 of the turnover in the euro zone, the analysed export and import values resulting from the GTAP model were subjected to correction allowing for the geographical structure of turnover and the fluctuations of mutual euro/dollar exchange rate. Thus, the final values of trade streams were calculated as weighted arithmetic means, where the weights were the shares of euro zone countries and other countries in the turnover of the analysed groups of agri-food products and the exchange rates of the euro and USD. The assumption was that in 2015 the share of EU countries in export and import of individual product groups will remain at the same level as in 2008. The euro/dollar exchange rate was assumed on the basis of the mean annual exchange rates in 2008 provided by the National Bank of Poland (1 EUR = 1.459 655 USD) [www.nbp.pl].

Changes in the competitive position of agri-food products made in Poland were defined with the use of a selected set of quantitative measures of international competitive position. The following indexes were applied: Export Specialisation Index (SI), Import Export Coverage Ratio

⁴ The construction of the GTAP model requires an estimation of the dynamics of the planned variables and entering them into the model in the relative approach. 2008 was assumed to be the base year.

⁵ It is possible to suppose that the modalities included in this version do not go beyond the limits of realistic final compromise. For more information about the results of studies allowing for the negotiating positions of chief players of the Doha Development Round (EU, USA, developing countries group G-20) [Poczta, Pawlak 2008].

⁶ The reductions apply to the tariffs of the Most Favoured Nation (MFN) Clause. In the process of implementation of the reduction commitments WTO members will have the right to introduce a smaller reduction of duties for the so-called „sensitive goods” than the one resulting from the band reduction formula. Due to the absence of lists of sensitive goods the analysis does not discuss the problem.

⁷ Nonlinear estimation is a general adjustment procedure which is used for the estimation of any type of dependence between the dependent variable (being discussed) and independent variables. Estimation errors in this method are smaller than in the case of linear estimation.

(CR), revealed comparative advantage indexes, including Relative Revealed Comparative Export Advantage Index (XRCA), Relative Import Penetration Index (MRCA), and Relative Trade Advantage Index (RTA) and Grubel-Lloyd Intra-Industry Trade Index (IIT)⁸.

Scenarios of changes in the competitive position of selected groups of agri-food products on the world market

The analysis of potential future competitiveness proved that both in the case of retaining unchanged conditions of access to agricultural markets and with the assumption of further reduction in customs tariffs and lifting export subsidies until 2015 meat, offal and meat preparations may be the group of products reaching the highest competitive advantage on the world market (XRCA, RTA) and distinguished by the high degree of export specialisation (SI) (Tab. 3). The values of import-export coverage ratio (CR>100%), which indicate the surplus in trade turnover, may also be an index of profit made by Poland in the intra-EU meat trade. However, it is necessary to note that in the conditions of progressing liberalisation of agricultural trade the value of positive balance in the meat trade sector may be more than two times lower than in the situation without further liberalisation actions. Until 2015 the trade in meat, offal and meat preparations should also be characterised by high and growing (with the reduced level of tariff protection of agricultural markets) intensity of intra-industry trade, thus leading to a larger variety of goods offered on the market and favouring better fulfilment of consumer needs as well as enabling the realisation of economy of scale and increase in the efficiency of factors of production involved in the process.

Dairy products from Poland should have a relative favourable competitive position on the world market, but in the following years it will be weakening (Tab. 3). In the years 2008-2015 in the dairy sector it will be possible to observe the following trends: the level of comparative advantage will be lowered from high (XRCA>1 and RTA>1) to medium (0<XRCA<1 and RTA=-0.3 or RTA=0.2), and the degree of export specialisation (SI) and the value of trade surplus (CR) will be reduced. While in 2008 the SI value calculated for this product group was 1.6 (this means that its share in the total agri-food export from Poland was by about 60% higher than the world average), in 2015 it may fluctuate from 0.6 with reduced customs tariffs in world agricultural trade to 0.9 without changes in the current conditions of access to the market and indicate that the importance of dairy products in the Polish agricultural trade is by about 10-40% lower than in the global scale. During that period in Poland the value of export advantage over import may decrease from nearly fivefold to about 1.5-fold in the conditions of further liberalisation of agricultural turnover or 2.5-fold if all actions taken to liberalise the market are withheld (CR=489% in 2008 and CR=161% or CR=265% in 2015).

⁸ The Export Specialisation Index (SI) compares the share of product *i* in the country's export *k* with the share of the product in the world export: $SI_i = \frac{X_{ik}}{X_i} \cdot \frac{X_w}{X_{wk}}$, where: M – import, X – export, Q – production. High SI values are considered desirable. Otherwise, it is possible to conclude that the economy in question or its sector do not have satisfactory competitiveness [Jagiello 2003].

Similarly to the SI, the Export-Import Coverage Ratio (CR): $CR_i = \frac{X_i}{M_i} \cdot 100\%$ enables the calculation of export specialisation of a given country within the analysed sector, product or group of products. The coefficient values exceeding 100 specify the specialisation of the analysed country, which gives a possibility to claim that it has relative advantage over partners [Lubiński, Michalski, Misala 1995].

The indexes of revealed comparative advantages were calculated on the basis of the following formulae:

$$XRCA_i = \frac{X_{ik}}{X_{im}} \cdot \frac{\sum_{j=1}^m X_{jk}}{\sum_{j=1}^m X_{jm}}, \quad MRCA_i = \frac{M_{ik}}{M_{im}} \cdot \frac{\sum_{j=1}^m M_{jk}}{\sum_{j=1}^m M_{jm}}, \quad RTA_i = XRCA_i - MRCA_i, \quad \text{where: } X - \text{export; } M - \text{import; } i, j - \text{product groups; } k, m - \text{countries, and then they were generally evaluated with the use of relations between them.}$$

Positive RTA index values and XRCA index values larger than unity show high competitiveness (+), but when the RTA index is negative and the MRCA index is larger than unity, the country shows no competitiveness (-). In other cases the results of analysis are not definite (+/-) [Frohberg, Hartmann 1997].

Grubel-Lloyd Index (IIT) [Cieślak 2000]: $IIT_k = \frac{(X_{ik} + M_{ik}) - |X_{ik} - M_{ik}|}{(X_{ik} + M_{ik})} \cdot 100\%$ was applied to specify the importance of intra-industry trade. High values of the index, which are close to 100, show the presence of intra-industry exchange, i.e. the exchange with a high degree of overlapping streams of export and import of products from the same branch. However, the IIT index assuming the value close to zero indicates the presence of inter-industry trade.

Table 3. The competitiveness of selected groups of agri-food products made in Poland in world trade in 2008 and the projection for 2015

Years	SI	CR [%]	Revealed comparative advantage indexes				IIT [%]
			XRCA	MRCA	RTA	general evaluation	
Meat, offal and meat preparations							
2008	1.78	169.95	1.96	1.33	0.63	+	74.09
2015 ^a	1.59	145.61	1.73	1.42	0.31	+	81.43
2015 ^b	2.23	221.97	2.58	1.34	1.24	+	62.12
Dairy products							
2008	1.58	488.99	1.65	0.38	1.27	+	33.96
2015 ^a	0.57	161.26	0.54	0.85	-0.31	+/-	76.55
2015 ^b	0.90	265.43	0.89	0.73	0.17	+/-	54.73
Sugar							
2008	0.54	149.93	0.53	0.38	0.15	+/-	80.02
2015 ^a	0.13	32.87	0.12	0.49	-0.37	+/-	49.47
2015 ^b	0.53	144.69	0.52	0.43	0.09	+/-	81.74
Cereals							
2008	0.12	22.44	0.11	0.59	-0.48	+/-	36.66
2015 ^a	0.16	24.86	0.15	0.55	-0.40	+/-	39.82
2015 ^b	0.15	30.95	0.13	0.54	-0.41	+/-	47.27
Fruit and vegetables							
2008	0.39	65.29	0.35	0.65	-0.30	+/-	79.00
2015 ^a	0.45	71.31	0.41	0.53	-0.12	+/-	83.25
2015 ^b	0.40	80.23	0.36	0.57	-0.21	+/-	89.03
Oil seeds							
2008	0.24	46.61	0.23	0.53	-0.30	+/-	63.58
2015 ^a	0.09	9.26	0.09	0.84	-0.75	+/-	16.94
2015 ^b	0.21	48.55	0.20	0.45	-0.24	+/-	65.37
Oils and fats							
2008	0.34	47.58	0.32	0.81	-0.49	+/-	64.48
2015 ^a	0.29	32.72	0.27	0.87	-0.60	+/-	49.31
2015 ^b	0.44	63.68	0.42	0.77	-0.36	+/-	77.81

a – the variant allowing for progressing liberalisation of world agricultural turnover, b – the variant assuming absence of further liberalisation of world agricultural trade

Source: Analiza wybranych...2009, www.faostat.fao.org, www.nbp.pl, Hertel, Tsigas 1997, own calculations.

of export specialisation ($SI < 1$) and trade balance deficit ($CR < 100\%$) (Tab. 3). It is worth noting that the liberalisation of access to world agricultural markets may be accompanied by weakened competitive advantage gained by Polish producers and exporters in trade in oil seeds, oils and fats as well as a slight increase in cereal, fruit and vegetable trade. It is also worth emphasising that in consequence of the increase in liberalisation tendencies oil seed trade may be more and more marked by the inter-industry character of specialisation ($IIT = 17\%$), whereas cereal, fruit and vegetable trade may adopt the form of intra-industry trade. By contrast, oil and fats turnover may be distinguished by similar share of intra- and inter-industry trade in the total exchange ($IIT = 49\%$).

The trend can be accounted for by the growing intensity of intra-industry trade (IIT), especially in the conditions of reduced customs tariffs and export subsidies, and more aggressive competitiveness of the milk producers from the countries of low production costs, such as Australia, New Zealand or some South American countries.

The projections give grounds for prediction that in consequence of the reduction in customs tariffs and elimination of export subsidies suggested at the WTO forum the competitive position of sugar exported from Poland may become considerably worse (Tab. 3). If the current status quo concerning the conditions of access to agricultural markets does not change, the competitive position of the Polish sugar sector should not become very much different. However, the implementation of the new agricultural agreement may contribute to a drop in the relative trade advantage (RTA) and lower degree of realised export specialisation (SI), decreased intensity of the intra-industry trade (IIT) and thus result in Poland changing from the role of an exporter to a net sugar importer ($CR = 33\%$ in 2015). In the conditions of impediments to trade being removed one of the possible explanations to the trend can be the growing competitive pressure of the producers of cane sugar, which is cheaper than beet sugar.

Regardless of the degree of advancement of liberalisation processes, by 2015 the other groups of plant products on the world market may be characterised by the average level of comparative advantages ($0 < XRCA < 1$ and $RTA < 0$), absence

Bibliography

- Agriculture in the European Union – Statistical and economic information 2009. 2010: European Union Directorate-General for Agriculture and Rural Development, Brussels-Luxembourg.
- Analiza wybranych zagadnień i tendencji w polskiej produkcji i handlu zagranicznym artykułami rolno-spożywczymi w 2008 roku. 2009: FAMMU/FAPA, Warszawa.
- Cieślak A.** 2000: Nowa teoria handlu zagranicznego w świetle badań empirycznych. PWN, Warszawa.
- Devarajan S., Go D.S.** 1998: The simple dynamic general equilibrium model of an open economy. *Journal of Policy Modeling*, vol. 20, no. 6, s. 677-714.
- FAPRI 2010: US and World Agricultural Outlook. Iowa State University, University of Missouri-Columbia.
- Frohberg K., Hartmann M.** 1997: Comparing Measures of Competitiveness. Discussion Paper, no. 2. IAMO, Halle.
- Hertel T.W., Tsigas M.E.** 1997: Structure of GTAP. [W:] Global Trade Analysis. Modeling and Applications (ed. T.W. Hertel). Cambridge University Press, Cambridge.
- Jagiello M.** 2003: Wskaźniki międzynarodowej konkurencyjności gospodarki. *Studia i materiały*, nr 80. IKCHZ, Warszawa.
- Lubiński M., Michalski T., Misala J.** 1995: Międzynarodowa konkurencyjność gospodarki. Pojęcie i sposób mierzenia. Raporty – Studia nad konkurencyjnością. Instytut Rozwoju i Studiów Strategicznych, Warszawa.
- Narayanan G.B., Walmsley T.L.** (red.) 2008: Global trade, assistance and production: The GTAP 7 Data Base. Center for Global Trade Analysis, Purdue University, s. 2.1-2.13.
- OECD-FAO. 2006-2015. 2006: Agricultural outlook. Paris.
- Orłowski W.M.** 2000: Koszty i korzyści z członkostwa w Unii europejskiej. Metody, modele, szacunki. CASE, Warszawa, s. 32, 36.
- Pawlak K.** 2009: Liberalizacja handlu rolnego w ramach WTO a pozycja konkurencyjna polskiego sektora rolno-spożywczego na Jednolitym Rynku Europejskim. [W:] Determinanty i wyzwania gospodarki światowej. *Zesz. Nauk.* nr 126 (red. E. Najlepszy, M. Bartosik-Purgat). Wyd. UE w Poznaniu, Poznań, s. 59-73.
- Pocza W., Pawlak K.** 2008: Liberalizacja światowego handlu rolnego a możliwości rozwoju polskiego handlu zagranicznego produktami rolno-spożywczymi. *Żag. Ekon. Rol.*, nr 3, s. 3-18.
- Prospects for agricultural markets and income in the European Union 2008-2015. 2009: European Commission, Directorate-General for Agriculture and Rural Development, Brussels-Luxembourg.
- Revised draft modalities for agriculture. 2008: WTO, TN/AG/W/4/Rev. 4, 6.12.
- Robinson S., Roland-Holst D.W.** 1988: Macroeconomic structure and computable general equilibrium models. *Journal of Policy Modeling*, vol. 10, no. 3, s. 353-375.
- Rynek mięsa – stan i perspektywy. 2009: IERiGŻ-PIB, ARR, MRiRW, nr 37, Warszawa.
- Rynek mleka – stan i perspektywy. 2009: IERiGŻ-PIB, ARR, MRiRW, nr 37, Warszawa.
- Rynek rzepaku – stan i perspektywy. 2009: IERiGŻ-PIB, ARR, MRiRW, nr 36, Warszawa.
- Rynek zbóż – stan i perspektywy. 2009: IERiGŻ-PIB, ARR, MRiRW, nr 37, Warszawa.
- Shoven J.B., Whalley J.** 1984: Applied general equilibrium model of taxation an international trade: An introduction and survey. *Journal of Economic Literature*, vol. 22, no. 9, s. 1007-1051.
- World agriculture: towards 2015/2030. 2002: Summary report. FAO, Rome.
[www.epp.eurostat.ec.europa.eu], 06.04.2010.
[www.web.worldbank.org], 06.04.2010.
[www.fao.org], 06-07.04.2010.
[www.nbp.pl]. Tabela średnich rocznych kursów walut NBP, 06.04.2010.

Streszczenie

W artykule określono zmiany pozycji konkurencyjnej produktów rolno-spożywczych pochodzących z Polski na rynku światowym w warunkach potencjalnej implementacji nowego porozumienia rolnego wynegocjowanego na forum Światowej Organizacji Handlu (WTO oraz jego braku). W analizie wykorzystano celowo dobrany zestaw wskaźników konkurencyjności *ex post* i *ex ante*, w tym matematyczny model równowagi ogólnej Global Trade Analysis Project (GTAP).

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