

ANALYSIS OF SELECTED DETERMINANTS OF THE AGRICULTURAL MARKET IN LATVIA AND POLAND

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Abstract. On the agricultural market, many factors are determined by the current changes. As a result, there has been an increase in competitiveness and productivity in the agricultural sector in many countries of the European Union, which is inhabited by almost 7 % of the total population of the world, and comprises 2.1 % of the world's land surface. It is not a homogeneous region as regards the level of the agricultural market development, especially the milk market.

Since 2004, when Latvia and Poland joined the European Union, the production of cow's milk has risen in spite of the decrease in the population of dairy cattle which has been accompanied by increased efficiency. The decline in consumption of cow's milk and its products, on the other hand, is an unfavourable phenomenon.

The aim of the research was to identify the key determinants that influence the milk market in Latvia and Poland. In order to achieve the research objective, the authors have conducted an analysis of the Common Agricultural Policy documents associated particularly with the dairy market. The authors defined the set of agricultural market's determinants in order to achieve the set goal. The research was based on Eurostat data generated for years 2005-2013. Twenty eight variables were used for analysis. A number of determinants were eliminated on the basis of coefficient of variation. The remaining variables were used for conducting examinations involving Hellwig's method to determine the value of the integral capacity of information carriers.

According to the analysis, the dairy market in Latvia is considerably influenced by the number of cattle, the age of farmers and agricultural holdings by economic size. The Polish dairy market is affected by the agricultural holdings with agricultural area of less than 5ha and agricultural holdings with the economic size of the farm less than 4000 euro.

Key words: agricultural market, milk, determinants

JEL code: Q13, Q18, C43

Introduction

The Common Agricultural Policy reforms were caused by the changes on the European Union milk market, which occurred at the beginning of the 21st century.

The increased competitiveness in the world, enlargement of the European Union, changes in the global output, in the consumption and the demand for milk and milk products led to transformations in cattle raising.

Productivity from one cow is more significant than the size of the herd.

The implemented reforms are expected to contribute to increased efficiency, innovation and realignment of the situation on the milk market, which in turn will contribute to the growth of competitiveness.

The authors attempted to identify the determinants that have the most significant influence on the milk market in Latvia and

Poland, especially in the period after the accession of these countries to the European Union.

The importance of actions which have been taken under the Common Agricultural Policy is emphasized in literature. However, the authors of this article focused on available Eurostat data for years 2005-2013 and, by means of the Hellwig's method, defined the determinants that have the greatest influence on the dairy market in the analysed countries.

1. Common Agricultural Policy

The experience of many countries shows that agriculture is a very sensitive sector which requires special treatment, special protection and support.

The fact is that agriculture does not provide a return on invested capital as fast as in other sectors of economy. The entire production cycle is longer and agricultural production often

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depends on factors beyond the control of man, like e.g. weather conditions. Therefore, in the process of creating the Euromarkets, it was recognized that the agriculture sector should be treated in a special way.

Historically the Common Agricultural Policy, was one of the first socio-economic policies of the European Union. The decision to introduce Common Agricultural Policy was included in The Treaty of Rome establishing the European Economic Community (Burnat M., 2001). The objectives of the Common Agricultural Policy in the European Union were determined as follows (Official Journal of EU, 2012; Gawlikowska-Hueckel K., 2003, Rowinski J., 2000):

- raising the productivity based on implementation of technological progress and development of agricultural production based on optimum use of all production factors;
- ensuring fair standard of living for the farmers;
- securing market stabilization;
- securing safety in food supply;
- securing prices of agricultural-food products acceptable to the consumers.

These aims should be achieved by a common organization of agricultural markets, vocational training of farmers, agricultural research, dissemination of agricultural knowledge as well as implementations of measures which will stimulate consumption of certain agricultural products.

The solutions to current and long-term problems of agriculture or other sections of the food economy are aided by the Common Agricultural Policy.

The Europeanization of legislation may take the form of coordination of the national agricultural markets, which will guarantee the integration and functioning of the common organization of agricultural markets.

The common market organisation of the milk and dairy products is one of the first, having been created in 1968 as part of the Common

Agricultural Policy. Community policy on the milk market is based on the goals of the Common Agricultural Policy.

At the same time, implementation of all aims is difficult; therefore, a hierarchy of priorities set for individual markets and their organizations may change over time.

As regards the common organization of the milk market, provisions relate primarily to:

- balancing the milk market. The balance refers to matching supply with demand on the milk market and reducing structural surpluses;
- ensuring a fair standard of living for the agricultural community (Official Journal of EU, 2012), in particular by increasing the individual earnings of persons engaged in agriculture;
- improving the milk and milk product's competitiveness on international markets; competitiveness must be attained, among others, by adjusting European prices to the world market prices, which are structurally lower (Regulation (EC), 1999, Regulation (EC) 2007).

The Common Agricultural Policy has enabled achieving food self-sufficiency of the Community and its Member States. Its cost was the expensive rise in surpluses of the production of agricultural commodities. This policy did not lead to the solution of structural problems in agriculture and its surroundings. Significant changes in the policy were caused by the high costs of its financing as well as protests of the global competitors and the preparations for the admission of new members from Central and Eastern Europe.

Substantial surplus production and the risks associated with food safety were the internal problems of the European Union. These problems were solved by introducing previous reforms, which resulted in favourable changes both within the EU group and in the international arena.

The recent reforms of agricultural policy of the European Union caused agriculture to become

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more market-oriented with simultaneous support for producers' incomes. Consistency of environmental protection requirements has been improved and the interest has grown in development of rural areas through extensive involvement in new projects for the countryside.

Taking the new trends into account, the reformed Common Agricultural Policy should become more balanced, better targeted, simpler and more efficient. It should respond to the needs and expectations of the European society, account for environmental aspects, climate, innovation, and natural constraints.

2. Dairy in the European Union

The most privileged sector in the European Union, which is regulated by many provisions of law is the milk and dairy products market.

The objective of the common milk market organisation is to limit of the overproduction of this raw material. This goal determines the main directions of the undertaken reforms, serves the purpose of ensuring price stability and sustaining farmers' income, supporting restructuring and modernization of the dairy sector, maintaining the balance of payments and sustaining economic growth. These numerous goals aim to fulfil the tasks of the Common Agricultural Policy and safeguard the interests of whole dairy industry.

The fundamental regulations of the milk market are instruments of market support. It is possible to divide them into three groups:

- 1) instruments affecting stabilization of the market (a system of guaranteed prices and intervention applied on the butter and skimmed milk powder markets);
- 2) instruments stimulating the domestic demand (subsidies to the consumption and processing of butter, powdered milks and creams);
- 3) regulations of the foreign trade (import duties, access limits and exports subsidies).

As a result, of all CAP reforms of the milk market, the milk target price was abandoned and, gradually, intervention prices for butter and skimmed milk powder (SMP) were reduced.

Procedures of intervention purchases were simplified, allowing them to be carried out within the limits set by the European Commission at a price equal to 90 % of the intervention price, regardless of the level of market prices. In addition, a decision was made to liquidate subsidies for SMP storage (which in practise had not been used for several years). Subsidy rates for processing milk fat by the food industry and for the use of milk protein for animal feed and casein were systematically lowered (Nitecka E, 2007; Seremak_Bulge J, 2008).

Purchase, intervention prices for butter and skimmed milk powder as well as private storage aid for butter, SMP and cheese are instruments which stabilize the milk market. The aim of the intervention mechanisms of purchases and sales of butter is to maintain balance due to collecting seasonal surplus and the sale of the accumulated intervention stocks during the period of reduced supply (Ginalska B., 2015).

The system of intervention along with subsidies creates a safety net, which is designed to prevent decline the market prices below a certain level. Purchases of butter are conducted exclusively within the tender system. They are activated at every time of the milk year when market prices of butter in one or more Member States within successive two weeks fall below 92 % of the intervention price. These measures are suspended when selling prices rise by more than 92 % of the intervention price (Commission Regulation 2771/1999). To participate in the tender, the producer must meet the quality criteria, and have a certificate of entitlement for production of butter within the intervention scheme.

Since 2010, lack of interest has been noted in the purchase mechanism because the prices of butter and SMP significantly exceed the intervention price for these products.

The response to the constantly changing demand are decisions concerning changes in butter production and distribution (Baer-

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Nawrocka, A., Grochowska, R., Kiryluk-Dryjska, E., Seremak-Bulge, J., Szajner, P., 2012).

In relation to dairy farms, for several years the market competition in the area of the uniform market was inhibited by the quota system (Judzinska A., Łopaciuk W., 2011), which was supposed to stabilize the market and to prevent emergence of surplus production. In fact, the system of production limitation led to a concentration in the industry, which was manifested by the reduction of the number of companies and increase in the scale of individual unit production (Sadowski A., Baer-Nawrocka A., Począta W., 2013). Thus, the liquidation of quotas, which took place in 2015, will most probably

accelerate the concentration of producers in different EU countries. It may help to enhance competition and, more specifically, the competitive struggle between Member States and individual farms. This can lead to the reorganization of the production of raw material in Europe. According to Baer-Nawrocka and Kiryluk-Dryjska, the withdrawal from the quoting system will most probably contribute to the transfer of milk production to areas where the production will be possible at relatively low costs on account of favourable natural conditions (Baer-Nawrocka A., Kiryluk-Dryjska E., 2010; Report Agricultural and Rural Development, 2014).

Table 1

**Milk production and number of dairy cows in the European Union
in the years 1994-2014**

Years	Total production (mln l)*	Production – annual increase (%)	number of dairy cows ** (in thousands)
1994	123 784	-	22 526
2003	125 598	1.5	19 257
2004	146 539	16.7	25 256
2005	146 998	0.3	24 824
2006	145 284	-1.2	22 268
2007	152 612	5.0	24 158
2008	153 863	0.8	23 951
2009	147 135	-4.4	23 696
2010	148 960	1.2	23 073
2012	156 493	5.1	23 206
2014	154 470	-1.3	23 500

* assuming the weight of 1 litre of milk to be 1.03 kg.

** status in December

Source: authors' study DG-AGRI, Eurostat, Milk market, status and prospects, IERIGZ-PIB, Warszawa 1999, 2008, 2013, 2014.

About 6.6 % of the world population inhabit the Member States of the European Union, whose area occupies 2.1 % of the earth's surface; and the cow's milk production constitutes almost 25 % of the world production. According to the International Dairy Federation estimates of milk production, in 2011 the EU contribution accounted for 83 % of global milk production (all kinds). Until 2003, farms produced from 120 - 125 million tonnes of milk, which was the result of the contemporary milk quota system in the group. The production rose up to 146 million tonnes (Table 1) after the next extension of the

EU, which took place in 2004 (10 countries). In relation to the scale of enlargement and milk quotas increase, it may seem to be only a slight rise.

In the literature on the subject, the size of the herd and milk efficiency of cows are considered to be the factors which determine the cost of milk production (Manko S., 2007; Switłyk, M., Zietara, W., 2012). The data presented in Table 1 shows that milk production in the EU increased within 20 years. In 2014 it was 154 mln litres and it was an increase by 24 % compared to 1994. The steadily growing cow milk unit's efficiency within

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the whole EU may be viewed as a positive development as regards production efficiency, despite the cattle numbers decline which has been occurring since 2008.

3. Determinants of the milk market – the Hellwig's method

Latvia and Poland joined the European Union in 2004. Before accession, both countries benefited from aid programmes, which were aimed at improving the competitiveness of their economies. Among other things, actions of the EU aimed to improve the situation on the milk and dairy products market.

In 2004, Latvia produced 478.1 thousand tonnes of cow's milk, and in 2015 it was already a value of 807.66 thousand tonnes. A similar dynamic growth was recorded in Poland, where, respectively, in 2004 8151.4 thousand tonnes were produced, and in 2015 - 10,874.28 thousand tonnes.

Such dynamic changes occurring in the milk market, not only in Latvia and Poland, led to the transformation of the agricultural policy of the European Union. These changes affect not only milk production but also its processing and consumption.

The purpose of the study was to determine the main factors influencing changes in the milk market in Latvia and Poland.

The authors, in order to identify the determinants, generated from the EUROSTAT database those variables which are related to the milk market in the analysed countries for the years 2005-2013. This database allowed analysing and determining the market-related determinants.

The analysis focussed on selected determinants of the agricultural market with particular emphasis on the milk market. The exogenous variable was the total number of farms operating in each of the countries under analysis (agricultural holdings by agricultural area), and the endogenous variables were those listed in Table 2. A total of 28 endogenous determinants were identified. Next, due to the large size of the set, certain endogenous variables were eliminated. The coefficient of variation was used in order to eliminate variables.

Further analysis considered only those determinants which were characterised by the highest level of changeability. Further analysis concerned the following five factors for Latvia (accordingly X11, X12, X13, X14, X20) and for Poland (accordingly X1, X6, X10, X11, X17).

In the initial stage, the research method was the correlational analysis of the value of the Pearson linear correlation coefficient. The vector and matrix coefficients were created relative to the analysed variables of the milk market.

In order to define in detail the determinants for Latvia and Poland, the Hellwig's method was employed, which is based on the integral capacity of information carriers. The latter are defined as the potential explanatory variables. Subsequently, the number of possible combinations of potential variables is determined and for each combination, individual information capacity is calculated. In this case, for each of the countries under analysis, 31 combinations were calculated, according to formula 1 (Kowalik K., 2014).

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Factors shaping the milk market in Latvia and Poland

Variable	Name	Variable	Name
X1	Agricultural holdings by agricultural area less than 5 ha	X15	Agricultural holdings by age of holder from 45 to 54 years
X2	Agricultural holdings by agricultural area from 5 to 19.9 ha	X16	Agricultural holdings by age of holder from 55 to 64 years
X3	Agricultural holdings by agricultural area from 20 to 49.9 ha	X17	Agricultural holdings by age of holder 65 years or over
X4	Agricultural holdings by agricultural area from 50 to 99.9 ha	X18	Agricultural holdings with livestock (cattle)
X5	Agricultural holdings by agricultural area 100 ha or over	X19	Agricultural holdings by crops (fodder crops)
X6	Agricultural holdings by economic size of the farm less than 4000 euro	X20	Agricultural holdings with livestock (number of holdings with livestock)
X7	Agricultural holdings by economic size of the farm from 4000 to 14999 euro	X21	Selling prices of raw cow's milk (EUR per 100 kg)
X8	Agricultural holdings by economic size of the farm from 15000 to 49999 euro	X22	Production of cheese (1000 t)
X9	Agricultural holdings by economic size of the farm from 50000 to 99999 euro	X23	Production of butter (1000 t)
X10	Agricultural holdings by economic size of the farm from 100000 to 249999 euro	X24	Production of milk powder (1000 t)
X11	Agricultural holdings by economic size of the farm from 250000 to 499999 euro	X25	Production of meat: cattle (1000 t)
X12	Agricultural holdings by economic size of the farm 500000 to over euro	X26	Production and utilisation of milk on the farm (1000 t)
X13	Agricultural holdings by age of holder less than 35 years	X27	Collection of cow's milk (1000 t)
X14	Agricultural holdings by age of holder from 35 to 44 years	X28	Number of dairy cows

Source: author's calculations based on ... (as an example)

Fig. 1. Determination of the combination

$$L = 2^m - 1 \quad (1)$$

Where:

m - the number of explanatory variables.

Further, the individual capacity is determined according to formula 2.

Fig. 2. Determining the individual capacity

$$h_{lj} = \frac{r_j^2}{\sum_{i \in I_l} |r_{ij}|}, \quad l = 1, 2, \dots, L, \quad j \in I_l \quad (2)$$

Where:

r_j - correlation between Y and x_j

r_{ij} - correlation between x_i and x_j

Subsequently determining the information capacity for all explanatory variables occurring for l^{th} combination according to formula 3.

Fig. 3. Determining the information capacity for explanatory variables

$$H_l = \sum_{i \in I_l} h_{ij}, \quad l = 1, 2, \dots, L \quad (3)$$

Where:

H - integral capacity of the information carrier

Based on the obtained calculations, it was possible to define the determinants which have the greatest influence on the development of the milk market in Latvia. These include X14 and X20. This result indicates that on the Latvian milk market stocking and the age of people running farms have the biggest impact. In the case of Latvia, they are the farm owners aged 35-44. It should also be noted that the high values of Hellwig method information capacity was observed in the case of agricultural holdings with economic size of the farm from 250 000 to 499 999 euro.

The analysis conducted for Poland, returned X1 and X6. The Polish milk market is primarily

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influenced by agricultural holdings of agricultural area less than 5 ha and agricultural holdings of economic size of the farm less than 4000 euro. This result is surprising because in Poland milk production is primarily the domain of farms which are large in terms of area and income obtained. In addition, high information capacity value was obtained for agricultural holdings with the holder's age 65 years or over. Depopulation of rural areas is clearly visible in Poland. Farms are run by older people, and, in many cases, there is no substitutability of generations understood as inheriting the parental farms.

A noteworthy fact is that the data which were used for the analysis of both countries do not contain information concerning the production of milk powder in Latvia. EUROSTAT reports that these data are confidential. This situation does not concern only Latvia but also other Baltic states of the former Soviet Union.

Conclusions

The issues related to the Common Agricultural Policy in the milk market are of interest not only to the producers (suppliers of milk) but also food

processing businesses and consumers. In the article, in order to determine the determinants, the authors used a simple and transparent synthetic indicator, which enables calculating the integral capacity of the information carriers. This method can be used to determine the dependencies occurring between the analysed exogenous and endogenous variables.

The determinants obtained by means of the Hellwig's method also show the specificity of milk production in Latvia and Poland despite the fact that the two countries differ in terms of size, e.g. the number of farms, livestock, milk production and dairy products.

It is worth noting that, as a result of this analysis, the determinants related to the milk market, as determined by the examination of integral capacity of information carriers, coincide with the current Common Agricultural Policy carried out by the Community on the milk market and show the current trends. The result may be a better use of the available funds for restructuring and modernization of the dairy sector in the two countries that have been analysed.

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