

## FACTORS AFFECTING WHEAT BREAD PRICES

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**Abstract.** Bread prices and the factors affecting them were studied in Latvia within an ESF project\*. The research aim of the present paper is to identify the most significant factors affecting bread price fluctuations. The grain market was studied first to find out the most significant factors affecting a bread price. The most significant factors affecting grain prices in the world are weather conditions (which affect crop yields), currency exchange rate fluctuations, speculations on markets of agricultural goods, and political decisions. In Latvia, food-grade wheat prices have increased 2.4 times, while food-grade rye prices have increased 2.3 times from 2005 to 2011. Energy prices continue to increase in the world, which also affects the growth in food prices, including bread. A lot of manual work is used in the process of bread production, which might account, on average, for 37% of total variable cost in bread production. The average gross monthly wage has increased 2 times in Latvia in the period of 2005-2011. Owing to these factors, the retail prices of wheat bread, and rye and wheat bread have increased 2 times in Latvia in this period. After studying the bread prices before 2005, i.e. Latvia's accession to the European Union, one can find that the bread retail prices have had insignificant fluctuations, the range of which was analogous to that observed in Latvia's period of independence from 1925 to 1940. The paper's research **object** is wheat bread price changes affected by the respective factors. The paper's research **aim** is to identify the most significant factors affecting the price of wheat bread.

**Key words:** bread price, prices of grain, labour costs, affecting factors.

**JEL code:** L11, L66, R32

### Introduction

According to a general theory (Saravacos G., 2008; Kunkulberga D., 2010; Marouli A.Z., 2005), production costs are composed of raw materials (including packaging materials), machinery (equipment), labour, maintenance (including expenses on energy), depreciation, and taxes. In food production, the main raw material is produced on the areas under crops (on farms). The costs of agricultural raw materials may account for 20%-50% of the total food production costs. Prices of agricultural products may differ across various countries owing to government subsidies granted to farmers. With the globalisation of markets, prices of agricultural products may adjust to market prices, and these prices converge among countries.

In the period of 2006-2008, the prices on raw materials, energy (including fuel), and labour and fixed costs sharply increased in the USA (Lambert David, 2010), thus, affecting food prices. The same process was observed in Latvia as well. In 2008, the price of fuel sharply rose in the USA (Mueller S. A., 2011), which affected also the market price of grain in Europe. In general, the world prices of food products rose by 15% in the period of 2002-2008. The costs of transportation increase with the increase in fuel prices. This, in turn, raises food prices. International transport services become more expensive due to the increase in fuel prices (Wilmsmeier G., 2009). If raw materials needed in food production have to be delivered from distant countries, it undoubtedly raises prices of food products. Based on the overall increase in prices of food products, it is important to identify the most significant factors affecting the price of bread in order to identify the most essential risk factors and to know the cost items in bread production that may cause a price increase.

The process of bread production is time intensive, as it takes some time to prepare dough and it may last up to 5-6 hours. After that, baking and cooling down the bread additionally requires 2 hours. Afterwards, the bread is packed or frozen, depending on the purpose of producing the bread. Labour is needed and wages have to be paid to do all these operations,. A lot of manual work is used in Latvia's bakeries, which increases the costs of labour that may account for even 37% of variable costs.

When the bread is baked and prepared for selling, it is necessary to deliver the bread to consumers. Usually, bread production companies have their own transport that delivers bread to grocery stores. Therefore, the sales price of bread is also affected by the transportation costs, which, first, are related with the cost of fuel consumption. As the prices on transportation services and fuel change in the course of time, bread production companies increasingly use services of logistics companies.

A long bread production cycle is specific to rye bread. Wheat bread has a significantly shorter production cycle, which allows current assets to circulate at a faster rate. This leads to greater competition among bread production companies on the wheat bread market. However, supermarkets, too, engage into competition along with traditional bread producers, since wheat bread is baked on the spot and offered still hot at supermarkets. The consumption of bread has decreased by half in Latvia over the recent two decades, besides, the consumption pattern has also changed, as wheat bread replaced rye bread. Therefore, the research object is wheat bread, the role of which has unfortunately increased, although, it is not the healthiest type of bread. The research subject is price changes and the factors influencing them.

The research **object** of the present paper is changes in the price of wheat bread affected by the relevant factors.

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Table 1

## Average prices of food-grade wheat in Latvia, LVL/t

| Year | January | April | July | October |
|------|---------|-------|------|---------|
| 2005 | 74      | 60    | 63   | 71      |
| 2006 | 78      | 74    | 71   | 87      |
| 2007 | 97      | 100   | 119  | 165     |
| 2008 | 165     | 171   | 150  | 95      |
| 2009 | 114     | 111   | 89*  | 91*     |
| 2010 | 88*     | 91*   | 130* | 151*    |
| 2011 | 186*    | 172*  | 137* | 130*    |
| 2012 | 146*    | 150*  | 179* | -       |

\* prices at the European exchanges MATIF/LIFFE (euros converted into lats)

Source: authors' construction

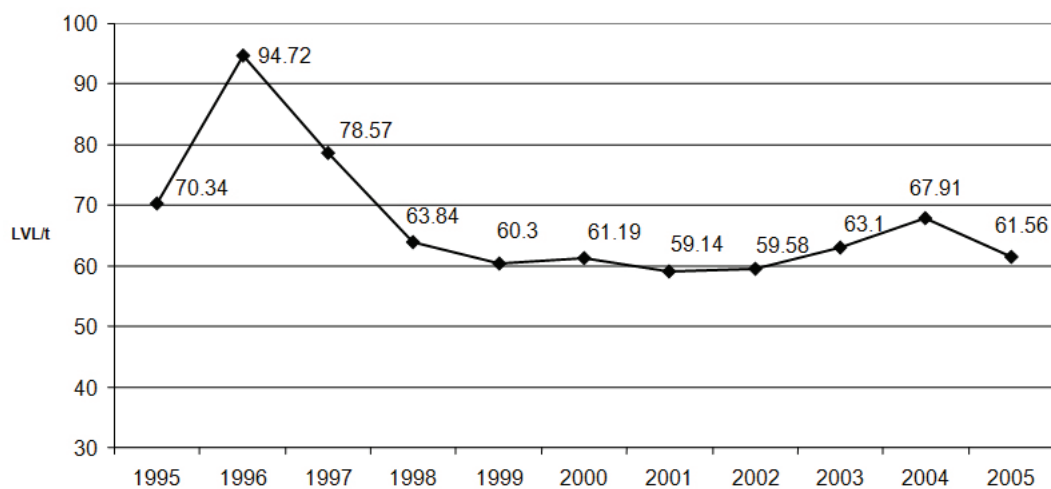


Fig. 1. Purchase prices of food-grade wheat according to the CSB data

The research **aim** is to identify the most significant factors affecting the price of wheat bread.

The research **tasks** are as follows:

- 1) to analyse the prices of food-grade wheat in Latvia;
- 2) to analyse the prices of energy in Latvia;
- 3) to assess the gross wage of employees in the food industry;
- 4) to identify the factors affecting the price of wheat bread.

The monographic method, the abstract and logical methods, the graphical method, and analysis and synthesis were employed in the present paper. Correlation analysis was used to process data and determine the significance level among the factors that affected the price of wheat bread.

## Research results and discussion

### Food-grade wheat prices and their effect on the price of wheat bread in Latvia

The grain market was first investigated to identify the most significant factors affecting the price of bread. The most significant factors affecting grain prices in the world are weather conditions (affecting crop yields), currency exchange rate fluctuations, speculations on the markets

of agricultural goods, and political decisions. One of the political decisions affecting grain prices also in Latvia was the decision of Russia's president in 2010 to ban the export of grain to secure the domestic consumption of grain due to the grain yield decline in Russia by a third in that year. Similar situation emerged also in 2012 related with a drought in Russia, which affected grain yields; thus, one can forecast that the grain prices will increase in Latvia in the near future. The summer of 2012 was rainy in Latvia, which affected the quality of food-grade wheat. Irrespective of the high yield this year, grain contains too much moisture, which has to be removed; it requires large resources and, thus, one can forecast that the food-grade wheat would not meet the quality standard and a part of it would be sold as forage grain. An increase in the price of food-grade wheat in July 2012 already indicated it (Table 1). The analysis of food-grade wheat prices over the previous years shows that in Europe, the price of food-grade wheat rose to EUR 215 (LVL 151) a tonne in October 2010 (Table 1). Since the reserves of grain were not sufficient in Europe, the price of food-grade wheat continued to increase in the beginning of 2011, reaching EUR 265 (LVL 186) a tonne.

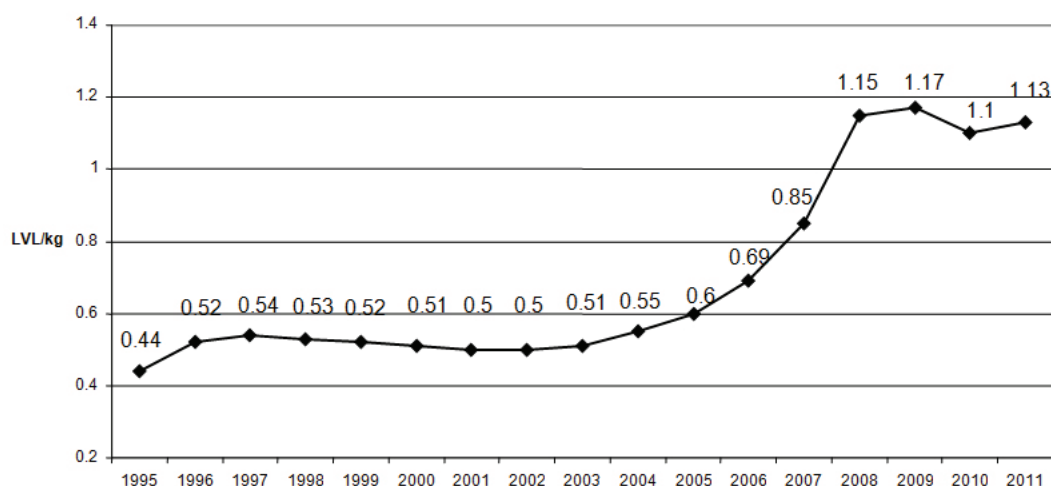


Fig. 2. Retail price of wheat bread, according to the CSB data

Table 2

Average natural gas tariff for enterprises, VAT excluded, LVL /thou. nm<sup>3</sup>

|                | 01.01. 2005 | 01.01. 2006 | 01.01. 2007 | 01.04. 2008 | 01.10. 2008 | 01.01. 2009 | 01.07. 2009 | 01.01. 2010 | 01.07. 2010 | 01.01. 2011 | 01.07. 2011 | 01.01. 2012 | 01.07. 2012 |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Average tariff | 117         | 123         | 121         | 205         | 286         | 261         | 181         | 166         | 246         | 211         | 232         | 267         | 287         |

Source: authors' construction based on the JSC Latvijas Gaze data

In the autumn 2007, a sharp increase in the price of food-grade wheat was associated with the high purchase price of this grain in the world, as the consumption of grain was high in the world but the output of grain was insufficient (the factor of weather conditions). Regardless of the high yield of grain in Latvia in 2007 and owing to the fact that grain purchase prices are set in accordance with the market conditions in Europe, the food-grade wheat prices did not fall. Based on the trends and seasonality of the previous years, one can forecast that the food-grade wheat prices and the price of wheat bread might reach the highest levels in 2013.

According to the Central Statistical Bureau data, the prices of wheat fluctuated on average from 60 to 70 LVL/t in the period of 1995-2005, which indicates that grain prices were affected only by the weather conditions before Latvia's accession to the European Union (Figure 1).

Following Latvia's entry into the European market, other significant factors have emerged that affect grain prices in Latvia. The demand for wheat increased in the entire world, including the increase in demand in the Asian market. So, the Latvian market has become dependent on the world's markets that are difficult to forecast and affect. Since Latvia has become dependent on decisions of other countries, it is possible to affect Latvia's economic and financial situation, which was observed already in 2010 and 2011 when Europe and the International Monetary Fund determined their terms for Latvia's economic growth.

A time delay is observed if the increase in the price of wheat bread is compared with the trend in prices of

food-grade wheat (Figure 1 and Table 1). Already in 2007, there was a sharp increase in the prices of food-grade wheat, which significantly affected the price of wheat bread reaching 1.13 LVL/kg on average in 2011. The price of some sorts of wheat bread reached even 1.50 LVL/kg which was the highest price compared with the previous years in Latvia.

One can calculate an average price of wheat flour based on the increase of grain purchase price by 20% on average raised by grain processing enterprises. This increase of price might reach 25% and more considering the dependence of grain processing enterprises on energy prices. If grain prices fell by 30%, a decrease in the price of flour is only 10%, which indicates increases in other costs. Therefore, the next research object is energy prices in Latvia.

#### Energy (natural gas, electricity and fuel) prices and their forecast in Latvia

The price on natural gas was again raised on 1 July 2012. Businesses are affected by the increase of price on natural gas caused by an increase in the excise tax rate and an increase in the market price made by the company Gazprom. The prices of 2008 and 2009 were equal to the price of 2012 (Table 2) which was 286 LVL/thou. nm<sup>3</sup> on average (VAT excluded), while the average price has been 287 LVL/thou. nm<sup>3</sup> (VAT excluded) from 1 July 2012.

Natural gas prices might be very volatile, depending on the prices and resources of oil in the world, since the market prices of natural gas are set based on the price of oil on the market.

Table 3

**Electricity tariffs, VAT excluded, for individuals and businessmen, LVL/kWh (for 0.4 kV power lines)**

| Category of customers       | 01.01.2004 | 01.03.2006 | 01.01.2007 | 01.04.2008 | 01.04.2011 |
|-----------------------------|------------|------------|------------|------------|------------|
| Households                  | 0.03814    | 0.04068    | 0.04857    | 0.6762**   | 0.0880*    |
| Enterprises, average tariff | 0.04237    | 0.04417    | 0.05140    | 0.06857    | 0.08505    |

\* base tariff, as of 1 April 2011, households are charged differentiated tariffs

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Source: authors' construction based on the LATENERGO data

Table 4

**Average retail prices of petrol and diesel fuel in Latvia in 2005-2012 (February)**

|              | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2012/<br>2005, % |
|--------------|------|------|------|------|------|------|------|------|------------------|
| Petrol (95E) | 0.49 | 0.62 | 0.65 | 0.69 | 0.61 | 0.74 | 0.84 | 0.95 | 94               |
| Diesel fuel  | 0.47 | 0.63 | 0.63 | 0.70 | 0.65 | 0.71 | 0.85 | 0.95 | 102              |

Source: authors' construction based on the AA Ireland data

Table 5

**Average gross monthly wage of employees in food production by quarter, LVL**

| Year | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 | On average a year |
|------|-----------|-----------|-----------|-----------|-------------------|
| 2005 | 172       | 185       | 194       | 205       | 189               |
| 2006 | 212       | 227       | 247       | 257       | 236               |
| 2007 | 271       | 301       | 315       | 327       | 304               |
| 2008 | 349       | 370       | 387       | 372       | 370               |
| 2009 | 362       | 362       | 362       | 337       | 356               |
| 2010 | 336       | 349       | 357       | 354       | 349               |
| 2011 | 350       | 362       | 367       | 370       | 362               |
| 2012 | 360       | 373       | -         | -         | -                 |

Source: authors' calculation based on the CSB data

The greatest changes in natural gas tariffs occurred in 2008 when a new methodology for calculating natural gas tariffs based on oil market prices was introduced on 1 October. It caused a hike in natural gas tariffs in the period from the end of 2007 to October 2008 (a speculative market trick that was made after introducing a new project), which was also observed for the prices of wheat grain and wheat bread.

Electricity tariffs have also increased in the course of time (Table 3). The electricity tariffs were also raised during the same period of 2007-2008. It has to be noted that the tariff rose 70% on average in 2008 compared with 2004. The electricity tariffs were raised on 1 April 2011, while natural gas prices were increased on 1 July 2011. In 2012, the electricity tariffs remained at the level of 2011; though, it is possible that these tariffs would increase in the future due to the increase of natural gas prices.

Table 3 shows the average tariff for enterprises, a price reduction of 30% or even more is possible for various connections, power lines, and zones as well as day and night hours.

Fuel prices and their changes in Latvia during the period from 2005 to February 2012 were analysed further in the present paper. According to the data of Table 4, the prices of petrol and diesel fuel have annually risen since 2005, except for February 2009 when the fuel prices fell, almost reaching the price level of 2005. In 2009, the decrease in fuel prices may be explained by the global economic crisis, which influenced the USA as one of the leading market participants on the oil market.

In March 2012, the price of petrol exceeded a level of LVL 1 per litre in Latvia, the price of petrol fell below LVL 1 during the summer months, while in August, it rose again and reached the level of LVL 1 per litre. Latvia's bread producers have to consider the ways of decreasing transportation costs due to the fluctuations of fuel prices. Thereby, bread producers search for companies of transportation services dealing with logistics services. However, there are risks that bread might not be delivered to grocery stores in time, which may affect the consumption of bread. Bread producers can also search for other solutions, for example, purchasing fuel in another country (like Estonia) where fuel is cheaper.

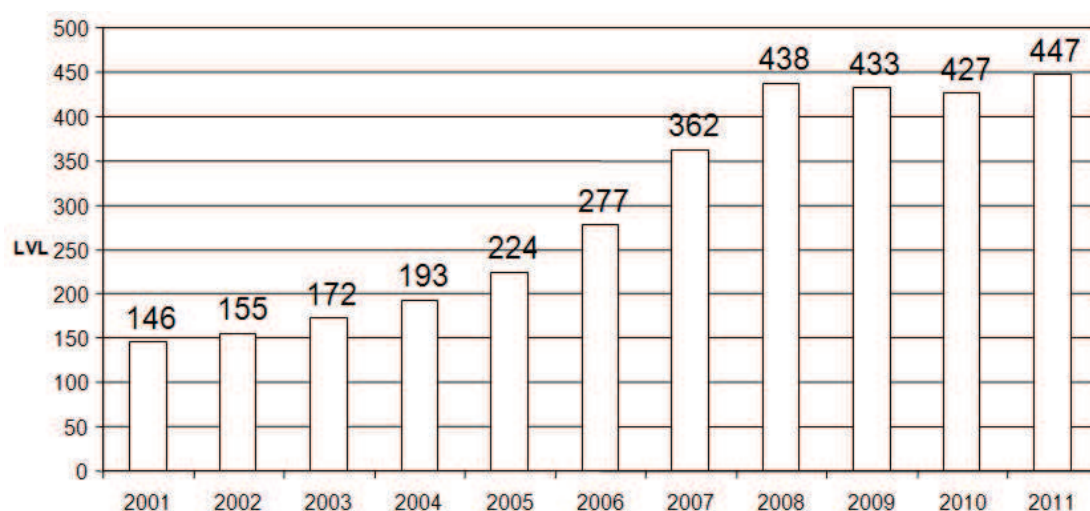


Fig. 3. Average gross monthly wage of employees in the private sector, LVL (CSB data)

Table 6

#### Identification of the factors affecting the price of wheat bread by means of correlation analysis

|  |                     | Retail price of bread, LVL/kg |
|--|---------------------|-------------------------------|
| Prices of food-grade wheat, LVL/t                | Pearson Correlation | 0.705                         |
|  | Sig. (2-tailed)     | 0.051                         |
| Petrol prices, LVL/l                             | Pearson Correlation | 0.731                         |
|  | Sig. (2-tailed)     | 0.039                         |
| Diesel fuel prices, LVL/l                        | Pearson Correlation | 0.753                         |
|  | Sig. (2-tailed)     | 0.031                         |
| Natural gas prices, LVL/thou. nm <sup>3</sup>    | Pearson Correlation | <b>0.937</b>                  |
|  | Sig. (2-tailed)     | 0.001                         |
| Electricity prices for businessmen, LVL/1000 kWh | Pearson Correlation | <b>0.917</b>                  |
|  | Sig. (2-tailed)     | 0.001                         |
| Gross wage in food production, LVL/month         | Pearson Correlation | <b>0.975</b>                  |
|  | Sig. (2-tailed)     | 0.000                         |

Source: authors' calculation

#### Wages of employees in food production enterprises in Latvia

According to the information of Latvian Bakers Association on bread price formation (cost items), wages of employees is one of the most significant cost items, since baking bread and producing confectionery goods require a lot of manual work. Though, the largest bakeries start increasingly exploit equipment in their bread production process. Table 5 shows the average gross monthly wage in food production where the average gross wage tends to increase. If the average gross wage in food production is compared with that in the private sector, one can see that employees working in food production earn less than those employed in the entire private sector (Figure 3).

The interviews with bread producers outlined that the turnover of employees was not large at bakeries, since a baker as a profession is stable and requires specific knowledge preventing employees from quitting their job.

In addition, a wage of long-term employees is higher than the average wage.

The analysis of changes in wages by year showed that the sharpest increase in wages was observed in 2007 and 2008; the same situation was observed with increases in the prices of grain and energy during this period.

#### Factors affecting the price of wheat bread

The correlation analysis was applied to identify the most significant factors affecting the price of wheat bread. The data shown in Table 6 indicate that the strongest correlations exist between the price of bread and the wage of employees, the price of natural gas, and the price of electricity. The prices of petrol and diesel fuel and the price of food-grade wheat affect the price of wheat bread only partially. Bread producers have stated many times that grain prices have a secondary effect on the price of bread. Bakers use flour in bread

production purchased from grain processors, the flour prices of which are affected by not only grain prices but also energy prices.

According to the result presented in Table 6, one can assert that the wage of employees affects the price of wheat bread in the most direct way in Latvia, since baking bread requires a lot of manual work. The second most significant factor affecting the price of wheat bread is the prices of electricity and natural gas, because ovens run on either natural gas or electricity are exploited in baking bread, and the consumption of energy depends on the output of bread. Regardless of the fact that the key raw material in baking wheat bread is the flour of food-grade wheat, the price of food-grade wheat has no direct effect on the price of wheat bread. Bread producers also state that raw materials account for only 10% of the price of wheat bread.

### Conclusions, proposals, recommendations

1. The prices of food-grade wheat has increased 3 times in the period of 2005-2012, while the retail price of wheat bread has grown 2 times, thus,, evidencing significant price hikes during a relatively short period. The price of natural gas has also increased 2.5 times during the same period as well as the prices of electricity and fuel have increased 2 times.
2. The gross wage of employees working in the food industry has increased 2 times in the period 2005-2012.
3. The second most significant factor affecting the price of wheat bread is the prices of electricity and natural gas, as these energy resources are used in bread production.
4. Regardless of the fact that the main raw material in the production of wheat bread is the flour of food-grade wheat, the price of food-grade wheat has no direct effect on the price of wheat bread; it plays only a secondary role. The price of wheat bread changes only in relation with a significant and long-

lasting increase or decrease in the price of food-grade wheat.

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