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ANALYSIS OF PRICE TRANSMISSION ALONG THE AGRI-FOOD CHAINS IN ROMANIA

ABSTRACT

The paper investigates price transmission along the agri-food chains, using the monthly series of agricultural, processor and consumer price indices in the period January 2006 – August 2010 for this purpose. The analysis is made at sectoral level and it is particularized for a few important chains, such as the wheat and bakery products chain and the chain of meat and meat products.

The main characteristic of price transmission by chains, as revealed by the data series analysis, is the apparent stability of consumer and processor prices and the strong volatility of agricultural prices. Hence, the agricultural prices and the consumer prices follow different evolutions: consumer prices have a much lower volatility and generally a constant growth trend, while the agricultural prices have strong fluctuations, both on the medium term and on seasonal term. This remark is true both for the crop products and for the animal products. The consumer prices and the processor prices attenuate and level off the excessive variations of agricultural prices.

Another conclusion of the paper is that the transmission of agricultural price variation in the period of agricultural crisis, which in Romania was manifested in the period March 2007 – May 2008, had an asymmetric character, i.e. the increase of agricultural prices was almost simultaneously accompanied by the increase of processor and consumer prices (attenuated transmission amplitude). On the contrary, in the period of agricultural price decrease, which followed after the month of May 2008, the processor and consumer prices continued to increase slowly, or stagnated in the best case, while the prices of crop products (mainly cereals) experienced significant decrease.

Key words: price volatility, agri-food chains.

JEL Classification: Q 13.

1. INTRODUCTION

Agricultural price volatility is not a new phenomenon, yet it experienced unprecedented growth in the second half of the year 2007 and early 2008, under the background of increased disequilibria between demand and supply also amplified by the ongoing economic-financial crisis.

Price volatility generates instability on agricultural markets and puts under question the population's food security, which is the most important objective of the Common Agricultural Policy. The recent incidents generated by the climate excesses in the years 2007/2008 and even in 2010 increased instability and brought about incertitude with regard to the European Union's capacity to ensure food security for the population from the European countries and its capacity to contribute to global food security.

Agriculture in the European Union operates in an extremely competitive environment, if we take into consideration the fact that the agricultural markets from the new emerging countries and not only, the world economy being increasingly integrated, and the world trade increasingly liberalized. Although the agricultural markets seem to have favourable perspectives on medium term, on long term they will experienced increased uncertainty mainly generated by price volatility.

At the same time, within the future Common Agricultural Policy, it is essential to have a sector of dynamic and competitive farms, attractive for young farmers, mainly in the New Member States, where agriculture continues to be the driving engine of rural economy. Furthermore, agriculture is important in the rural areas, as it generates adjacent economic activities, being closely linked to agro-processing and trade. Agriculture lies at the basis of the rural communities' identity in many zones from Europe.

The first objective of the current CAP reform is to ensure a stable food production, by providing safe incomes for farms and by limiting their variability, starting from the recognition of the fact that price volatility and natural risks are much higher in this sector compared to other economic sectors, while profitability in agriculture is lower than in the other economic sectors. The share of agriculture in the value added by chains, in the European Union, was down from 29% in the year 2000 to 24% in 2005; in the same period, the share of food industry and of wholesale and retail distributors increased. At the same time, it is important to equilibrate the negotiation power along the chain, the contractual relations, farm restructuring and consolidation, transparency and operation of agricultural markets.

The improvement of the agricultural sector competitiveness and the increase of its share in the value added along the chain is also another important issue. It must be taken into consideration that the agricultural sector has a lower negotiation power compared to the processing sector, as the farms have a higher dispersion in the territory and the farmers' concentration level is lower than in the economic sectors. At the same time, the European farms have to face the world market competition under the conditions in which they are obliged to respect the very high standards referring to food safety, quality, environment and animal welfare.

In the present study we attempt to evaluate the agricultural price volatility level on the Romanian agricultural markets, as well as the modality of price volatility transmission along different commodity chains. This approach tries to respond to the question to what extent the volatility and instability of agricultural markets affect final consumers and their incomes.

2. THEORETICAL FRAMEWORK

2.1. PRICE TRANSMISSION ALONG THE CHAINS

The evaluation of the modality of price transmission along the agri-food chains, how much and how fast the price changes are transmitted from the farm level to the store shelf and to final consumers is an information that is most often

used to measure the efficacy, efficiency and competition level on the existing markets along these chains. Price adjustment along the chains finally reflects the chain nature, structure and organization and it can finally identify the eventual market failures. A study that introduces the main concepts and definitions related to the price transmission analysis and highlights the main factors that influence the intensity, gaps and the eventual asymmetric transmission of price adjustment along the chains is the following: "Analysis of price transmission along the food supply chain in Europe", dating from October 2009.[1] According to this report, price formation along the chains depends on several factors, among which we mention the following: *product specificity* (perishability, seasonality, storage/preservation conditions), *market structure* (e.g. intensity of competition at each level in the chain, number of intermediaries on each chain) and *applied public policies*. The evaluation of price transmission along the chains presupposes the knowledge of the following issues:

– price adjustment intensity, or in other words how much of the price variation at a certain level is transmitted to the next level in the chain;

– adjustment rate, i.e. how much time is needed for the price variation at a certain level to be transmitted to the next levels (the transmission is made immediately or in several months?);

– price adjustment asymmetry, i.e. to what extent price increase or diminution is transmitted on a differentiated basis along the chain, with regard to the intensity and rate (for example whether an increase in prices is transmitted much faster than the diminution of prices).

The evaluation of these issues presupposes available information on the prices at different stages of the chains, which is not easy, as while the agricultural and consumer prices are available in most Member States, there are great difficulties in collecting prices in the processing stage and for the wholesale trade. This problem also applies to Romania, where price transparency along the food chains represents a problem that is far from being solved up.

The perfect transmission of prices presupposes the fact that the variation that takes place at a certain level of the chain is fully and simultaneously transmitted to the next levels. However, in reality, although the price changes at farm level are transmitted to the next stages, the variation amplitude is different at the level of processor or of retail trader and this in the first place because the agricultural raw material represents only a part of a final food product cost. Hence, the price transmission amplitude ***depends on the cost structure*** of products in the different stages of the chains. At present, in the EU countries, the agri-food chains experience a continuous sophistication process, under the pressure of main economic and social trends (mainly the unprecedented growth of incomes but also population's ageing), of the changes in the families' lifestyle, urbanization, women's attraction into off-farm

[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions, A better functioning food supply chain in Europe

activities and last but not least concerns for a healthy diet. Thus, at EU level, the average share of agricultural raw material in the final food product cost reached about 20%, significant shares (or even more significant) being held by labour, energy and marketing costs. These shares are certainly significantly different by product and by country.

The second factor influencing price transmission is the competition on the markets present in the different chain stages. The agri-food chains experience a great diversity of market structures, characterized by great differences with regard to the horizontal concentration or to the vertical integration. At the same time, there is a great diversity of involved players, from the small-sized farms or small agro-processors to the large transnational companies. The research studies suggest that the presence of non-competitive structures on the market represents the main cause of imperfect price transmission and of the existing time gaps in the transmission process. For example, markets of oligopoly or oligopsony type distort price variation transmission along the chains. However, other recent studies reveal that the imperfect transmission of price variations is not only a result of the non-competitive markets. Another aspect that should be taken into consideration is the asymmetry of negotiation power between the involved players in the agri-food chains. Thus, a large economic operator, with a significant market share, implicitly has a greater negotiation power and the power to speed up or to slow down the price change transmission along the chain. In this context, the negotiation power of the great retailers significantly increased lately, mainly in their relation with the small and medium-sized enterprises from the processing sector. We must mention here the extremely low negotiation power of the agricultural sector, which is fragmented, too little organized and which produces finished products that are too little differentiated compared to the operators at the other levels in the chains (large processors or retailers). The decrease of the value added share in agriculture at chain level (from 29% in 2000 to 24% in 2005) is also the result of the weak negotiation power of farmers' groups compared to the other operators from the chains. Other identified factors that might influence the modality of price change transmission along the chain are the following: the retailers' marketing policy, as these prefer to maintain prices as constant as possible (in case the agricultural price increase is only on short term) because the consumers are very sensitive to the price changes, to the perishabilty of certain products, to the number of stages in a chain, to the spatial dispersion of the chain.

2.2. PRICE VOLATILITY

As regards the relation between volatility and price transmission along the agri-food chains, certain remarks can be made derived from the empirical analysis of the agricultural, processing and final consumer price series.

In the first place, ***agricultural prices are volatile***. In the last years, agricultural prices experienced two growth cycles and then diminution. In the first cycle, which began in the year 2007 with a maximum in late 2007 and in early 2008, agricultural prices significantly varied in both directions, in a relatively short period of time. Thus, in our country, the agricultural prices were higher by 28% in December 2007 as compared to December 2006, and lower by 22% in August 2008 compared to December 2007.

In the second place, ***the consumer prices are more stable***, having a relatively constant variation rate. Thus, consumer prices were higher by 9.3% in December 2007 as against December 2006, although agricultural prices increased by 28% in the same period, as we have already seen. In essence, consumer prices have a slow growth tendency over time, while agricultural prices have very great fluctuations from one period to another.

In the third place, on the long term, ***agricultural prices had a decreasing trend***, due to the increase in the productivity of production factors in agriculture, which led to the agricultural production increase. This aspect, corroborated with the inelasticity of the demand for agricultural and food products, led to the diminution of agricultural prices on long term, both in nominal and in real terms. In order to compensate the farmers for the income loss generated by lower prices, the direct payments were introduced (initially named compensatory payments).

In conclusion, the main characteristic of price transmission along the chains is the ***apparent stability of consumer and processor prices and the strong volatility of agricultural prices***. As a result, the agricultural prices and the consumer prices follow divergent trends: consumer prices follow a constant growth trend, while agricultural prices feature great fluctuations, both on the medium and long term. The consumer prices and the processor prices have the role to attenuate, to level off the excessive variations of agricultural prices.

2.3. PRICE TRANSMISSION ALONG THE CHAINS IN THE EUROPEAN UNION

Price variation transmission on the different stages of chains has significant intensity and time gaps. At the EU level, several phases can be distinguished:

– Crisis of agricultural prices (May 2007 – February 2008). Agricultural prices sharply increased by 16% in 10 months, while the processing and consumer prices by only 9% and 5% respectively, in the same period.

– Price transmission to processors was made with delay, in the period March 2008 – August 2008. In this period, agricultural prices began to decrease (–5%, in 6-month time), while the processing and consumer prices continued to increase in the same period, yet at a lower rate, of only 2%.

– Price transmission to consumers (in the period September 2008 – February 2009), when the agricultural prices continued their strong decline (–11%). At the same time, processor prices declined by –3%, yet consumer prices continued to rise and their stabilization took place only in March 2009.

– The stabilization took place in the period February 2009 – July 2009, when the processor and consumer prices began to decrease (see Table 1).

Table 1

Price variation along the agri-food commodity chains, in EU-27, in the period May 2007 – July 2009

Phase	Beginning date	End date	Price evolution			
			Agricultural prices	Processor prices	Consumer prices	Consumer price index
Food crisis	May 2007	February 2008	16%	9%	5%	2%
Processor gap	February 2008	August 2008	–5%	2%	2%	2%
Consumer gap	August 2008	February 2009	–11%	–3%	2%	0%
Stabilization	February 2009	July 2009	n.a.	0%	–1%	1%

Source: Analysis of price transmission along the food supply chain in the EU, EC, 2009.

In conclusion, the analysis of prices along the chains, since 2007, makes it possible to reveal certain trends in the price transmission mechanism. Firstly, the magnitude of variations is much higher at the base of the chain (agricultural prices) and much attenuated at the intermediary levels and in the final stage (at consumer). Secondly, there is a significant delay in price transmission from agriculture to processing (about 6 months) and also a 6-month delay from the processing stage to consumer. Thirdly, consumer prices are characterized by certain rigidity, in the sense that they remain constant or they experience only a slight decline, although the prices on the intermediary and final stages in the chain significantly drop.

3. METHODOLOGY

This paper contains an analysis of the evolution of aggregated prices along the agri-food chains from Romania, namely the agricultural prices, food processing prices and consumer prices. The monthly series of price indices were analyzed, from the period January 2006 – November 2010. For the evaluation of price volatility, the variation coefficient was calculated for different periods from the agricultural, processor and consumer price series. The variation coefficient measures the dispersion level of a statistical series and is calculated as ratio of standard deviation to the statistical mean. The higher the value of this coefficient, the series is more dispersed and price volatility is higher.

At the same time, the mechanism of price transmission from farmer to final consumer is investigated, per total agri-food sector and along the chains of several important food products, in order to identify the intensity, the asymmetry and delay of price transmission from the primary levels to the final consumer.

4. DISCUSSION OF RESULTS

4.1. ANALYSIS OF PRICE TRANSMISSION ALONG THE AGRI-FOOD CHAINS

For the evaluation of price transmission along the agri-food chains in Romania we used monthly series of agricultural, processing and consumer price indices in the period January 2006 – November 2010.

As a general observation, the transmission of agricultural price variation caused by the agricultural price crisis, which in Romania was manifested in the period March 2007 – May 2008, had an asymmetric character, in the sense that the process of agricultural price increase was almost simultaneously accompanied by the increase of processor and consumer prices (transmission with attenuated amplitude). In the period when agricultural prices decreased, which followed after May 2008, the processor and consumer prices continued to slowly increase or stagnated in the best case.

As we can see from Table 2, in the period of the 2007/2008 crisis, agricultural prices increased by 25.1% on the average, and this increase was relatively fast transmitted to the processing sector, where the output prices increased by 24.6% on the average, i.e. by a percentage quite close to that of agricultural price increase.

We mention that the European average of processing price growth in the period of the 2007/2008 crisis was only 9%. Logically, the processing price growth should be lower than the agricultural price growth as the agricultural product represents only one of the cost items in a processed food product. In EU-27, the agricultural raw material averagely accounts for 20% of the processed product cost. In Romania, the cost structure of processed food products is not transparent. Some disparate information would indicate very high shares of agricultural raw material (e.g. 65–70% in the case of bread), but we do not know how much of this information is true or whether it is disseminated in order to justify the excessive increase of prices following processing. It is also true that other cost elements also increased in the above-mentioned period, such as labour, fuel, energy, etc.

But in any case, the increase in transparency with regard to value added creation along certain chains would indicate whether these problems originate in the imperfect operation of markets along the chains (eventually concentrations in the processing sector for certain products), in the general economic background, in other input prices (energy, labour) etc.

Anyhow, as we can see in the table above, price growth transmission to final consumers is much attenuated (13.6% in the period of the 2007–2008 crisis), as in the end, the final consumer's purchasing power constrains the continuous intention (which is explainable) to increase prices from the part of operators in the agro-processing and primary sectors. Although foodstuffs are basic products, and the food demand is relatively inelastic, the consumer, in the situation of income

diminution, looks for cheaper products or increases self-consumption (mainly in rural areas). In this way, food demand of more expensive products decreases, mainly in the case of products that are source of animal protein (milk and dairy products, meat and meat products), and also in the case of fruit. The studies on the food behaviour of households in our country reveal that the demand for these products is very sensitive to income variations[2].

Table 2
Price variation transmission along the agri-food chains in Romania

Phase	Beginning date	End date	Price evolution (%)			
			Agricultural prices	Processing prices	Consumer prices	General consumer price index (CPI)
Period prior to crisis	January 2006	March 2007	5.8%	7.3%	0.7%	4.2%
Agricultural crisis	March 2007	May 2008	25.1%	24.6%	13.6%	9.8%
Processor gap	May 2008	October 2008	–16.0%	1.8%	1.3%	2.4%
Consumer gap	October 2008	September 2009	–9.3%	1.9%	0.2%	3.8%
Second increase of agricultural prices	September 2009	November 2010	31.2%	8.9%	7.1%	8.9%

Source: own calculations on the basis of statistical data from the Price Bulletins 2006–2010, NIS.

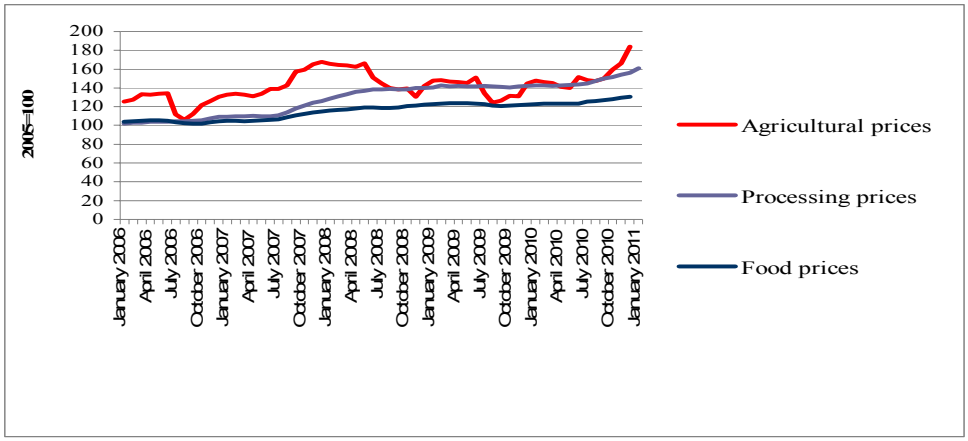
In the period following the crisis (May 2008 – October 2008), although agricultural prices were down by 16% on the average, processing prices stagnated, which reveals the asymmetric transmission phenomenon, i.e. in Romania the variations of prices at the higher stages in the chains of many products have only one direction: they grow. We can notice that at EU-27 level, agricultural price depression was also followed by a modest decrease of processing prices (see Table 1).

The same stability can be also noticed with regard to consumer prices, which after they grew following the crisis, yet a more modest increase than in the case of processing prices, were maintained at a constant level, and then slightly increased (Table 2).

Another price growth cycle along the agri-food chains was produced in the year 2010, under the background of natural disasters (Russia), as well as of the economic crisis that led to great speculations on the markets of agricultural raw materials. This agricultural price escalation was felt in Romania as well, where in the period September 2009 – November 2010, the agricultural prices increased by 31.2%, while the final consumer prices by 7.1% (Table 2).

[2] See paper: Securitatea şi echilibrul alimentar în România (Food security and equilibrium in Romania), Cecilia Alexandri, 2001.

The graph below reveals, in the first place, the high agricultural price volatility together with the relatively stable evolution (in the sense of growth) of processor and consumer prices.



Source: designed on the basis of data from the Price Bulletins from the period January 2006 – November and from Tempo-on line database, NIS.

Graph 1: Evolution of agricultural products prices, of the processed products prices and of consumer food prices in Romania, in the period 2009–2010 (2005%).

In the second place, the transmission of agricultural price increase from March 2008, to processors and then to consumers, was made with a delay of several months (about 4 months). The processing price increase was much ampler than in the case of consumer prices (almost double), and the trend was also maintained after the agricultural prices began to decrease. These phenomena are not singular, because as we could notice in the previous chapter, in all the European countries the agricultural prices are volatile and the consumer prices are much more stable. The specific situation from Romania mainly refers to price transmission asymmetry and to its particular intensity, in the sense that the processing prices grew with the same intensity as the prices of the agricultural raw material. This raises certain questions with regard to the operation of downstream markets and mainly to the competition on these markets.

The transmission of prices along the particularized chains reveals certain aspects that do not appear at the agri-food sector level, considered as an entity and analyzed as such (Table 3).

For example, price transmission on the chain of milling and baking products reveals the price variation amortization in the first place, as we go upwards along the chain. From the table below, we can notice that the beginning of the agricultural crisis in the year 2007/2008 produced an increase of agricultural prices in wheat by 87%, of the prices of milling products by 66%, of the bakery produce prices by 37% and of consumer prices in the milling and baking products by only 16%.

In the situation when agricultural prices decreased in autumn 2008, by –38%, this decrease was transmitted only in the first stage of processing (milling) by –11%. The panification and consumer prices continued to rise, yet at a modest rate, under the probable influence of the population's purchasing power increase.

Table 3
Price variation transmission along the chain of milling and baking products in Romania

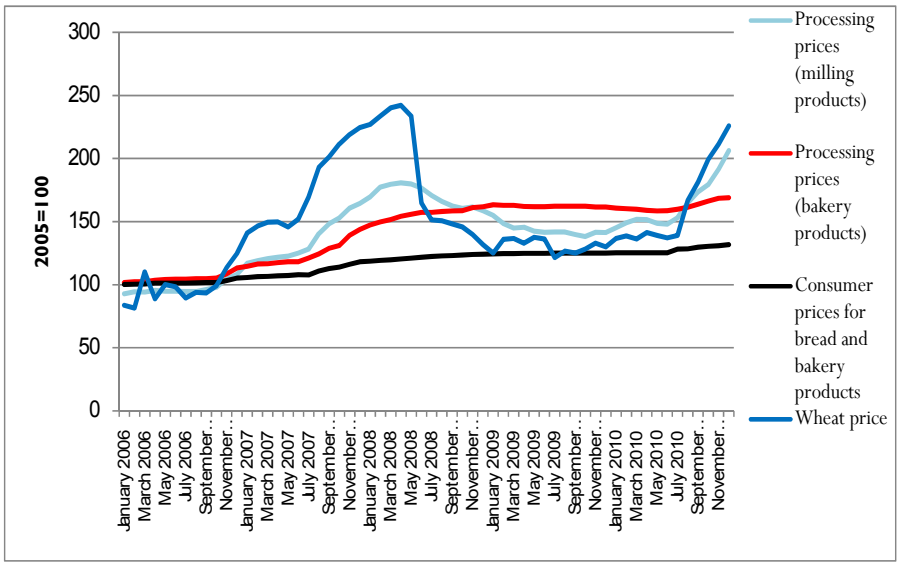
Phase	Beginning date	End date	Evolution of prices (%)			
			Wheat prices	Milling product prices	Bakery products prices	Consumer prices
Period prior to crisis	January 2006	December 2006	+50%	+16%	+11%	+5%
Agricultural crisis	December 2006	May 2008	+87%	+66%	+37%	+16%
Processor gap (milling)	May 2008	October 2008	–38%	–11%	+2%	+2%
Processor gap (milling)	October 2008	September 2009	–14%	–13%	+1%	+1%
Panification and consumer gap	September 2009	November 2010	+69%	+37%	+4%	+5%

Source: own calculations on the basis of statistical data from the Price Bulletins 2006-2010, NIS.

The agricultural price depression tendency was also maintained in the next year (2009), in the sense that agricultural prices continued to decrease (by –14%), similarly to the milling prices (by –13%); however the prices in the final segments of the chain were maintained constant or slightly increased (by +1%). In the period September 2009 – November 2010, wheat prices increased again, under the pressure of deficiencies on the regional markets (Russia). We can notice from Graph 2 that wheat price increased by 69% in the above mentioned period, and this price increase was attenuatedly transmitted along the chains, so that the price increase at final consumer was only by 5%. We mention that this bread price increase at the final consumer may be also the effect of VAT increase, yet the main cause was the pressure of wheat price increase.

We can notice from Graph 2 that price transmission along the chain seems to be symmetrical in the first stage of the chain (milling/baking), but it becomes asymmetrical in the higher processing stage and at the final consumer. There is also a 6-month gap in price variation transmission from the primary level to the milling and baking sector. The same 6-month gap also appears in price transmission to final consumer.

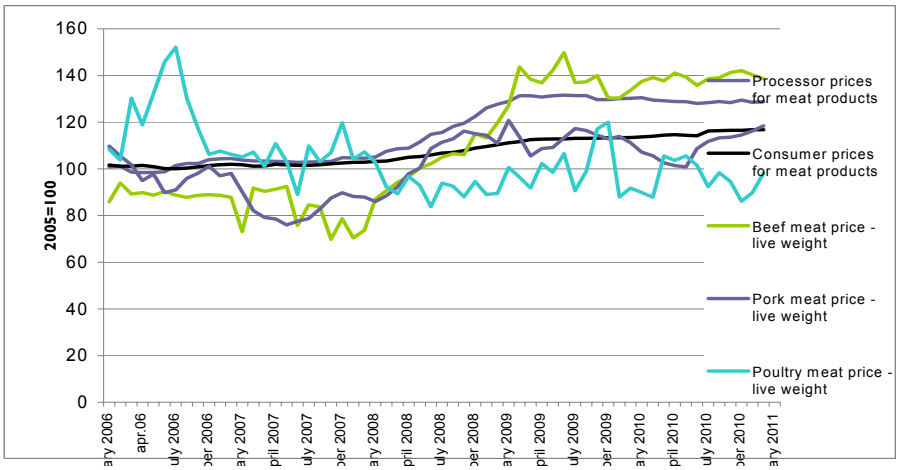
An important phenomenon is also revealed in Graph 1, i.e. after the crisis of 2007, neither the agricultural prices, nor the processing prices and the consumer prices reached the level prior to crisis (first part of 2006). This remark is true both for the prices in the overall agri-food sector and for the particular case of the milling and baking chain.



Source: designed on the basis of data from the Price Bulletins from the period January 2006 – November 2010, NIS.

Graph 2. Evolution of prices in the different stages of the milling and baking chain (2005 = 100%).

The evolution of prices along the meat and meat products chain reveals the same high volatility of agricultural prices and almost continuous increasing trends in the processing prices and more attenuated trends in the final consumer prices (Graph 3).



Source: designed on the basis of data from the Price Bulletins from the period January 2006 – November 2010, NIS.

Graph 3. Evolution of prices along the chain of meat and meat products (2005 = 100 %).

It can be also noticed that for certain meat types (pork and poultry), the live weight meat prices significantly declined in the largest part of the investigated period (under the 2005 level), yet the consumer prices of meat products and preparations had a slightly constant increasing trend.

The prices along the meat and meat products chain experienced different evolutions compared to vegetable products, e.g. cereals, due to the intensity of price variations in the first place, which are much lower in meat. In the second place, the transmission of the agricultural crisis effects was made indirectly, through the feed prices, on a much longer period of time. At the same time, part of the meat used in population's consumption and in the meat preparations in our country comes from imports (mainly in pork but also in poultry); this is the reason why the prices of regional and even world markets are important for these products.

Table 4

Transmission of price variations along the chain of meat and meat preparations

Phase	**Beginning date**	**End date**	**Evolution of prices (%)**				
			Beef	**Pork**	**Poultry meat**	**Processing of meat products**	**Consumers**
Period prior to crisis	January 2006	March 2007	+5%	–27%	–7%	2%	–0.3%
Agricultural crisis	March 2007	Mai 2008	+11%	+27%	–8%	+8%	+4%
Processor gap	Mai 2008	October 2008	+14%	+15%	+2%	+10%	+3.5%
Processor gap	October 2008	September 2009	+21%	–1%	+24%	+6%	+4%
Consumer gap	September 2009	November 2010	0%	+2%	–23%	–1%	+3%

Source: calculations on the basis of data from the Price Bulletins from the period January 2006 – November 2010, NIS.

Throughout the investigated period, i.e. January 2006/November 2010, the agricultural prices increased by: 63% in beef, 6% in pork and decreased by 17% in poultry. At the same time, processing prices increased by 27% and the consumer prices by only 15%.

A special remark should be made with regard to beef, as the significant increase of price in this product is also an effect of the price convergence phenomenon that took place after Romania joined the EU in 2007. In the period before the accession and in the first two years after, beef prices were much lower in Romania compared to the other EU countries, this being also the effect of significant differences in quality. However, in the year 2007, the price for 100 kg live weight beef was 101.54 euro in Romania and 270.31 euro in Hungary, for example, in

other EU countries prices being even higher. This is the reason why the price of this product has had a faster growth rate in recent years at agricultural sector level.

The above-mentioned trends on long term hides different evolutions in the sequences we have investigated in Table 4. Thus, we can notice the quasi-permanent increasing tendency of beef price and the variations of pork prices in both directions as well as a decreasing trend in the case of poultry meat. In any case, we can notice that market stabilization after the 2007/2008 crisis was delayed on these chains, and it is only in September 2009 that prices began to decrease in almost all the stages of the chains.

4.2. PRICE VOLATILITY ALONG THE AGRI-FOOD CHAINS

Price volatility analysis was based on the calculation of variation coefficients of the monthly series of fixed base price indices, namely agricultural prices, processor prices and consumer prices. The calculations were made for the integral series and for certain segments of these, in an attempt to capture the effects of agricultural crisis, of the periods prior to and post crisis.

The obtained results reveal that the prices along the agri-food chains in Romania feature a higher volatility in the primary stage of chains (agriculture), while in the processing and consumer stage the volatility is lower. We can notice from Table 5 that the variation coefficient for the prices of crop products is 16.5% and for the prices of animal products 14.0%, in the period January 2006/August 2010. In the same period, price volatility in the case of processed foodstuffs was 12.8%, while in the case of the consumer prices of foodstuffs it was only 7.2%. As we have mentioned in the previous chapter, the main characteristic of price transmission along the chains is the apparent stability of consumer and processor prices and the strong volatility of agricultural prices. As a result, the agricultural prices and the consumer prices have different evolutions: the consumer prices have *a much lower volatility and generally a constant growth trend, while the agricultural prices feature great fluctuations, both on the medium and seasonal term. Both the consumer prices and the processing prices have the role to attenuate, to level off the excessive variations of agricultural prices.* An explanation for this situation is that the food demand is conditional to the prices of products as well as to the consumers' incomes. Although foodstuffs are basic commodities and have a relatively inelastic demand, the budgetary restriction applies mainly to the more expensive products, i.e. consumers can opt for cheaper products in the case of the excessive price increase of these products. Most foodstuffs are perishable products, so that the operators in the retail sector have special strategies: they do not increase selling prices very much when the agricultural prices explode, and they do not decrease them either when the agricultural prices significantly decline.

Table 5
Price variability in the main stages of agri-food chains in the period January 2006 – August 2010*

Name of product	Variation coefficient Jan. 2006–Aug. 2010	Jan. 2006–Aug. 2010 average	Variation coefficients				
			Jan. 2006–Mar. 2007	*Mar. 2007–May 2008*	*May 2008 – Oct. 2008*	*Oct. 2008–Sep. 2009*	*Sep. 2009–Jul. 2010*
Crop products	16.5%	158.1%	11.2%	10.8%	16.2%	9.4%	8.9%
Animal products	14.0%	115.6%	5.8%	8.4%	5.1%	3.4%	4.5%
Total processing	12.8%	127.3%	2.4%	8.8%	0.5%	0.7%	0.7%
Total foodstuffs	7.2%	114.8%	1.2%	4.6%	0.6%	1.0%	0.8%

*) The price indices used are fixed base indices, 2005 = 100.
Source: Own calculations on the basis of data from the Price Bulletins 2006–2010, NIS.

4.2.1. Agricultural price volatility

The volatility of agricultural prices seems to be higher in the case of crop products, on the average, compared to that of animal products, if we take into consideration the investigated period, namely January 2006/August 2010. However, in certain products of animal origin, price volatility is also high, for example in beef, mutton, eggs. Price volatility is the result of several factors, among which the weather variability plays a main role. This adds to the variability of the other input prices: energy, fuels, feed, and interest rates. Furthermore, the conjuncture of regional and world markets as well as the financial speculations that take place on the markets of agricultural raw materials also have a role to play.

Among the investigated agricultural products, we can see from Table 6 that the crop products with the most volatile prices are soybean, maize, wheat, barley and two-row barley and apples. The period with the highest volatility of agricultural vegetable prices was that of the crisis from the period March 2007 – May 2008. With regard to the prices of animal products, we have already mentioned that the most volatile are mutton prices (33.6%), beef (22.6%) and eggs (23.8%), while the other animal products have relatively more stable prices (pork 12.1%, poultry meat 13.6% and cow milk 13.7%)

In the table below we present the variation coefficients of prices on the world and European market, so as to get a picture of price volatility on these markets (Table 7).

As a general rule, the prices on the European market are in general less volatile than prices on the world market, and we think that one of the reasons refers to the operation of the common Agricultural Policy, which also comprises measures for the stabilization of supply and prices on the markets of certain products, through the Common Market Organizations.

Table 6
Agricultural price variability in the period January 2006 – August 2010*(%)

Name of product	Minimum value of price index	Maximum value of price index	Variation coefficient Jan. 2006–Aug. 2010	Variation coefficients (%)				
				Ian. 2006–Mar. 2007	*Mar. 2007–May 2008*	*May 2008–Oct. 2008*	*Oct. 2008–Sep. 2009*	*Sep. 2009–Jul. 2010*
Crop products	**108.3**	**218.2**	**16.5**	**11.2**	**10.8**	**16.2**	**9.4**	**8.9**
– Wheat	81.3	242.1	28.3	20.5	17.8	18.7	5.4	4.0
– Barley	81.1	269.5	29.0	16.7	21.7	15.0	11.2	5.2
– Maize	94.4	310.8	32.2	19.4	18.4	13.7	7.4	7.8
– Soybean		260.2	50.1	58.4	57.5	14.2	20.2	5.1
– Potatoes	61.9	191.9	18.0	27.7	14.4	3.9	8.5	4.7
– Apples		191.6	32.2	39.7	41.8	10.5	4.5	4.9
Animal products	**89.2**	**142.0**	**14.0**	**5.8**	**8.4**	**5.1**	**3.4**	**4.5**
– Beef	69.8	149.8	22.6	5.0	11.0	4.4	8.8	2.8
– Pork	76.0	120.7	12.1	8.2	8.2	4.7	3.7	4.8
– Mutton	41.1	176.5	33.6	27.3	18.2	6.9	26.9	12.3
– Poultry meat	83.8	152.0	13.6	13.3	8.2	4.2	8.3	11.5
– Eggs	66.0	186.0	23.8	24.1	20.2	13.7	11.4	18.9
– Cow milk	98.3	165.6	15.7	6.3	9.4	3.7	4.7	3.6

*) The price indices used are fixed base indices, 2005 = 100.
Source: Own calculations on the basis of data from the Price Bulletins 2006 – 2010, NIS.

Table 7
Variation coefficients in certain agri-food products on the world and European market

Variation coefficient	World market			European market		
Product	08/97 – 05/10	08/97 – 12/03	01/04 – 05/10	08/97 – 05/10	08/97 – 12/03	01/04 – 05/10
Barley	34.6%	16.0%	31.9%	21.3%	6.3%	27.0%
Wheat	38.7%	14.8%	32.6%	21.9%	6.2%	28.2%
Maize	33.9%	10.8%	30.5%	18.7%	6.4%	23.8%
Butter	44.75%	17.7%	34.9%	10.7%	3.6%	12.3%
Skimmed milk powder	40.43%	18.3%	34.1%	14.9%	8.6%	19.0%
Poultry meat	13.53%	5.9%	8.2%	10.6%	6.4%	9.2%
Beef	20.42%	10.2%	12.4%	6.8%	4.2%	5.4%

Source: Commodity price volatility: International and EU perspective, European Commission, DG for Agriculture and Rural Development, June 24, 2010, p. 2.

Another noticeable fact is that on longer periods of time, agricultural price volatility in Romania is higher than the EU-27 average, in similar products. Of course, the time periods for which we have information are not identical, but both are long enough for the above-mentioned observation to be true.

4.2.2. Volatility of processing prices

The volatility of processing prices is attenuated compared to that of agricultural prices, as we have already mentioned before.

At the same time, we can notice that the most volatile are the prices of products that are mainly obtained from the processing of raw vegetable products: oils and fats (24.2%), milling products (19.2%) and bakery products (16.9%). The lowest volatility is noticed in the prices of products resulted from the conservation of fruits and vegetables (4.9%), maybe as a result of the price support policy in vegetables, potatoes and fruits delivered to processing that was in place since 2002/ 2003 up to late 2009.

Among the sequences investigated in Table 8, the period in which the highest price instability was noticed was from March 2007 until May 2008, mainly for the products based on vegetable raw materials: oils, milling products, bakery products. For the products of animal origin, the price variation coefficients experienced a modest growth, even in the agricultural crisis period. Thus, while the processing prices of milling products increased by 15% in the mentioned period, those from meat production and conservation increased by only 6.5%, while those for meat preparations by 2.5%.

Table 8
Processing price variability, in the period January 2006 – August 2010*(%)

Name of product	**Min. value of price index**	**Max. value of price index**	**Variation coefficient. Jan. 2006-Aug. 2010**	**Variation coefficients**				
				Jan. 2006–Mar. 2007	***Mar. 2007–May 2008***	***May 2008 – Oct. 2008***	***Oct. 2008–Sep. 2009***	***Sep. 2009–Jul. 2010***
Processing total	**102.0**	**147.2**	**12.8**	**2.4**	**8.8**	**0.5**	**0.7**	**0.7**
Meat production and conservation (poultry excluded)	**81.8**	**118.6**	**11.1**	**5.8**	**6.5**	**4.3**	**1.9**	**6.2**
Poultry meat production and conservation	87.9	129.0	10.3	5.5	3.3	1.9	3.8	2.0
Meat preparations	98.4	131.6	11.0	2.1	2.5	3.0	2.2	0.6
Processing and conservation of fruits and vegetables	103.0	127.4	4.9	5.2	6.6	0.5	2.4	1.6
Processing of oils and fats	87.1	188.2	24.2	2.7	27.2	7.1	5.0	6.4
Margarine processing	99.7	142.3	12.7	2.2	7.8	3.7	2.0	1.9
Processing of dairy products and cheese	105.3	148.3	11.7	2.4	7.2	1.1	2.3	2.6
Milling products	92.8	180.7	19.2	9.6	15.0	4.2	5.5	3.5
Bread and pastry	101.5	163.3	16.9	4.8	10.7	0.6	0.7	0.9

*) The price indices used are fixed base indices, 2005 = 100.
Source: Own calculations on the basis of data from the Price Bulletins 2006 – 2010, NIS.

4.2.3. Volatility of consumer prices

As we have also mentioned before, consumer prices are much more stable: they increase with a much lower intensity when agricultural prices explode, yet they continue to slowly increase when agricultural prices decrease.

The first observation that can be made is that the products with the highest price volatility are mainly those that are based on vegetable agricultural products, namely: oils (16.9%), milling and baking products (8.4%) to which we add the products from the group milk, dairy, eggs (9.6%), vegetables (8.9%) and fruits (8.2%).

Another observation is that the prices of these products had a quasi-permanent increasing trend in most products throughout the investigated period (January 2006/ August 2010), with a few exceptions among which the most important is the group of vegetables and potatoes, in which prices decreased sometimes by 5–6%, not more.

Table 9

Consumer price variability in the period January 2006 – August 2010*(%)

Name of product	Minimum value of price index	Maximum value of price index	Variation coefficient Jan. 2006– Aug. 2010	Variation coefficients				
				Jan. 2006– Mar. 2007	*Mar. 2007– May 2008*	*May 2008– Oct. 2008*	*Oct. 2008– Sep. 2009*	*Sep. 2009– Jul. 2010*
Total foodstuffs	**101.8**	**125.8**	**7.2**	**1.2**	**4.6**	**0.6**	**1.0**	**0.8**
Milling and baking products	**100.1**	**128.3**	**8.4**	**2.2**	**4.8**	**0.8**	**0.4**	**0.1**
Meat, preparations and canned meat	100.0	116.4	5.2	0.6	1.2	1.2	1.3	0.5
Fish and canned fish	101.9	114.7	3.7	0.9	0.9	0.6	1.0	0.3
Milk, cheese, eggs	99.7	135.2	9.6	4.2	5.4	2.5	1.5	1.6
Oils and fats	98.5	158.6	16.9	0.6	16.6	0.9	7.2	0.6
Fruit	99.6	136.5	8.2	3.0	7.0	4.9	3.1	1.9
Vegetables, potatoes included	93.2	133.7	8.9	11.0	7.9	4.0	4.1	4.1
Sugar, confectionery	102.5	132.3	4.8	4.4	0.9	0.5	2.0	0.1
Other food commodities	102.1	118.7	4.3	1.1	1.2	0.7	1.0	0.4

*) The price indices used are fixed base indices, 2005 = 100.

Source: Own calculations on the basis of data from the Price Bulletins 2006–2010, NIS.

The stability of consumer prices, at least for the basic foodstuffs, represents an important element in the marketing strategy of the great retailers, as they know

very well that consumers are sensitive to the too frequent price increases. This is the reason why they do not decrease prices (or they decrease them less) when the agricultural prices collapse, keeping profit margins that they use when agricultural prices practically explode, thus maintaining a relative price stability at consumers level.

In any case, the agricultural markets, mainly those of crop products, due to the inelastic demand, amplify the deficit transmission in the prices of these products. This phenomenon has been known for a longer time (the so-called King effect), but the intensity of climate variations in recent years made the stability of agricultural supply and prices be more vulnerable both worldwide and at European level. That is why it is imperiously necessary, within the ongoing Common Agricultural Policy reform, to take into consideration certain risk insurance mechanisms in the case of risks generated by climate changes, for market stabilization and food security for the population both from the point of view of supply availability and of the access to food conditioned by prices and consumers' purchasing power.

5. CONCLUSIONS

1. The evaluation of the price transmission modality along the agri-food chains, of how much and how fast price changes are transmitted from farm level to the store shelves and final consumers is an information that is mostly used to measure the efficacy, efficiency and the competition level on the markets existing along these chains. Price adjustment along the chains finally reflects the nature, structure and organization of the chain and can identify the eventual market failures.

2. ***Agricultural prices are more volatile***. In the last years, agricultural prices experienced two growth cycles and then diminution. In the first cycle, which began in the year 2007 with a maximum in late 2007 and in early 2008, agricultural prices significantly varied in both directions, in a relatively short period of time. Thus, in our country, agricultural prices increased by 28% in December 2007, compared to December 2006, and decreased by 22% in August 2008 compared to December 2007.

3. ***Consumer prices are more stable***, with a relatively constant variation rate. Consumer prices were up by 9.3% in December 2007 as against December 2006, although agricultural prices increased by 28% in the same period, as we have previously seen. In essence, consumer prices have had a slow growth tendency over time, while agricultural prices have had very great fluctuations from one period to another.

4. The adjustment of the agricultural price variation transmission in the conditions of agricultural price crisis in the period March 2007– May 2008 had an **asymmetrical character**, as the agricultural price growth process was almost simultaneously accompanied by the increase of processing and consumer prices

(transmission with attenuated intensity). In the period when agricultural prices decreased, following the month of May 2008, the processing and consumer prices continued to slowly increase or stagnated in the best case, while the prices of crop products (in cereals mostly) experienced a significant drop.

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