Analysis of economic issues relating to the dairy sector, with emphasis on price transmission[1]

Péter András Popovics

Faculty of Agricultural Economics and Rural Development, University of Debrecen

Abstract: The dramatic decline in consumption after 1990 was an important problem during the analysis of the sector. Even today, consumption is still below the degree that was before the political change, and significantly lags behind the EU level. The importance of this topic is emphasized by the fact that surplus milk could be marketed through the increased domestic consumption; this would create a more stable and calculable situation for farmers. Therefore, I considered it important to reveal what factors and by what shares influence the consumption of milk and dairy products. The relationship, time series and cross-sectional analysis based on national and international databases demonstrate the relationship between the consumption of milk and dairy products and the other determining factors of consumption in Hungary and in the EU-25 through diagrams. I draw the conclusion that there is a medium correlation between the development of the economy, the higher income level and the consumption of milk and dairy products.

Just before our EU accession, the dairy sector was one of the most critical industries of Hungarian agriculture, which is why I chose this for my analysis. I regard as a new scientific result the econometric analysis of the asymmetric market conditions in the price transmission approach within our dairy sector between 1995 and 2003. I confirmed and quantified that the market is under an oligopoly and defined the direction of price adjustment. Furthermore, I regard as a new result in the price transmission analysis (also published in the article published with Dr. József Tóth), that the three possible dimensions (elasticity, asymmetry relations, lag) are analysed simultaneously. Therefore, a more sophisticated picture is given on price transmission. The theoretical advantages and disadvantages are verified by an example of a vertical coordination based on the horizontal cooperation in the dairy sector (Alföldi Tej Ltd).

> *Keywords:* milk production, dairy sector, price transmission, asymmetry, oligopolistic market structure

1. Introduction

I have undertaken an analysis of certain economic issues of the dairy sector, in which I set three objectives:

1) To analyse the past 15 years of the Hungarian dairy sector, I surveyed the stages of production, processing and trade. The income situation of producers and the most important factors that influence their profit situation have been given special attention. Considering the fact that the Hungarian dairy market is characterized as a supply market, I assumed that market balance can be attained at the consumer end of the chain. I have analysed the factors that influence the consumption of milk and dairy products from international aspects.

2) The main objective of the study is to introduce and analyse the asymmetry in the dairy sector caused by insufficient price transmission.

I assume that price transmission between the specific stages of the chain is imperfect, i.e. price changes at the production level are not passed on properly to price changes at the processing and at the retail level.

To support the theory above, I tried to answer the following questions:

1. Within the sector, significant changes have taken place. It is worth examining, which participant in the sector starts these changes.

2. Is there an unambiguous relation between the prices of the different stages in the chain? If there is, which price moves the others?

3. I also analysed how producer price influences prices in other stages, and to what extent these changes are market-conform.

4. Are the price changes symmetric, i.e. do the prices in one stage change to the same extent as prices changed in the previous stage, or they increase the asymmetry in the sector? What is the time interval of passing through of the price?

3) I conducted a case study to point out how the divided and vulnerable producers of raw milk can benefit from horizontal and vertical cooperation through the decrease of price asymmetry.

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2. Materials and metods

When I decided on the topic of my thesis, I planned to examine more product chains, but it seemed more reasonable to shrink the subject, thus I concentrated my analysis on certain economic relationships within the dairy sector.

The accomplishment of the thesis is based on scientific publications. Between 2002 and 2006, I wrote 3 book chapters, 1 lecture note chapter and published 11 proceedings at national and international scientific forums.

In addition to the accurate examination of national and international literature, I strove to support my study with methodological arguments.

The methods applied are chosen according to the characteristics of the subtopics.

In the first chapter, the comparative analysis based on secondary data bases (Eurostat, FAO, HCSO) is dominant, during which the verbal development is supported by different statistical analytical programs (MS Excel, Eviews 3.1, SPSS 13.0), by exact correlation and trend calculations.

The completion of this chapter was supported by professors *Dr. Péter Biacs, Dr. Sándor Szakály* and *Dr. Gyula Széles,* and by associate professors *Dr. Béla Béri, Dr. Csaba Borbély* and *Dr. Zoltán Szakály*.

From the methodological point of view, the biggest challenge was made by the econometric analysis of the Hungarian dairy sector (Chapter 2). The use of the ADL model allows for the deduction of potential market imperfections. I have cooperated with *Dr. József Tóth* associate professor (Corvinus University of Budapest) (*Popovics–Tóth,* 2006) in this analysis.

Some of the data base used – processing prices – is my own collection (with the help of the HCSO), allowing for an outstanding solution even in the international point of view, that besides producer and consumer prices, the analysis of price transmission is extended to the processing prices as well.

3) The case study in Chapter 3 is based on an in-depth interview with the managing director of the Alföldi Tej Ltd. in September 2005. Furthermore, I have consulted the leaders of the Dairy Marketing Board, *Dr. József Popp* (AKI) and other experts.

Dr. Gábor Szabó G. (MTA KTI) helped me to review the national and international literature on the cooperation and integration issues and to adapt these concepts in the case study.

3. Results and discussion

The main results and statements are overviewed according to the specific chapters.

3.1. An introduction of the Hungarian dairy sector from the 1990s to the present

3.1.1 The main characteristics of the Hungarian dairy sector

The most relevant conclusions *of Chapter 1* that give a comprehensive analysis of the Hungarian dairy sector are the following:

1) Cattle farming, especially dairy cow breeding has traditionally been an important Hungarian agricultural sector. Consequently, the share of the dairy sector within the food industry is also high, and the consumption of milk and dairy products comprises an important part of our food consumption.

2) The number of cows has been continuously decreasing since the 1980s, but the sector also suffered a dramatic fall after the political change, when the cattle stock dropped by half (53%).

3) The drop of milk production (39%) was less than the decrease in the number of cows, as milk production per cow increased significantly (47%).

4) Per capita consumption of milk and dairy products (hereafter consumption) has significantly decreased (about 20%) in the period between 1990 and 1996, in parallel with the drop of real incomes. During the following four years, consumption has been growing continuously, then another significant fall came in 2001, in contrast to the fact that real incomes continued to grow. So far, the reasons of this drop could not be revealed. According to FAO statistics, out of the EU 24 (there is no data for Luxembourg), only Slovakia comes after us. Considering the relevance of the topic, the issues on consumption are specified in depth in chapter 3.1.2. (I would like to note that there are significant differences between the consumption of milk and dairy products data of the HCSO and FAO databases).

5) The level of self-sufficiency continuously increased to 100% in these product groups in the 1990s, and it exceeded 110% in the period between 1995 and 2003.

6) Between 1995 and 2003, the increase of import significantly exceeded that of export, strengthening the profile of the dairy supply market. This tendency changed from bad to worse after our EU accession.

7) Concerning the production costs of 100 kg milk (IFCN), out of the four categories Hungary is ranked third. Thorough analysis of this fact would be required, which I could not take in the framework of this study. I assume that the low quality of our grasslands and breeding circumstances significantly influence this result.

8) Studies published in the Research Institute for Agricultural Economics offer a comprehensive survey on the profitability of milk production in Hungary. The calculations for agricultural companies show that the relatively unfavourable profitability situation in the '90s has been continuously declining from 2000 to 2003. The data for 2004-2006 – not including the area-based subsidies – are already in the negative range.

9) 80% of milk production comes from large farms with more than 300 cows in each. Contrary to the public opinion, it indicates a significant concentration level.

10) The proportion of foreign capital in the dairy processing sector is considerably higher than it is in

the food sector, and the concentration rate for the first ten companies (CR10) is also high.

11) Multinational companies are becoming increasingly dominant, not only in the food industry, but in the commerce of milk and dairy products as well.

3.1.2. Analysis of the consumption of milk and dairy products in Hungary

In Hungary, the demand for milk and dairy products is generated by domestic consumption. Its long term trend between 1960 and 2003 can be divided into three main periods, out of which two concern social-economic structural changes, and the third to changes in technology and breed.

In international comparison, the current milk consumption is considered to be medium level in Hungary, but we are lagged in the consumption of some other dairy products. While per capita cheese consumption is 8.9 kg in Hungary, it is 18–19 kg in the average of the EU-15. Our butter consumption is also very low, only 1.3 kg/person, while in other EU member countries it is the triple, 4.5 kg/person. Comparing with developed countries, our liquid milk consumption is also very low.

Considering the fact that in the period between 1998 and 2003, the international consumption trends of milk and dairy products was also stagnating, the Hungarian consumption still lags behind the EU average. While, according to the HCSO, per capita consumption of milk and dairy products ranges between 140–150 kg/year in Hungary, the EU average is 246 kg/year (in milk equivalent).

These very low consumption data inspired me to analyse the issue and survey the factors that influence consumption by means of different methods of analysis. I consider this to be the key problem of the Hungarian dairy sector, because if our consumption fell in line with that of the EU members, the participants of the sector would enjoy a more stable situation.

First I tried to prove my hypothesis that there is a close relationship between per capita milk consumption and real income. The correlation coefficient for the period 1990–2003 is r=0.05, which means that there is no correlation between the two time series. Thus, the hypothesis seemed to fail, but interestingly, there was a very strong correlation (r=0.82) between 1990 and 2000, which proved my hypothesis for this decade.

Then I analysed the time series and found that reverse changes occurred

between 2000 and 2003, because in this period real income increased while consumption decreased. *(Figure 1.)*

My next hypothesis was that if there is such a close correlation between the consumption of milk and dairy products in Hungary during the examined 10 years, then the similar tendency must prevail for the EU member states between per capita consumption of milk and dairy products and per capita GDP during the same years. The FAO database for the consumption and GDP in the EU-25 (excluding Luxembourg) (2003) is almost complete. I found strong correlation (r=0.7) with an acceptable significance level (5%) that was calculated both by using GDP on exchange rate parity and GDP on purchasing power parity, therefore, this hypothesis seems to prevail as well.

Figure 2 shows that in countries where GDP is lower than the average (typically EU-10 countries), the consumption is lower as well, and where per capita GDP is higher (EU-15), the consumption is also significantly higher. The figure also depicts that the countries disperse around a linear trend line.

However, the difference from the trend in old and newly joined countries is worth analyzing separately. Figure 3 shows that the EU-15 follow the trend, except for four countries. At the same time, the relationship is weaker in the EU-10. The correlation coefficient is r=0,52 and r=0,26, respectively.
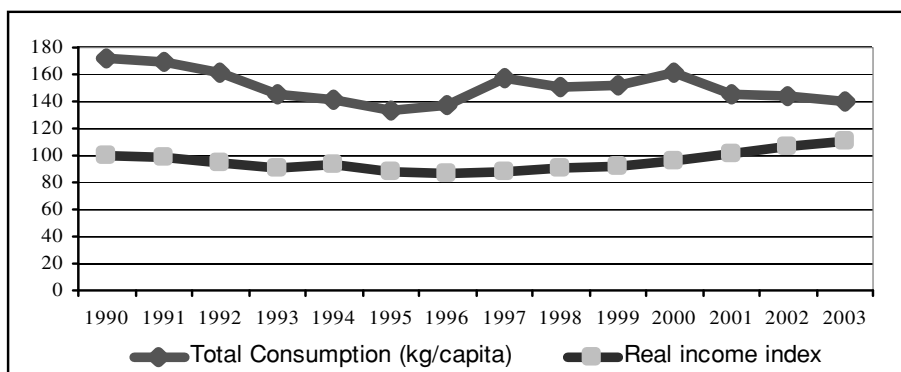

Figure 1: Consumption of milk and dairy products and real income in Hungary between 1990 and 2003 (Source: *HCSO,* 2004)
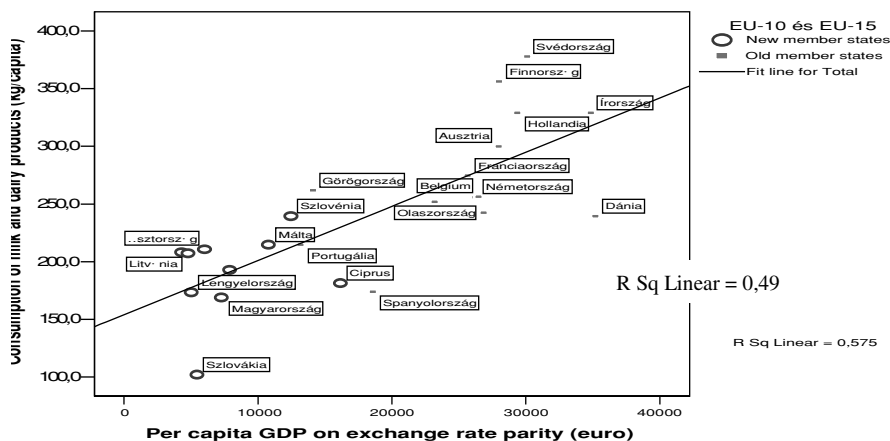

Figure 2: Correlation between the consumption of milk and dairy products and GDP on exchange rate parity in the EU-24 (Source: own calculations based on FAO (2003) statistics)

Consumption of the milk and dairy products (kg/capita)

Figure 3: Correlation between the consumption of milk and dairy products and GDP on exchange rate parity in the EU-15 (Source: own calculations based on FAO (2003) statistics)
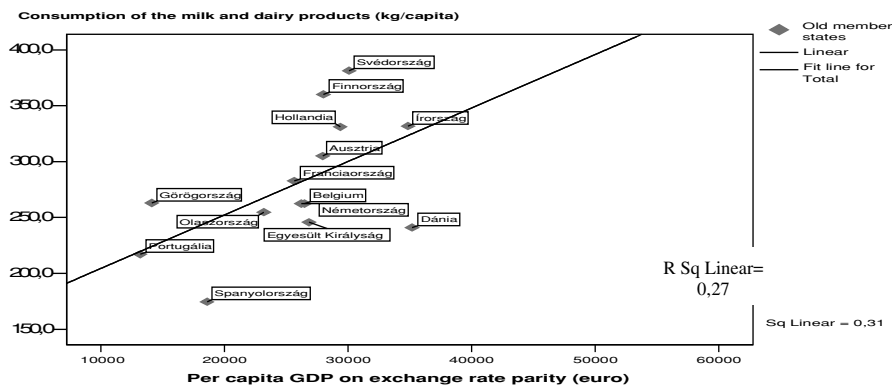
My third hypothesis was that in EU countries where per capita milk consumption and milk production per cow is higher; the consumption is high as well. The values calculated here are not correlated as much as those found with income values. There is a weak medium correlation between per capita consumption and consumption values (r=0,47), and between milk production per cow and consumption values (r=0,45). However, it has no connection with production calculated for 100 ha. The conclusion is that only if our economy strengthened and real incomes were higher could we expect the increase of milk consumption in Hungary in the new circumstances of the EU.

At the same time, in addition to the income situation of the population, milk consumption is influenced by several other factors, such as marketing, the traditions in the gastronomy of the specific country, health education, healthy nutrition, and the spread of illnesses like lactose intolerance and allergic reactions.

3.2. Theoretical and practical approaches of price transmission

3.2.1. Theoretical approaches of price transmission

The price relationships between the different vertical levels can be analysed by means of price transmission analysis. First, I give the definition of price transmission that is a complex price effect, during which the prices of products or sectors (markets) influence one another, the determining (starting) prices are passed on and establish economic relationship between the specific products or sectors.

Most studies examine price transmission for its symmetric or asymmetric features. Price transmission is symmetric if the price increase or decrease in a market (for e.g. raw

milk) influences the other market (for e.g. end consumption) by the same rate. The similar reaction on price increases and decreases prevails for the direction, measure and speed of price reactions. In an inverse situation, price transmission is asymmetric. The characteristics of price transmission include several assumptions, for example:

- Symmetric price transmission characterizes the perfectly competitive markets, while if price transmission is asymmetric we can conclude to non-competitive, imperfect markets.
- Perfect (complete) price transmission prevails rather in the long term, while in the short term; price transmission may be asymmetric or incomplete.
- The direction of price transmission is also an issue of great importance. If the price is determined by the suppliers (for e.g. farmers producing raw milk), during the process of price transmission cost-push impulses are dominant. However, if the demand (for e.g. the consumer market) is dominant, the characteristics of price transmission are determined by the demand-pull force. (*KInnucan* and *Forker*, 1987).

The "price gauging law" introduced in New York State in 1991 claims that retail price of milk must not exceed twice the price of raw milk. (*Cotterill,* 2003)

We can obtain an interesting result if we analyse the hypothetical application of the price gauging law, were it applied to the Hungarian dairy sector. Figure 5 demonstrates the difference between the consumer price and the double price of raw milk. The diagram shows that while the results stayed in the positive range in the period before 1998, between 1998 and 2003 almost every result was negative. Thus, we can conclude that farm prices lag far behind
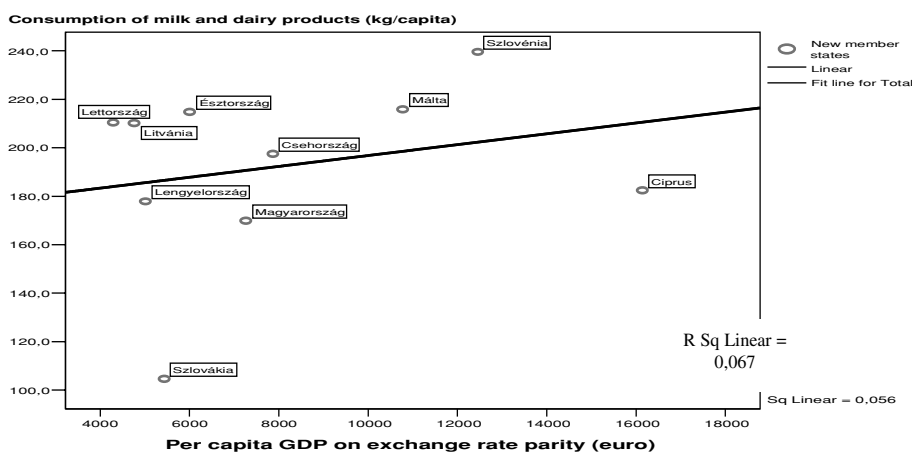
Consumption of milk and dairy products (kg/capita)

Figure 4: Correlation between the consumption of milk and dairy products and GDP on exchange rate parity in the EU-10 (Source: own calculations based on FAO (2003) statistics)
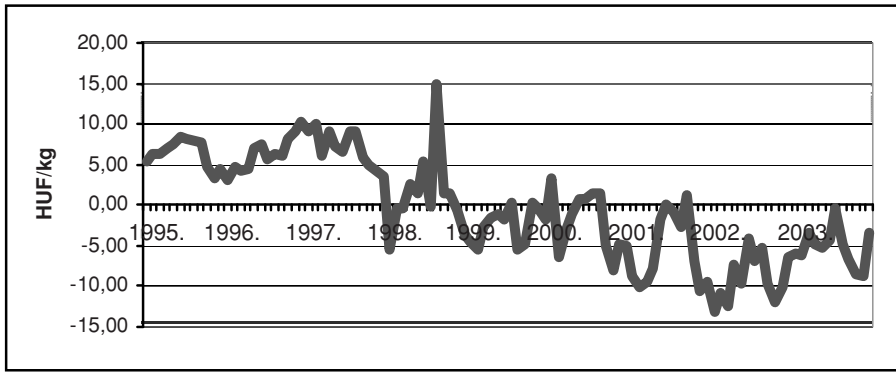
Figure 5: Differences between the effective consumer price and double the price of raw milk in Hungary (HUF/kg) (Source: Own calculations based on HCSO statistics)

consumer prices. The application of this law in domestic circumstances would be effective, because it would allow for the increase of farm prices through the increase of consumer prices in the more powerful commercial sector; thus, producers would be less forced to accept low prices.

3.2.2 Analysis of price transmission in the Hungarian dairy sector from the practical point of view

The issues of profitability and the distribution of profits within the sector are of great importance. Our analysis showed that producers within the sector are in a vulnerable situation, as they sell milk at nearly the unit cost. Contrarily, the retail price of milk we come across in the shops is higher than double the farm price. This contradiction drove us to compare the prices of the different stages. To analyse the imbalance in the sector, we have conducted a price transmission analysis for the whole sector that deals with the rate of transmission of price increases and decreases between the specific stages.

3.2.2.1 Antecedents and considerations

Our analysis proved that two parallel effects of different directions prevail in the formation of the market price. One is the upward price mechanism, when changes in raw milk prices induce price changes in the processing and retailing stages. However, in the oligopolistic market, there is also a downward price mechanism.

The reason for this is the effort of the commercial sector that forces processors and farmers in a price taker position. The latter puts raw milk producers in a vulnerable position; as a consequence, they get the worst of the fight for favourable prices. The problem stems from two things. One is that milk is a perishable product; therefore, there is no way to retain or to stock it. The other is historical, i.e. Hungarian producers are unwilling to join forces and establish effective economical

cooperations. However, if farmers integrated into larger organizations, they could reduce the transaction costs per unit that would improve their profitability position.

We assumed that price transmission between the retail and the production stages is imperfect, i. e. price changes in the production stage are not transmitted properly in price changes in the consumer stage. We tried to answer the following questions:

1. Within the sector, significant realignments have taken place. It is worth examining, which participant within the sector starts this realignment.
2. Is there an unambiguous relation between the different prices in the stages of the chain? If there is, which is the price that moves the others?
3. We examined how producer price influences prices in other stages, and to what extent these changes are market-like.
4. Are the price changes symmetric, do the prices in the retail stage change at the same rate as prices changed in the production stage, or they increase the asymmetry in the sector? How long does it take the price effect to pass through?

We neither analysed the factors that increase or decrease producer prices, nor did we want to decide whether the distribution of profit between the stages is fair or unfair. Our analysis tries to reveal at what rate the price changes between the specific stages are influenced by the effectiveness of their market functioning.

To solve these problems, we have conducted an econometric analysis: we adapted a **linear autoregressive model** using a time series of price data showing changes at national level.

3.2.2.2. Price margins in the dairy sector

Figure 6 shows price margins in the dairy sector between 1995 and 2003 in real and nominal values. When we analysed the figures, it became clear that the price margin
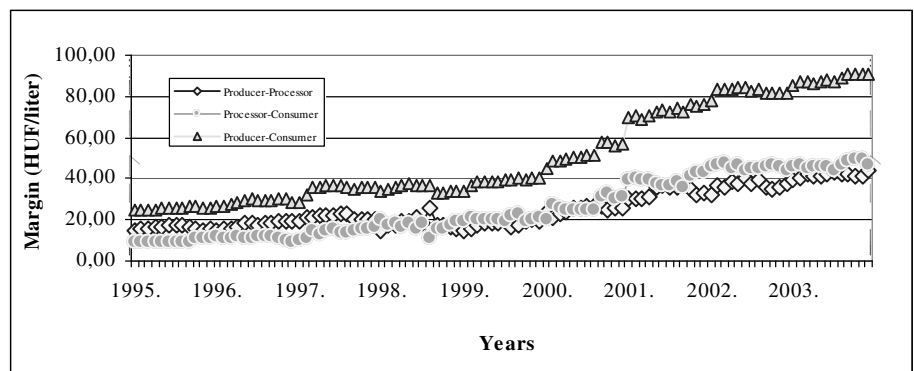

Figure 6: Price margins in nominal value (1995–2003) (Source: Own calculations based on HCSO statistics)

between the producer and processor stage was wider than the commercial price margin between 1995 and 1998. It was probably the consequence of the concentration in the processing industry and of the lack of that among the farmers.

During the period after 1988, processors lost their market power within the sector, partly due to the loss of confidence caused by the scandals concerning MIZO and other processors. The other factor was the significant investment of foreign capital in the dairy sector. Its share increased by 20% from 1998 to 2000, attaining an 80% share (*Rontóné*, 2005).

In line with this trend, the market power of commercial sector has increased. This was the period when huge commercial chains spread and started the battle for supplier positions. This allowed the strengthening of the commercial sector to become a price leader.

The figures show that the peaks of the different price margins varied between the stages and increased continuously between 1998 and 2000. During this period, the balance of power between processors and traders was evened out. Later in 2001, price margins started to increase rapidly, as a sign of a market distortion. In the battle for the price margin, the commercial sector seems to take the lead against processors.

3.2.2.3. Econometric analysis of the Hungarian dairy sector

To construct the model, we used monthly price data of 8 years between 1995 and 2003. The model uses output prices of the production, processing and retail stages. These prices from the database of the Hungarian Central Statistical Office (KSH) allowed us not only to analyse the price symmetry between the production and retail stages, but also to look at the symmetry between the production-processing and the

Figure 7: Summary of the econometric analysing methods (Source: own design by Rapsomanikis, *G. – Hallam, D. – Conforti, P.,* 2003)

processing-retail prices by breaking down the stages into two sub-stages by inserting the processing stage.

We had to analyse the co-integration of price data. We have conducted this analysis on the production-processing, the processing-consumer stages and the whole chain. We considered the staging of the time series dividing them into 2 stages (1995–1998, and 1999–2003), according to the analyses in chapter 4 and 5. Basically, we cannot reject the fact that consumer prices are not co-integrated at different levels of the dairy chain in the examined period in Hungary. We also examined whether the price determination process is upstream or downstream in the marketing channel, the Granger causality test seemed an appropriate tool for that.

3.2.2.4. The Autoregressive Distributed Lag (ADL) model

The results on the direction of price determination process give no answer to the question of at what extent the change of output price signals are transmitted from one stage to another. The importance of this question lies in the fact that it might point to market distortions. When the effect of price change is asymmetric, the market fails to act the part of a balancing and profit allocating medium[2].

To decide whether an asymmetric price transmission prevails, we assumed the price correlations from the model by Kinnuchan and Forker (*Knnuchan, H.W., Forker, O.D.,* 1987; *T=th,* 2003). The characteristics of marketing costs are excluded from our analysis, as we do not analyse whether price margins between the output prices are market-effective, but the appearance of price changes in the following stage.

During the process, the characteristics of price transmission have been analysed in the following 3 models:

$$dfl\_pcp = a_1 + b_1 AR(1) + c_1 AR(2) + d_1\ sdppri + e_1\ sdpprd \quad (1)$$
$$dfl\_cp\ = a_2 + b_2 AR(1) + c_2 AR(2) + d2\ sdppri + e_2\ sdpprd \quad (2)$$
$$dfl\_cp\ = a_3 + b_3 AR(1) + c_3 AR(2) + d_3\ sdppri + e_3\ sdpprd \quad (3)$$

where

dfl_pcp: deflated processing (output) price
dfl_cp: deflated consumer price
c: constant
$AR(1)$ és $AR(2)$: autoregressive terms
$sdppri$: cumulated production price increases
$sdpprd$: cumulated production price decreases
$sdpcpri$: cumulated processing price increases
$sdpcprd$: cumulated processing price decreases

Model (1), (2) and (3) describe the price transmission in the processing, retail and the entire chain, respectively. To separate instant and long-run price effects, we used the Almon lag structure with linear polynom, using two lag periods for both price increases and decreases.

We expected that price movements would be asymmetric in the examined period: price increases are passed on to the following stage more completely than price decreases. We also assumed that the effects of short-run price increases would be higher than those of short-run price decreases, and that their transaction over time would be different.
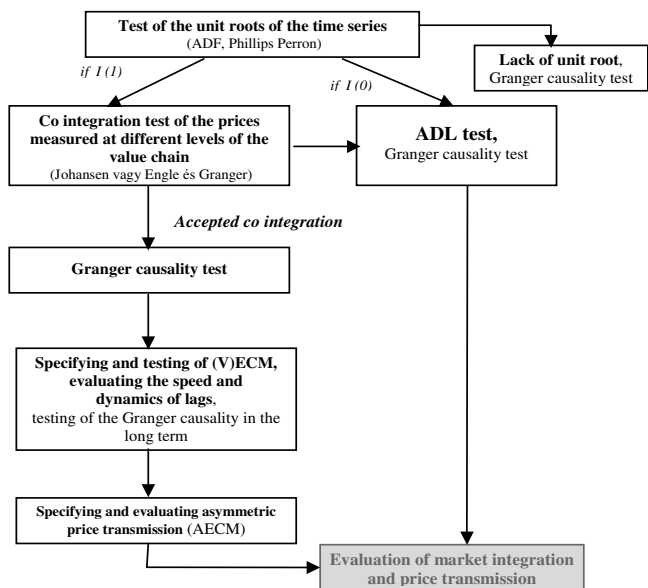
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[2] See *Meyer, J.* and *Cramon-Taubadel, S. Von,* 2004; *Tóth,* 1999; *Tóth,* 2003

Table 1: Results of the Granger causality test

Lag	Processing stage			Retail stage			Entire chain		
	1995–2003	1995–1998	1999–2003	1995–2003	1995–1998	1999–2003	1995–2003	1995–1998	1999–2003
1 month	↑*	↑*	↑***	↓***	↓***	↓***	○	→←	↓*
2 months	↑*	↑*	↓**	↓***	↓*	↓*	○	↑*	○
3 months	↑*	↑*	↓*	↓***	○	↓*	○	↑*	→←
4 months	○	↑*	→←	↓***	○	↓*	↑*	○	→←

Keys:
↑   Upstream flow of information on price and price enforcement   ***   The causality test is significant at 1%
↓   Downstream flow of information on price and price enforcement   **   The causality test is significant at 5%
○   No significant causality relations   *   The causality test is significant at 10%
→← The causality test gave paradox results

Table 2: Summarizing table of the results (price transmission elasticity)

Price transmission elasticity		Processing stage			Retail stage			Entire chain		
		1995–2003	1995–1998	1999–2003	1995–2003	1995–1998	1999–2003	1995–2003	1995–1998	1999–2003
In-crease	prompt	0,35***	○	0,65*	0,72***	0,55***	1,03***	0,84***	0,59***	2,14***
	next month	0,16***	0,20***	0,38***	0,34***	0,37***	0,38***	0,42***	0,27***	0,60***
	long term	0,49***	0,59***	1,14***	1,01***	1,12***	1,13***	1,27***	0,82***	1,81***
De-crease	prompt	○	○	○	0,43**	0,97***	○	○	○	○
	next month	0,08**	0,23***	0,19***	0,19**	0,36***	○	○	0,35***	○
	long term	0,24**	0,68***	0,58***	0,57**	1,09***	○	○	1,04***	○
Corrected R^2		0,85	0,61	0,76	0,97	0,81	0,95	0,97	0,86	0,95
DW test		2,02	2,04	1,95	2,01	2,03	2,00	2,02	2,02	1,99

Keys: ***   the parameter is significant at 1%   *   the parameter is significant at 10%
        **   the parameter is significant at 5%   ○   non-significant parameter

3.2.2.5. The results of the causality test

Table 1 summarizes the results of the Granger test[3]. (*Granger,* 1989)

Table 2 demonstrates that in the processing stage the direction of the price determination process is upstream, from dairy farms to the processors. The *mark up pricing* theory indicates that participants of the production and processing stages are more willing to accept that market values are generated along the chain, than participants in the retail stage. However, we have to note that in recent years, the causality correlation seemed to turn. When lags are 2 and 3 months long, a downstream correlation prevailed between 1999 and 2003.

The relationship is demonstrated more obviously and significantly by the retail stage, as market price information spreads upstream the chain.

We cannot draw unique representative information for the whole chain[4].

3.2.2.6. Asymmetry

Using models (1) – (3), we have concluded to the results shown in table 2[5].

The table demonstrates that both dividing the chain into stages and staging of the time series are confirmed in the results. In the examined period, asymmetric price development prevails in the whole chain and in the specific stages as well, but the appearance of these effects is different in the specific stages. On the one hand, parameters for price increases significantly indicate that these price increases will appear in the price of the next stage or of the end product; and in the long term its amplitude is definitely higher than it would be for price reductions. On the other hand, price reductions do not induce significal decreases in the prices of the following stage, especially in the short term in the processing stage and in the retail stage between 1999 and 2003. Furthermore, the extents of price effects vary within the specific stages, since the effects of price increases

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[3] Previously and according to the literature (*Mészáros–Popovics*, 2004; *Tóth*1999) we supposed that by applying maximum four months long lags in the model, we can determine the characteristics of the direction of price reporting process.

[4] Partly it comes from the reverse results of the two phases; fortunately, the individual analysis verified the logic conclusions.

[5] Only those results are published that are relevant for the issue.

are more intense in the retail than in the processing stage. Consequently, the retail stage reacts on input price increases more rapidly and intensely.

In the neoclassical theoretical model of the economy, market price includes perfect and full information. At the same time in national economies there are situations and periods when the effective functioning of the economy is far from the theoretical model, therefore, market information is somewhat distorted.

Our study reveals that Hungary faced this situation in the period between 1995 and 2003. Given a general overview of the sector, we showed those factors (oligopolistic market structure, market power) that can be the basis for asymmetric price developments.

I would like to emphasize the following results that concern the functioning of the sector:

- The results obviously show that price determination process moves upstream in the production-processing stage. Consequently, it seems that the transmission of values is based on the value added, by summing up the production and processing costs. Thus, the value is determined rather by the production than by the market. However, the prices of the retail stage are determined in the consumer market. To decide whether the marketing chain fails to transmit the information of the production stage through the whole chain is an interesting issue for future research.
- **Fragmenting the marketing sector for analysis seems definitely necessary: the characteristics of the production-processing stages are absolutely different from those of the retail stage. This highlights that analysing only the production-consumer price relations is not sufficient.**
- **The results of the causality tests alone do not necessarily indicate market power; however, when examining it together with the results of price transmission analysis, we can conclude that the transmission of price reductions is less significant and is of a less magnitude, due to market power of retailers.**
- In the second period of the analyzed time interval, the asymmetric character has grown in each two stages.

These questions raise further issues. What is the role of the asymmetric price development (if there is)? If there is, how distorted the price determination process is, and how it take decision makers away from the optimal solution. What are the long term effects? The dairy sector is only a small segment of the whole economy.

3.3. Theoretical and practical approaches towards coordination and integration processes

Independent, privately owned farm organisations cannot countervail the market power of their business partners. Accordingly, coordination seems an appropriate solution, as it tries to solve the most critical problem: the great deficiency in pursuing the interest of producers in the chain. The results of our price transmission analysis obviously show that only the increase of input prices will increase the prices in the production-processing stage. Hence, the farm gate price is determined by the costs, not by the market situation. Farmers cannot enforce their interests separately and act against the concentrated processing industry. High investment costs, expensive functional machinery, the long production cycle from the time of investment, the continuous production and the perishable dairy products are all significant risk factors and deepen the vulnerable situation of farmers.

The different coordination mechanisms improve and strengthen the position of farmers in the price negotiations for a fairer selling price and for eliminating the fluctuations of the price. Furthermore, some effects might go beyond the industry and concern the whole society, such as decreased demand for subsidies through stabilized prices and supply, or lower food prices through more effective marketing (*Szabó M.* 1999).

In the following section, I summarize the strengths, weaknesses, opportunities and threats of the different

Table 3: SWOT analysis of the coordination structure established by the processor

Strengths	Weaknesses
• decreasing transaction costs; • cost effectiveness of the production stage can be enhanced; • more computable, more secure market through long term contracts; • more-or less-balanced prices guaranteed in contracts; • the processor takes part in ensuring the current assets of farmers through pre-financing • long term stability, permanent subsistence; • bad quality products are filtered out by the system; • transportation is organized and financed by the integrator.	• the different market power causes imbalanced relationship between the integrator and the farmers; • the integrator is interested in cost cuts (raw materials, pre-financing current assets etc.;) • price-asymmetry; • the integrator might arbitrary change the contract; • the bargaining power and the interest enforcement of farmers remain weak.
Opportunities	**Threats**
• easier technological and product development; • better flow of information; • food safety is ensured via central control and monitoring.	• milk is a perishable product, that leads to opportunist behaviour of the contracting partner; • hold-up (relationship) problem based on the vulnerability of farmers because of functional investments.

Source: own design based on *Szabó G.G. - Bárdos,* 2005; *Szentirmay-Gergely,* 2005; *Széles,* 1998

Table 4: SWOT analysis of the coordination structure established by the farmer

Strengths	Weaknesses
• decreasing transaction costs; • cost effectiveness of the production process can be enhanced; • lower technological and market risks; • more influence on the market and on prices; • cost savings through the shortened flow of information; • rearranging some of the profit from a certain level of the marketing chain to farmers; • better interest enforcement , better bargaining position;	• inexperienced management; • inexperienced independent marketing activity; • members often have to cope with shortage of capital, therefore the investment structure is not optimal; • the current assets of the farmers have to be financed under their own capital; • members often cannot recognize that investments serve their interest – internal conflicts (horizon problem); • contact with the cooperative, transparency of its operation and practicing their managing and controlling role might cause problems for members; • ensuring food safety, quality control • weak logistics
Opportunities	**Threats**
• acquiring and retaining new markets; • high value added activities.	• shortage of capital; • technological and product developments are not materialized; • some members might gain benefits without paying-in ("free rider" symptom); • the cooperative is sometimes unable to control the quality and quantity of the supplied product; • milk is a perishable product

Source: based on *Szabó G.G.*, 2002

coordination structures, assuming two theoretical situations: one is when the coordination is initiated by the processor or when it is initiated by the farmer.

SWOT analysis on the vertical coordination mechanisms in the Hungarian dairy sector

SWOT analysis of the coordination structure established by the processor (as initiator) from the farmers' point of view (market compensation model):

If we have a look at the statements defined in both SWOT analyses, we find that depending on the initiator of the coordination, there are significant differences between the strengths, weaknesses, opportunities and threats. There are common points, since transaction costs decrease and production is more cost effective in both cases. However, some factors occur as a strength in one system and as a weakness in the other, for e.g. quality. We cannot decide which organization is more beneficial, since the factors listed might include many subjective factors that make the judgement more difficult; furthermore, the development, fulfilment and emphasizing of the specific points might cause significant differences even for two similar organizations. However, we can claim that, in any organization, the key points of the successful coordination are financial muscle, quality consciousness, and professional management, and these factors are included as strengths in the processor-initiated coordination.

At the end of the chapter, I present a successful organization in the region. The Alföldi Tej Selling and Supplying Ltd. is a good example for the vertical integration based on the horizontal coordination of farmers as initiators. The Ltd. is an independent group of farmers, of which members cooperated not for production, but for selling, in order to establish market power against the monopolistic processors and retailers in the region, and to ensure the benefits of the members.

The existence, development and the efficient production of the business proves that by the cooperation of farmers there is a chance and opportunity to significantly improve their interest enforcement and to establish ownership for farmers in the processing stage of the chain.

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