

Tendencies of price transmission and the asymmetric effect of prices
in the Hungarian dairy sector³

This study analyses the market behaviour of the Hungarian dairy sector between 1995 and 2003. On the one hand, we examined whether prices in the different stages of the food chain followed the market effects within the dairy sector and, on the other hand, which participants in the sector influence these prices. We used price transmission analysis to examine the asymmetry in prices currently seen in the dairy sector, as this method is not only used by agricultural economists to measure market efficiency, but also to examine food chains. When examining the inflation-corrected prices of the different stages of the food chain, it is clear that perfect market competition does not exist; instead, price moves indicate oligopolistic competition. Most of the literature indeed claims that the market structure of the food industry in developed countries is oligopolistic, which is why the commercial sector has even more market power and is growing in Europe. Our econometric analysis reveals that, in Hungary, the dairy sector is characterised by the pricing-up effect at the bottom of the chain and by the top down effect at the commercial stage. Further examinations showed that, in the studied period, the price transmission between the two ends of the chain, and even between the stages within the chain, is imperfect, asymmetric, and delayed in time. Therefore, it greatly influences the current crisis of the dairy sector. Certainly, price transmission is influenced by several other factors, which have further effects on the current situation, which we do not touch upon. The study draws up suggestions for the utilization of price transmission knowledge in the economic policy and gives edification for the future.

1. Theoretical considerations

The quantity of milk produced in Hungary has been continuously decreasing over the last ten years. As regards quality, specifications have become stricter, and milk production has attempted to adjust to meet these expectations, justified by an increasing proportion of extra quality milk (*Tenk at al.* [1988]). There are still signals of a crisis in milk production, and this becomes evident when one examines profitability indexes, or considers the huge amount of surplus milk entering the market year by year. This study examines the entire dairy chain, in order to identify the reasons behind the current crisis. The gravest problem with the profitability index of raw milk production, as with other fields in the food sector, is that price effects are rather asymmetric, instead of operating according to the conditions of a competitive market.

Our analysis proves that in market price composition, two opposing effects prevail. One is the pricing up effect, which means that changes in production prices induce a price change in other stages of the sector. The market is oligopolistic and, as it is distorted, there is a pricing-

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down effect as well. In the background, there is pressure to conform to price levels set by the commercial sector, by making the actors in the chain accept a given price. This latter effect puts producers in a particularly vulnerable position, and they get the worst in the battle for higher profitability. Regardless, the problems discussed previously stem from two factors. One is that milk is a perishable product, i.e. long-term storage is impossible. The other is that, for reasons which are grounded in our history, our producers are unwilling to join and establish effective economic cooperatives, even though their integration into larger organizations would reduce the transaction costs per unit, and thereby improve their profitability position. (Szabó G.G. [2002])

In this study, we examined the effective operation of the dairy sector using price transmission analysis. We assumed that price transmission between the commercial and the production stages is imperfect, i. e. price changes in the production level do not correspond exactly to price changes in the consumer level. (Fertő [1999]) According to economists analysing price transmission, these complex price effects integrate different markets both horizontally and vertically (Meyer and Cramon-Taubadel [2003, Tóth [2003]). If it stands, price transmission analysis could be a wide-spread instrument of analysing market efficiency. Contrarily, only a few wide-spread analyses on a national-economy level can be found (Peltzman [2002]). In a comprehensive study of price transmission tests between 1980 and 2002, except from the food sector, we could only find these types of studies for oil products and bank procedures (Meyer and Cramon-Taubadel [2003]).

Although we can find analyses of horizontal price transmission in agro-economist literature from, e.g. Bailey and Brorsen [1989], Mohanty et al [1995], Abdulai [2000], studies into vertical price transmission are the most frequent. One reason for this is that both farmers and consumers think that in the processing and commercial sector, competition is imperfect and the latter misuse their market power. These opinions are often stated as complaints, and persuade US congressional representatives to order the General Accounting Office to review prices in the dairy sector. (Nicholson and Novakovic [2001])

Most studies analyse whether price transmission is symmetric or asymmetric. Price transmission is symmetric if a price increase or decrease in one market (e.g. raw milk) induces similar changes in another market (e.g. the consumer market). This similar reaction applies for the direction, magnitude and speed of price reactions. Otherwise, price transmission is asymmetric. Characteristics of price transmission are related to several assumptions, e.g.:

- While symmetric price transmission characterises perfectly competitive markets, if price transmission is asymmetric, we can conclude that there are non-competitive, imperfect markets.
- Perfect (complete) price transmission prevails rather in the long term, while in the short term, asymmetric or incomplete price transmission is more frequent.
- The direction of price transmission is also worth analysing. If the price is determined by the supply side (e.g. farmers producing raw milk), during the process of price transmission cost-push impulses are dominant. However, if the demand side (e.g. the consumers market) is dominant, the characteristics of price transmission are determined by the demand-pull force. (Kinnucan and Forker [1987])

Measuring price transmission refers to the quantification of its main characteristics, such as **speed, magnitude and symmetry**. (Palaskas, [1995]). Price Transmission Elasticity (PTE) plays an important role in measuring price transmission and, as it is expressed %/%, is internationally comparable. Price transmission elasticity shows the increase (decrease) in the

consumer price caused by a 1 % increase (decrease) in the farm price. (*Mészáros-Popovics* [2004]) This study examines symmetry-relations after a determined delay, by taking the proportion of the price increases and decreases in the depending stages of the chain.

2. Indications, viewpoints for analysis

In Hungary, between the political change in 1989 and our EU accession on May 1, 2004, we witnessed a serious crisis in the agricultural industry which especially hit the livestock sector. Although specific indexes and quality have improved, the volume of production has suffered a dramatic decrease. The crash of our Eastern market possibilities have also had a negative influence. These factors placed our agricultural producers in a desperate position. The worst year was 1995, after which we experienced stabilization. Our study deals with this progressive period, and compares it to an earlier study that examined the market behaviour in our food sector through price-symmetry between 1990 and 1996. (*Tóth* [1999]: *Szabó-Tóth* [1998]). In this paper, we analyse the dairy sector using a similar approach, in order to gain comparable data and to make asymmetry changes traceable. This is our approach in attempting to estimate the effectiveness of the dairy market. Furthermore, thanks to price data referring to all actors in the sector, we have the opportunity to analyse the individual stages as well.

1. Within the sector, significant realignments have taken place. It is worth examining which participant within the sector begins this realignment.
2. The second question is whether there is an unanimous relation between the different prices in the stages of the chain, and, if the answer is positive, which is the price that moves the others.
3. We examine how producer price influences prices in other stages, and to what extent these changes are market-like.
4. Is the price change symmetric, do the prices in one stage change at the same rate as prices changed in the stage before, or do they increase the asymmetry in the sector? How long does it take for the price effect to pass through?

We used the (*Szabó-Tóth* [1998]) study to analyse the causal details of the setting up of price asymmetry. We do not analyse the factors that cause producer prices to go up or down, nor do we want to decide whether the distribution of profit between the stages is fair or unfair. The only and deliberate aim of our study is to analyse at what rate price changes between the stages can be explained by the market operation.

To solve these problems, we conducted an econometric analysis: we tried to adapt **linear autoregressive models** using a chronology of price data showing changes on a national level.

3. Characteristics of the Hungarian dairy sector and its structural changes

3.1. The efficiency of the structure of production

When analysing the national figures, we find that in the examined period (1995-2003), mechanisms towards concentration have been taking place in some stages of the food sector: the number of cows has decreased by 15-20%. (*Nyárs et al.* [2004]), at the same time, the amount of milk produced – thanks to higher yield – has showed a moderate increase. The number of dairy farms has decreased by 40% between 1995-2003 in Hungary. (Table 1).

Important indexes of the Hungarian dairy sector

Table 1

Indexes	Hungary	
	1995	2002
Dairy cows (1000)	421	338
Milk production (1000 t)	1994	2163
Number of dairy farms (1000)	49,9	29,8
Number of cows/farm	8,4	12,3
Milk production/cow (kg)	5040	5894

Source.: Hungarian Central Statistical Office, 2003

When examining the farm structure, we find that the level of concentration of the stock on Hungarian dairy farms (business associations and corporations) is higher than in other EU countries (for e.g. Germany, Denmark). While most farms in e.g. Germany and Denmark generally have 30-99 cows, in Hungary, there are a few farms with 100 or more cows, and these actually own the majority of the total livestock in the country. Yet, in Hungary in 2000, as regards privately-owned dairy farms, 95% of all farms had less than 10 cows each. Hence, 71 % of the stock of privately-owned farms belonged to the group of farms owning less than 10 cows (Table 2).

Number of milking cows on privately-owned farms and co-operations in Hungary, according to farms size (2000)

Table 2

Measure: %

Farm size (number of cows)	<9	10-19	20-29	30-99	>100	Együtt
Privately-owned farms						
Share in the number of farms (2000)	95,41	3,23	0,7	0,6	0,06	100
Share in livestock (2000)	71,21	12,64	5	8,43	2,72	100
Co-operations						
Share in the number of farms (2000)	7,6	3	2,9	12,5	74	100
Share in livestock (2000)	0,1	0,1	0,2	2,4	97,2	100

Source: Hungarian Central Statistical Office, Agricultural Census, 2000

In the EU-15 that existed until 2004, the level of concentration in the dairy sector is significantly higher than in other livestock sectors, as dairy farms have 29 cows per farm, on average. This number is explained by the high level of support keeping small farms alive. In the new EU-10, the level of concentration on dairy farms is even lower, i. e. 3 cows per farm, while in Hungary, this number is 12 (*Popovics* [2005]).

According to the level of concentration, the technology used and the production goal, **dairy farms** can be classified into 3 groups in Hungary. **Farms having more than 10 cows** usually **produce milk for direct processing purposes**. The number of farms with **3 to 10 cows** is relatively high and these **sell milk primarily through creameries**, but own consumption and

sale at the local market also accounts for a considerable amount. The number of farms with 1-2 cows is still high. These farms produce primarily for own consumption or for direct sales to consumers.

3.2. The competitiveness of the processors

The concentration of businesses begun after the political change continued during these years as well. Between 1998 and 2002, 7 businesses have bankruptcy, decreasing the number of businesses from 100 to 93. Calculated on the basis of income from sales, the share of the top 10 companies of total business income was 63.5% in 1998, and 78.2% in 2002. Eighty percent of the whole amount of milk produced was processed by the top 10 companies. The share of the first 5 companies of total income from sales also increased, rising from 41.9% to 56.9%. On the whole, the power of big-size companies increased, while that of small companies has shrunk. The first statement especially applies in the case of the market leader company, Friesland, which increased its 2002 year income from 20 billion Fts to 60 billion in 2003 (this figure includes buy-outs as well, e. g. Mátratej). As regards net income from export sales, the level of concentration has also increased: in the period 1998-2002, of the 26 companies that supplied export data, the top 10 companies' share was 88.7% of the total net income of the sector, and, at the end of the period, the share of the first 10 companies out of 20 was 89.4 %.

Because of the originally high level of concentration, export sales did not increase, despite the increase of income from domestic sales. The proportion of foreign investment in the share capital increased from 62% to 73% from 1988 to 2002. Friesland (earlier Nutricia), which owns the greatest share, calculated on the basis of net income from sales, had only 13% within the sector. However, in 2001 and 2002, it's share reached 18.5% and 17.8%, respectively, and reached 25 % by 2004. Mizo, which ranked second in 1998, even fell out of the top ten by 2001, but after it was renamed Új-Mizo, it ranked 8th in 2002, while Sole hit 2nd, leaving Danone 3rd.

Foreign investments continued to gain in the Hungarian dairy sector, backed by the fact that 6 of the 10 companies with the highest income are almost entirely (96-100%) in foreign ownership. The share of foreign investment in the dairy sector was 73% in 2002. This figure exceeds the amount of foreign investment in the Hungarian food sector, which averaged 57% in 2002. In the dairy sector, if foreign capital is invested in a business, its proportion almost always exceeds 50%, i.e. foreign investors attempt to garner a controlling margin of shares in the companies in which they invest. (*Tímár* [2004])

With our EU accession, the harsh state of competition causes further changes in company structures in the dairy sector. The intensive concentration that took place when competition was relatively moderate before accession, coupled with the disappearance of weak businesses from the market, is proof. The expansion of big-size companies has continued. However, the current tendency is that these companies only try to wrestle the market share from the control of small businesses and do not attempt to buy up these businesses themselves. As regards competitiveness, the low level of concentration found especially among milk producers is unfavourable. The constantly increasing level of business concentration increases competitiveness, contrary to the situation in the internal market of the EU, where competition is growing. This oligopolistic situation and the increasing level of concentration within the processing stage further enhances the effects that cause asymmetry, as producers are in an entirely vulnerable position and lack any working cooperation.

Although the dairy sector is a net exporter, it cannot be considered to be an export-oriented industry. The **value of our milk product exports** increased by 8% in 2003. As regards the surrounding countries, our export to the Czech Republic reached the highest value, i. e. 3% of total exports. In 2003, the **value of our milk product imports** increased by 42%, more dynamically than it did in the previous year. The export of the highest-volume product in the group, cheese, increased by 26%, but the highest increase in imports (4.5 times more) was in the case of liquid milk. As regards imports from the surrounding countries, imports from Slovakia reached the highest level, or 15% of total imports, in 2003. Imports from Slovakia increased by 80% from 2000 to 2003.

As we have joined the EU, we have to prepare for harsh competition both in the raw milk and processed milk markets. The processing industry is under foreign control, but it was impossible to forecast the nature of changes after accession regarding the market of raw materials or the import of end-products. Hungarian companies primarily fear the aggressive marketing and pricing policies of German companies (Zott, Müller, Bauer, Ehrmann). This fear of imports and insecurity is observed throughout the industry, due not only to the threats posed by the imports themselves, but by the perceived lack of information too. Producers feel vulnerable in the face of cheap, imported milk from Slovakia, while processors are endangered by cheap, yet good quality, import products, especially cheeses. Processors' fears are justified by import tendencies. (*Kartali et al.* [2004])

One warning sign is that, besides the EU-15, other countries in the new EU-10 have significantly increased their export of milk and milk products to Hungary in 2003 and 2004. This is a warning sign for both the producers and the processors. One business rationale that is typical of foreign-owned businesses is the risk they take in buying their raw material at a lower price from abroad. For the processors, the risk is the rational decision of price-sensitive consumers when they choose the cheaper product.

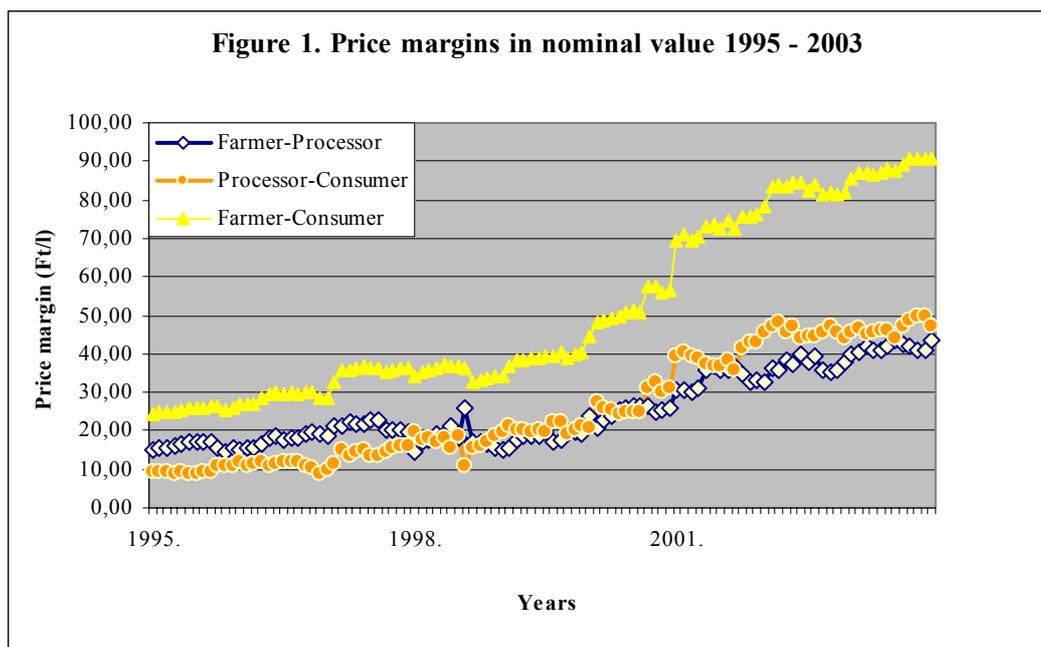
4. Price margins in the dairy sector

The figures below show the price margins in the dairy sector between 1995 and 2003, in nominal and real values. When analysing these figures, it became clear that the price margin between the producer and processor stages was wider than the commercial margin between 1995 and 1998. This was probably the consequence of the concentration of the processing industry and the deconcentration of producers. It is generally believed that the level of concentration in the Hungarian food sector is far too high. Due to privatization and foreign investments, companies in the food sector became overemphasized. However, both national and international practices indicate that this does not hold completely. If we compare our food companies with those in the developed EU, there is not a big difference between them. (*Lakner-Hajdu* [2002])

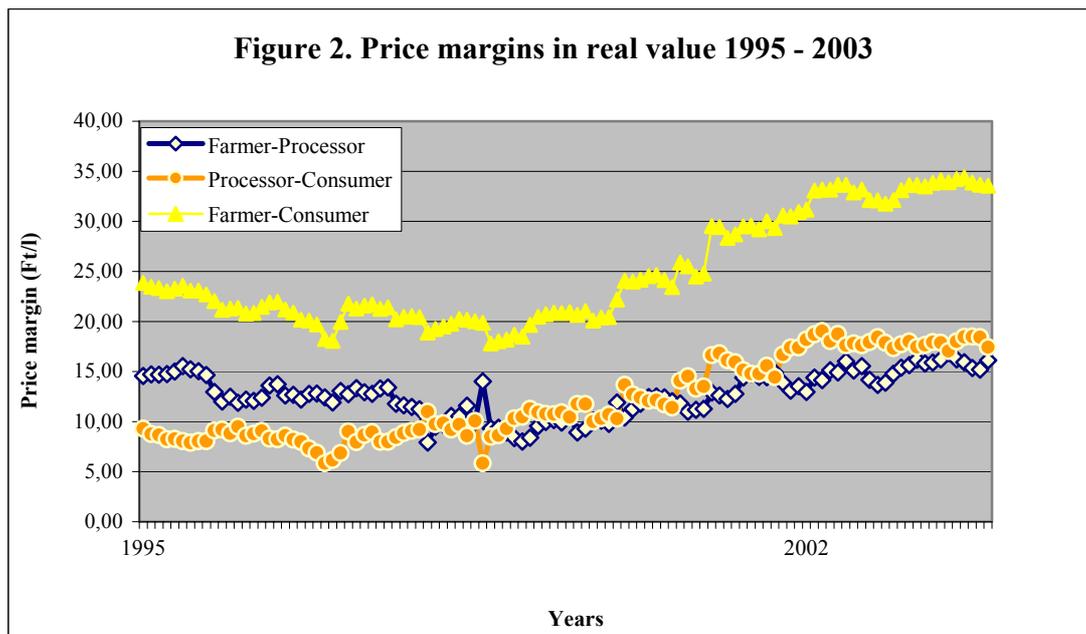
However, during the period after 1988, processors lost their market power within the chain; it was partly due to the scandals around the faltering MIZO and some other processors. Furthermore, a significant amount of foreign capital has been invested in the milk processing industry, its share increased with 20% from 1998 to 2000 and set at 80%. (Rontóné, [2005]) In parallel with this, the commercial sector has taken over and increased its market power. This was the time when huge commercial chains spread and the severe struggle for supplier positions has started, opening the door for the strengthening of the commercial sector as price maker in the market dealing with 100 million l surplus milk.

The figures show that the peaks of different price margins between the stages varied and increased continuously between 1998 and 2000. During this period, the balance of forces between processors and traders was probably evened out. Later, in 2001, price margins started to increase rapidly, even when calculated on nominal values. In this period, the price margin of the commercial sector seems higher, attributable to market distortion. In the battle for price margin, the commercial sector seems to be taking the lead. Some professionals claim that quality support on extra milk paid to farmers between 2001 and 2003 directly contributed to the increase of the commercial margin. By this support, of which farmers only came to a part, they were willing to cooperate with commercial companies – even when prices stagnated. Others claim that market members recognized that the easiest way to increase profit on milk products – assuming a slight increase in consumption - is to increase prices at a higher rate than would be reasonable based on the price changes of raw milk. (Cotterill [2000]; Mészáros – Popovics [2004])

The imported dairy products that farmers have to compete with started to grow in this stage. Various imported milk-substitutes appeared in shops as well, at very low prices. Although domestic processors started to produce these kinds of products as well, they could not compete with the prices of these less perishable products.



Source: own calculations based on data from the Hungarian Central Statistical Office



Source: own calculations based on data from the Hungarian Central Statistical Office

5. Econometric analysis of the Hungarian milk sector

Data source and estimation procedure

We used monthly data between 1995 and 2003. Both the producer prices as well as the processor prices have been applied. These source of data is the Central Statistical Office. Based on the data available we were able to investigate the price transmission not only between the farm gate and consumer, but also between the farm gate-processor and processor-consumer level.

We used autoregressive model in order to eliminate the autocorrelation (*Ramanathan [2003]*).

We also examined the nature of the price information flow: whether it goes in „bottom-up” or „top-down” direction through the marketing channel. The *Granger causality test* came handy to develop our opinion in this respect (*Ramanathan [2003]*, *Tóth [2003]*).

The nominal prices have been deflated by the appropriate producer price indexes.

Model specification

The information on the nature of price information flow is not sufficient to predict the amplitude and delay of asymmetry of price transmission in the next phase of the vertical chain. It is very important to answer this question because – based on the results – we can conclude the imperfect/perfect operation of the market in question. When we realize price asymmetry,

we can state that the market does not fulfill its equilibrium creation and income allocation functions properly⁴.

In order to decide whether the price formulation has got an asymmetric nature we used the price model of Kinnuchan and Forker (*Kinnuchan, H.W., Forker, O.D. [1987], Tóth [2003]*). We did not include the marketing cost into the model because we did not want to investigate the efficiency of the margin but instead the nature of price formulation in the next phase.

Three models have been created for the price transmission:

$$dfl_pcp = c ar(1) ar(2) sdppri sdpprd \quad (1)$$

$$dfl_cp = c ar(1) ar(2) sdpcpri sdpcprd \quad (2)$$

$$dfl_cp = c ar(1) ar(2) sdppri sdpprd \quad (3)$$

where

dfl_pcp: deflated processor (output) price

dfl_cp: deflated consumer price

c: constant

ar(1) és *ar(2)*: autoregressive terms

sdppri: cumulated producer price increase

sdpprd: cumulated producer price decrease

sdpcpri: cumulated processor price increase

sdpcprd: cumulated processor price decrease

Model (1) describes the price transmission of the processing-, model (2) the retailers' phase, while model (3) refers to the whole chain. For the separation of immediate and long-term price effect we used *Almon* delay model with first order polinom, two delay period for the price increase and one period (month) for the price decrease, respectively.

A priori assumptions for the model parameters have based partly on Tóth's survey *Tóth [1999]*, partly on the oligopolistic market structure of the domestic milk sector. The assumptions have also been strengthened by the immanent perishable nature of the raw milk as well. According to this supposition we have formulated the following hypothesis:

- the price increase appears in the price increase of the next phase in a greater extent than that of the decrease one,
- the immediate price increase effects are higher than those of the immediate price decrease,
- the time procession of the adjustment will differ from each other.

Summarizing them we can expect asymmetric price transmission during the last decade in the milk sector.

We have divided the time series into two parts in both (causality- and asymmetry test) cases. According to the observations made in the fourth chapter of this study we split the data *before- and after 1999 series*.

The econometric analysis have been made with Eviews 5.1.

⁴ See *Meyer, J. and Cramon-Taubadel, S. von [2003], Tóth [1999], és Tóth [2003]* in this respect.

Results

Causality test

We summarized the results of the Granger causality test⁵ in table 3.

Table 3

Delay	Processing phase			Retailer phase			Total vertical chain		
	1995-2003	1995-1998	1999-2003	1995-2003	1995-1998	1999-2003	1995-2003	1995-1998	1999-2003
1 month	↑*	↑*	↑***	↓***	↓***	↓***	○	→←	↓*
2 month	↑*	↑*	↓**	↓***	↓*	↓*	○	↑*	○
3 month	↑*	↑*	↓*	↓***	○	↓*	○	↑*	→←
4 month	○	↑*	→←	↓***	○	↓*	↑*	○	→←

Legend: ↑ the price and price enforcement information flows “**bottom-up**”
 ↓ the price and price enforcement information flows “**top-down**”
 ○ there is no significant causal relationship
 →← the causality test has resulted in inconsistency
 *** significance at 1% level
 ** significance at 5% level
 * significance at 10% level

Based on the results of Table 3 we can state that in the **processing phase** the price information and determination has got a definite “bottom-up” direction, from the milk producers to the processors. The „*mark up pricing*” theory seems to get through. Probably the milk farmers and processors accept the principle that the value formulation (basically “accumulation”) is realized according to the vertical chain. We have to draw the attention at the same time that especially in the recent years the causal relationship seems to turn back: between 1999 and 2003 (with 2 or 3 months delay) the “top-down” relationship came true.

The **retailer phase** has got a very characteristic “top-down” feature: the price information as well as the determination goes from the consumers to the processors.

For the **whole chain** the results are contradictory, we can not tell definite statements⁶.

Asymmetry

Using the models (1) – (3) we received the results summarized in Table 4⁷.

⁵ According to Mészáros - Popovics[2004] and Tóth [1999] we think that maximum 4 month delay is good enough for estimating the nature of the price information flow.

⁶ It derives partly from the ambiguous results of the two phase, but it is rather reassuring, that the analysis has proved the logical conclusions.

⁷ Only the relevant and most important results are listed here.

Table 4

Price transmission elasticities		Processing phase			Retailer phase			Total vertical chain		
		1995-2003	1995-1998	1999-2003	1995-2003	1995-1998	1999-2003	1995-2003	1995-1998	1999-2003
Increase	immediate	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***
Decrease	immediate	○	○	○	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***	○
Adjusted R^2		0,85	0,61	0,76	0,97	0,81	0,95	0,97	0,86	0,95
DW		2,02	2,04	1,95	2,01	2,03	2,00	2,02	2,02	1,99

Legend: *** significance at 1% level
 ** significance at 5% level
 * significance at 10% level
 ○ non significant

The results show that our models are well specified: the adjusted R^2 , as well as the Durbin-Watson test indicate it quite clearly. For elimination the autocorrelation of the residuum the first and second order autoregressive terms proved sufficient.

We can derive from Table 4 that both the splitting up the vertical chain into two phases as well as the division the time series into two parts became certified in the results. For the **whole vertical chain of the milk sector the asymmetric price formulation** has been verified in the examined period. This also can be stated for the different time periods and the different phases as well. The majority of increase parameters significantly indicate that the price increase appears in the next phase' as well as in the final product's price. Regarding the long term effect the amplitude is typically higher when the prices go up, than they go down. At the same time the price decrease generally does not have so much effect in the next phase' price formulation, especially in the processing phase and in the retail phase between 1999 and 2003.

Conclusions and some concerns

In the theoretical model of the economy the price incorporates perfect and complete information on the market. Consequently the decisions made upon the market prices are necessarily conditions of the optimal functioning of the economy. At the same time there are existing periods and situations in the life of the national economies when the actual functioning of the economy is far away of the theoretical optimum and the market information is some-how imperfect.

According to our analysis we have to face to the same situation between the period 1995 and 2003. While generally introducing the milk sector in Hungary we pointed out the facts (oligopolistic market structure, existence of market power) which can play decisive role in the asymmetric price transmission. The results of the applied models have proved our hypothesis.

From the viewpoint of functioning the milk sector we would like to emphasize the importance and propose for further discussions the following results.

- The results clearly show that in the processing phase the information goes in “bottom-up” direction. It seems that the value creation is based on “added value” approach, summarizing the value of the previous phase. We can tell that this type of value determination is that of “production-like” instead of “market-like”.
The prices of the retail phase at the same time are determined on the market. It seems worth to analyze, why the consumer market information does not go through the market channel?
- Without any doubt the division of the vertical chain into two phase has got very sense: the producer-processor phase has got absolutely other character than that of the processor-retailer one. This result underline that there is not sufficient to examine just the producer-consumer relationship.
- The results of the causality test *per se* not necessarily refer to the existence of market power, but together with the results of the asymmetry we can conclude that the higher phase of the vertical chain could exercise its interest more efficiently than that of the lower one.
- In the second period the asymmetric feature of price formulation became more characteristic in both phases, which – according to the previous statement – means more unbiased market functioning.

The questions raised here are more general than just the problems of the milk sector. The question also can be put to the global energy sector as well which is far beyond the scope of this study.

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