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PRICE ASYMMETRY IN FARM-RETAIL PRICE TRANSMISSION IN THE TURKISH DAIRY MARKET

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Price Asymmetry in Farm-Retail Price Transmission in the Turkish Dairy Market

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Abstract

This study investigates the price asymmetry in farm-retail price transmission in the Turkish milk market. An asymmetric error correction model is applied on the monthly price data, and the results suggest that there is a positive price asymmetry in the farm-retail price transmission in the Turkish dairy market. That is, the retail prices tend to adjust more quickly to the input price increases than to its decreases which yield welfare losses to the consumers. In addition, cointegration results imply that there is a significant market power in the dairy market.

Keywords: Price Asymmetry, Turkey, Milk, Error Correction Model

1. Introduction

Price transmission processes in the food marketing chain have received considerable attention as the markets become more concentrated. This implies that the links between the production and retail stages become indistinct, and that the retailers start to gain greater market power. An important indicator of the market power is the existence of price asymmetries which imply that price transmissions differ according to whether such prices are increasing or decreasing. By definition, price asymmetries describe the unreciprocal relationship between the price increases and decreases for a product through the farm gate and retail stages. A symmetric price transmission implies that a price increase or decrease in production influences the consumption by the same rate. If the price transmission between the specific stages of the supply chain is asymmetric, then the price changes at the production level are not passed to price changes at the processing and/or retail level. Price asymmetries could be negative or positive depending on its effect. A positive (negative) price asymmetry occurs when a decrease (increase) in prices at the farm level is not fully or immediately transmitted, but an increase (decrease) passes more quickly or fully on to the final consumer (Meyer and von Cramon-Taubadel 2004; Vavra and Goodwin 2005).

Price asymmetries are important because it implies a different distribution of welfare and a redistribution that would be obtained under symmetry, where the processors and retailers that handle the control of the food chain do not pass on the associated price reductions (Meyer and von Cramon-Taubadel 2004:582; Hahn 1990). Asymmetric price transmissions characterize non-competitive imperfect markets. As indicated in Peltzman (2000), asymmetric price transmission is the rule rather than the exception, and much scholarly work has revealed that asymmetric price transmissions are quite common, especially in agriculture.

Goodwin and Holt (1999) note that the direction of causality in agricultural supply chains flow from the farm level to the retail level. Serra and Goodwin (2003) found limited asymmetries in sterilized milk in the Spanish dairy industry, while Caps and Sherwell (2005) observed that milk prices at the retail level adjust more slowly to the decreases and more quickly to the increases in milk prices at the farm level. Asche et al. (2007) found a high degree of price transmissions in the supply chains as well as the integrated markets for salmon fish. According to Bernard and Willet (1996) downward

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movements in wholesale price passed on more fully to the growers than the increases in the wholesale price in their study regarding the broiler industry in the US where the concentration ratios of the processors are high in the period of 1983-1992, and where the industry is vertically integrated and the production is mostly done under contracts. There are a number of reasons for incomplete asymmetric price transmissions, such as market power, adjustment and menu costs, etc. (Meyer and Von Cramon-Taubadel 2004). According to Peltzman (2000), competitive as well as oligopolistic market structures simply cannot be the reason for the presence of asymmetric price transmissions; hence, it could not imply market power. However a great deal of research has implied market power to be the most important cause for the intense transmissions of price increases (Bernard and Willet 1996; Aguiar and Santana 2002).

This study investigates the price asymmetry in farm-retail price transmission in the Turkish milk market. The analysis of price transmissions in the Turkish dairy sector is considered to be relevant for a number of important reasons. To begin with, to the best of our knowledge, this topic is not empirically investigated. Additionally, there were important changes during the late 2000s in the dairy sector, resulting in high levels of concentration and raising the concerns about the efficiency of price transmissions. In turn, there has been an increase in the number of farms, dairy cowherd, and in product specialization and intensification. Although the dairy sector appears to be improving, the price formations in the dairy markets are somehow interesting, causing the demand for dairy products to become concentrated. Since the farmer cooperatives are not efficient, the sector is characterized by marketing contracts, meaning that farmers do not relatively have market power and that the farm-level price of milk is mainly determined by the industry. The selling price of a standard quality milk at the farm gate in Turkey in April 2013 has been around 0.80 TL (0.44 USD), but the price of UHT milk in the market shelves is around 2.45 TL per liter (1.36 USD). The difference between the farm gate and the retail prices cannot be explained other than by the use of market power sourcing from the non-competitive markets by the processors and retailers. Therefore, the differences between the farm gate and retail-level prices are of significant interest.

The paper is organized as follows. Section 2 provides an overview of the dairy sector in Turkey. The data, methodology and empirical results are provided in Section 3. Finally, concluding remarks are provided in Section 4.

2. An Overview of the Dairy Sector in Turkey

Turkey is among the 15 largest milk producers in the world. Livestock farming accounts for one-third of the agricultural GDP, involving some 2.5 million enterprises. The total annual milk production is about 15 billion liters. About 90 percent of this production is cow milk and the rest comes from goat, sheep, and buffalo. The production conditions vary considerably between the western and the eastern parts of the country. In this respect, the climatic conditions are more favorable in the western regions, allowing the development of commercially-oriented dairy farming. In contrast, extensive smallholder dairy farming prevails in the eastern and northern regions, where production is characterized by subsistence farming and a lack of a professional approach to production. The local native cattle are mostly found in the central and eastern Anatolia, whereas purebreds are more dominant in the western regions

There is a stable increase in the number of cattle with a total number of cattle of 12.3 million in 2011 from 9.8 million in 2008. The number of milking cows, however, has increased to 4.7 million from 4.4 million in the same period (Table 1). Milk yields vary according to breed: 3,881 kg per lactation for pure-breed cattle; 2,711 kg per lactation for crossbreed; and 1,317 kg per lactation for native breed. The national average lactation yield is 1,700 kg per lactation period.

Table 1.Total Number of Milking Animals (Million Heads)

	Total	Cattle	Sheep	Goat	Buffalo
2002	21.6	4.39	13.6	3.5	0.51
2003	20.7	5.04	12.4	3.1	0.57
2004	16.3	3.87	9.9	2.4	0.39
2005	16.6	3.99	10.1	2.4	0.38
2006	16.8	4.18	10.2	2.4	0.36
2007	16.6	4.22	10.1	2.2	0.30
2008	15.7	4.08	9.6	1.9	0.32
2009	15.4	4.13	9.4	1.8	0.32
2010	17.5	4.38	10.5	2.5	0.35
2011	19.3	4.76	11.5	3.0	0.40

Source: Turkish Statistical Institute(2012)

Dairy products have an important role in the Turkish diet. Very little liquid milk is consumed; the most common form of consumption is yoghurt, followed by white cheese (feta type) and ayran, a liquid salted milk drink. The annual per capita consumption of milk and milk products amounts to 132 liters, a figure that is low compared to other European countries. In 2011 the total production exceeded 15 million tons, a 42 % increase as compared with the production in 2003.Of the total production of about 15 billion liters of milk, 3 billion liters are used by farm families for their own consumption or processing, 1 billion liters are handled by street vendors, over 2 billion liters are processed by *mandira*s (small, simple processing establishments) and well over 3.5 billion liters are processed by medium and large-sized dairies. More than 6 billion liters of milk are handled outside any formal quality control, unpasteurized and unpacked. Dairies find it difficult to obtain sufficient quantities of high quality raw milk. The collection and quality control naturally increase the cost of raw milk by between 10 to 15 percent. As a consequence final consumer prices for dairy products and processed milk become high, which is the reason that large part of the population turns to the informal sector to obtain milk. The production of raw milk is mainly from cows and accounts for 92,35% of the total production in 2009, 91,69 % in 2010 and 91,67 % in 2011 (Table 2).

Table 2. Cattle Milk Production (Million liters)

	2009		2010		2011	
Milk Production	12.5	100 %	13.5	100 %	15.0	100 %
Milk From Cattle	11.5	92,35 %	12.4	91,69 %	13.8	91,67 %
Culture Breed	5.7	45,55 %	6.3	46,58 %	7.2	48,08 %
Cross Breed	4.5	36,56 %	4.8	35,90 %	5.3	35,48 %
Domestic Breed	1.2	10,24 %	1.2	9,21 %	1.2	8.11 %

Source: Turkish Statistical Institute (2012)

In Turkey, dairy processing industry received a considerable investment and the number of modern milk processing plants has increased over the last few years. Parallel to this increase in the number of processing firms, the amount of milk produced and processed has also increased. Most of the processing factories are equipped with ultra-modern technology. In this respect, there is eight dairy processing or affiliated companies among the top 500 Turkish companies. Leading companies in this sector are primarily organized under two institutions; SETBİR (Union of Dairy, Beef, Food Industrialists and Producers of Turkey**)** and ASÜD (Packed Milk and Milk Products Manufacturers Association). Cooperatives such as the Central Union for Animal Cooperatives, are supporting the producers. Cooperatives and the cooperative unions offer support for milk collection, provision of cooling tanks, milk quality control, and the sale of milk to other processors. Other services include input procurement, provision of veterinary services, the supply of animal feed, and seeds, and

training/education. Others have built up considerable processing capacities and some are involved in milk production themselves.

The modern large dairies appear to develop without any public support. Some of them produce in line with the EU standards and, as such, face considerable price pressure from large supermarket chains. In addition the dispersed location of production units in much of the country causes a very costly and inefficient milk collection system. Two issues emanate from this; On the one hand, this situation feeds into the street milk sector, where uncontrolled, unpasteurized and low-quality milk is delivered to consumers at a low price. On the other hand, the processors are not able to produce dairy products at a cost that is affordable to the common consumer and become compatible in the European context.

As stated before, considerable amount of milk is processed by small-scale, labor intensive processing units called *mandira*. They usually do not possess a milk collection and distribution system and mainly concentrate on production alone. Moreover a significant number of *mandiras* are run seasonally and unregistered (CEEC 2006; FAO 2007) and could process between 18% and 35% of the milk produced. Farm family consumption is estimated in the range between 15-40%, including the milk fed to farm animals. The direct sales to the final consumer are about 30% of the milk production.

Another drawback is that the holding structure of farm holdings is inadequate for intensive production, since most of the holdings (85%) own less than 9 animals. These holdings account for 57% of the total number of animals. The share of holdings possessing more than 50 animals is 3.6% and the average animal number (herd size) per holding is 5.7 heads. 97.7% of the animals in the holdings producing milk had between 1 and 25 heads in 2005, while 0.02% of them had more than 100. Milk producers can be classified into four categories (FAO, 2007): a) Self-sufficient producers having one or two cows. They consume the milk themselves, b) Small producers with 3 to 10 cows. They sell the milk to consumers, the collecting center, *mandiras*, or other milk processing units, c) Medium-size producers with 10-50 cows. They perform dairy farming commercially and sell their milk to the processors, and d) Professional producers with 100 and more cows.

In 2010, and as a policy, the Turkish Agricultural Bank opened long term credits with zero interest rates for dairy and feeding cow breeders in order to support the industry. These convenient credits allured the investors and a gold rush started. During the years 2010 and 2011,the total of the credits used by the industry amounts to 5.9 billion Turkish liras (about 3.28 billion USD), and 4.3 million cows (milk and feed) were purchased by the new enterprises, as well as the old firms.Many investments related to the dairy processing industry become equipped with high technology, and the result was an increase in the production of milk, altering the price of raw milk. Also, the industry observed new labels entering the market,with most of the retail chains had producing own brands and starting to compete with the others in the market.

The collected cow milk is processed into drinking milk, cheese, yoghurt, ayran and other dairy products like butter, kefir, milk cream, and ice cream. The drinking milk production by the industry through 2010 showed an upward trend. Two main improvements triggered this as well as each other. First as the industry improved, the new comers and the old firms began to increase their production. Second, as the process of urbanization accelerated and the supermarkets gained more importance in terms of consumers shopping preferences, consumers started to buy and use more milk and other dairy products –especially those packed for different consumption purposes that made milk to be stored in houses for longer duration– from the supermarkets.

Generally speaking the production costs of milk are high in Turkey and raw-milk producers work with low-profit margins due to costs mostly on feed and other services. Production based on contract is common in the dairy sector and the producers sell their raw milk to major processors and there is a high concentration in the sector. This indicates that the producers face unfair competition in the marketing of their milk, and that the price is mainly determined by the industrial processors independent from the cost of production. The producer revenue consists primarily of the sales of the milk, and secondarily, the sales of the animal, naturally making the cost of production of undoubtedly

important. However, the progress of the prices of raw milk is significantly lower than the progress of the main costs, and also lower than the final goods processed from raw milk. Thus, it is easily understood that the value is acquired not in the production stage but inside the supply chain, and that the real winners are not the producers, but the holders of the last stage, where the goods are sold to the final consumers.

3. Data, Model and Empirical Results

3.1. Data

In order to analyze the price asymmetry in the Turkish Dairy sector the monthly raw milk prices (RWMP) and retail milk prices (RMP) are used for the period January 2003 to December 2012. Both prices are from the Turkish Statistical Institute (TURKSTAT). Figure 1 shows the monthly behavior of farm and retail prices used in the study. As expected these two variables seem to be non-stationary (see Figure 1).

Figure 1 Time Plot of Raw Milk Prices (RWMP) and Retail Milk Prices (RMP)

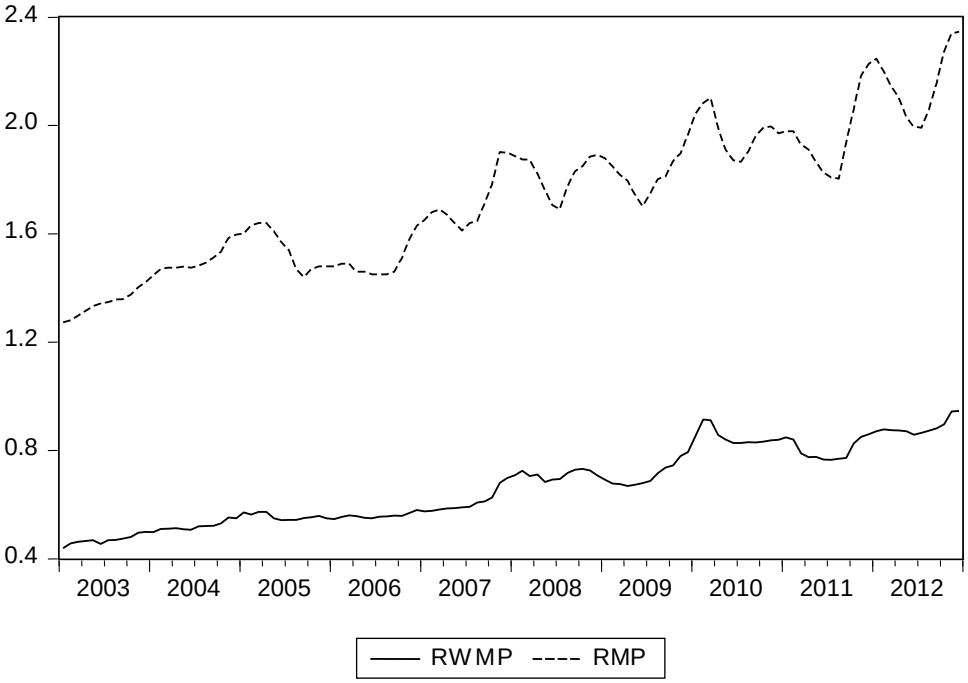

Table 3 presents the unit root test (ADF) results. As is clear from this table, for the *levels* of all the two variables, the null hypothesis of a unit root is not rejected at the 1% significance level by the ADF tests without the trend. However, ADF tests, with the trend term, indicate the possibility of trend-stationarity in the data.[4] These results imply that the existence of unit roots is not clear in these two variables. Therefore, we will consider this ambiguity in our empirical analysis below.

[4]The null hypothesis for the first differences of the two variables is rejected (p-values=.0000).

Table 3.ADF Tests

Variables	ADF Tests		
	Level		First Difference
	Without Trend	With Trend	Without Trend
RMP	-0.9288 (3)[a] [0.7759][b]	-6.2481 (1) [0.0000]	-7.2284 (5) [0.0000]
RMWP	-0.4763 (1) [0.8907]	-3.4538 (1) [0.0493]	-7.2913 (0) [0.0000]

[a]Numbers in parentheses are the optimal lag length chosen by the Schwarz Bayesian Criterion (SBC). Max lag=12.
[b]Numbers in square brackets are p-values.

3.2. Model and Methodology

In order to analyze the relation between the prices the standard Engle and Granger (EG)approach is used due to the possible non-stationarity in the data (see Bacon and Kojima, 2010).[5] Initially, the long run equilibrium relationship between the retail price of milk (RMP) and raw milk price (RWMP) is estimated by the following equation:

$$RMP_t = \beta_0 + \beta_1 RWMP_t + u_t, \quad (1)$$

where RMP is the monthly retail price of milk and RWMP is the monthly raw milk price and u is the error term.

Since Equation (1) relates the output price (RMP) to the input price (RWMP), β_1 is expected to be 1 to show that input costs are passed fully to the final (retail) prices (Bacon and Kojima, 2010).

In order to provide a *benchmark for the asymmetric error correction model (*ECM*),* consider the following *symmetric* ECM specification.

$$\Delta RMP_t = \sum_{i=1}^{k1} \delta_{hi} \Delta RMP_{t-i} + \sum_{i=0}^{k2} \delta_{ni} \Delta RWMP_{t-i} + \phi(RMP_{t-1} - \beta_0 - \beta_1 RWMP_{t-1}) + \varepsilon_t \quad (2)$$

where, Δ is the difference operator, ε is the error term and all variables are as defined earlier.

Equation (2) gives us the basic error correction model without any asymmetry. Here δ_{hi} measures the short-run impact of the lagged (*t-i*) retail prices of milk and δ_{ni} measures the short-run impact of raw milk prices (at *t-i*) on the price of retail milk price, ϕ is the long-run equilibrium adjustment parameter and the disequilibrium term $RMP_{t-1} - \beta_0 - \beta_1 RWMP_{t-1}$ $(or\ u_{t-1})$ is derived from the long run relation between retail price of milk and raw milk as stated in Equation 1. The parameter ϕ is also interpreted as the adjustment speed to correcting short-run disequilibrium.

In the case of asymmetric pricing, the adjustment process could be different for increases than for decreases in input prices. Following Granger and Lee (1989), in order to allow for asymmetries, the

[5]This sub-section partly draws from Bor and İsmihan (2013).

first differences on the variables are decomposed into their positive and negative components at each time (t). Therefore, ECM for the asymmetric case can be specified as follows:

$$\Delta \mathrm{RMP_t} = \sum_{i=1}^{k1} \delta_{hi}^{+} \Delta \mathrm{RMP_{t-i}} + \sum_{i=0}^{k2} \delta_{ni}^{+} \Delta \mathrm{RWMP_{t-i}} + \varphi^{+}(\mathrm{RMP_{t-1}} - \beta_0 - \beta_1 \mathrm{RWMP_{t-1}}) + \sum_{i=1}^{k1} \delta_{hi}^{-} \Delta RMP_{t-i} + \sum_{i=0}^{k2} \delta_{ni}^{-} \Delta RWMP_{t-i} + \phi^{-}(RMP_{t-1} - \beta_0 - \beta_1 RWMP_{t-1}) + \varepsilon_t \quad (3)$$

where, the superscript + (–)for the coefficient of ΔRMPimplies that this variable takes the actual value if positive (negative) or equals to zero, otherwise. δ_{ni}^{+}andϕ^{+} (δ_{ni}^{-} and ϕ^{-}) apply when raw milk prices increase (decrease).

As mentioned above, in order to capture the asymmetries in the short run, $\delta_{hi}^{+}\Delta RMP_{t-i}$ and $\delta_{\mathrm{hi}}^{-}\Delta \mathrm{RMP_{t-i}}$ (the lagged retail milk price increases and decreases, respectively) $\delta_{ni}^{+}\Delta RWMP_{t-i}$ and $\delta_{ni}^{-}\Delta RWMP_{t-i}$ (the lagged raw milk price increases and decreases, respectively) are used. The asymmetry in the adjustment speed is also checked by defining disequilibrium terms using $\varphi^{-}\left(\mathrm{RMP_{t-1}}-\beta_0-\beta_1\mathrm{RWMP_{t-1}}\right)$ and $\varphi^{+}\left(\mathrm{RMP_{t-1}}-\beta_0-\beta_1\mathrm{RWMP_{t-1}}\right)$.

The presence of asymmetry can be checked (jointly) by performing a standard Wald test both on the speed and magnitude of the adjustment with following null hypothesis: H_o: $\delta_{\mathrm{hi}}^{+}=\delta_{\mathrm{hi}}^{-},\delta_{\mathrm{ni}}^{+}=\delta_{\mathrm{ni}}^{-}$ and $\varphi^{+}=\varphi^{-}$*for all* i. Additionally, the asymmetry can also be checked in the adjustment speed (H_o: $\phi^{+}=\phi^{-}$) as well as in the magnitude of the adjustment (H_o: $\delta_{\mathrm{hi}}^{+}=\delta_{\mathrm{hi}}^{-},\delta_{\mathrm{ni}}^{+}=\delta_{\mathrm{ni}}^{-} for\ all$ i) separately.

3.3. Empirical Results

The asymmetric error correction model as specified in Equation (3) is estimated. In order to do so, first, the long-run relation as set-out in Equation (1) is estimated. Engle-Granger cointegration tests confirm the existence of a cointegration relations.[6]Table 4 provides the estimation results on the long-run relation between RMP and RWMP.

Table 4. Long-run Relation

Dependent variable: RMP		
Variable	***Coeff.***	***Std. Error***
Constant	0.5516	0.0313
RWMP	1.7701	0.0460

Considering the finding in Section 3.1 that the existence of unit roots is not clear in RMP and RWMP, we also check for the existence of long-run relationship between these variables with Bounds test and found a cointegration relation.[7] By using ARDL approach we also found a similar and significant result: RMP= 0.6095 + 1.6808 RWMP. (Cointegration results are going to be discussed at the end of the section)

[6]Test results are available upon request from the authors.

[7]Test results are available upon request from the authors.

Table 5 provides the empirical results on the asymmetric ECM specified in Equation (3). It should be noted that the length of the distributed lag process was determined based on Schwarz Information Criterion.

Table 5.Asymmetric ECM

Dependent Variable →	ΔRMP	
Independent Variable	***Coeff.***	***Std. Error****
$\Delta RWMP^{-}$	1.2282	0.4520
$\Delta RWMP^{-}_{t-1}$	0.2277	0.3245
ΔRMP^{-}_{t-1}	0.5337	0.1106
$\Delta RWMP^{+}$	0.8101	0.4558
$\Delta RWMP^{+}_{t-1}$	-0.1071	0.2382
ΔRMP^{+}_{t-1}	0.6432	0.1448
$(RMP_{t-1} - \beta_0 - \beta_1 RWMP_{t-1})^{-}$	- 0.2439	0.0493
$(RMP_{t-1} - \beta_0 - \beta_1 RWMP_{t-1})^{+}$	- 0.0942	0.0440

*Newey-West heteroscedasticity and autocorrelation consistent standard errors.

The null hypothesis of symmetry, when jointly testing the speed and magnitude of the adjustment (H_o: $\delta^{+}_{hi}=\delta^{-}_{hi}$,$\delta^{+}_{ni}=\delta^{-}_{ni}$ and $\varphi^{+}=\varphi^{-}$ *for all* i), is not rejected (p-value=0.8715). However, when separately testing the asymmetry in the adjustment speed the null hypothesis of symmetry (H_o: $\phi^{+}=\phi^{-}$) is rejected, and this implies that there is an empirical evidence on asymmetric pricing.[8] The results from Table 5 implies that the retail price of milk adjusts in roughly 4 months (1 / -0.2439) to the price increases in the raw milk but it takes about 10 months (1 / -0.0942) for the adjustment in price decreases.

In order to complete the picture, long run relationship between retail and raw milk prices are analyzed explicitly by using the cointegration results. The estimation results from Table 4 points out that 1TL increase in the raw milk prices increases the retail milk prices by 1.77TL in the long-run. Since the processors and the retailers incur costs like processing, packaging, distribution, inventories; this figure shows that there is a difference that cannot be explained by the cost formation in the long run. Thus, this result may indicate a significant market power in the milk market. This, in turn, in line with the empirical evidence on the asymmetry in the adjustment speed as shown above.

4. Conclusion

The results of this paper support the view that retailers exercise market power in Turkey as evidenced by asymmetric price responses. More specifically, it is found that there exists a positive price asymmetry in farm-retail price transmission in the dairy market and that such retail prices adjust more quickly to raw milk price increases than to its decreases. This, in turn, implies welfare losses to the consumers.

Moreover, the cointegration results imply a significant market power. There are two main reasons for such market power that are not only correlated, but also trigger each other. First, milk is a storable

[8]Even though the null hypothesis of symmetry is rejected for the speed parameters (p-value=0.0283), the null hypothesis of the symmetry of magnitudes of adjustment (H_o: $\delta^{+}_{hi}=\delta^{-}_{hi}$,$\delta^{+}_{ni}=\delta^{-}_{ni}$) is not rejected (p-value=0.6873).

product traded in concentrated markets and the results indicate that there is a larger degree of elasticity of transmission for price increase. The main cause of this asymmetry lies in the asymmetric relations shaping the formation of the production chain. Producers keep their raw milk in the cooling tanks, where it stays fresh for only a few days before collection by the processor. Therefore, the producers of raw milk are forced to work under contracts and, inevitably, have little bargaining power over the processors. Nevertheless, after the processing stage the milk can stay fresh for several months on the shelves in UHT (Ultra-Heat Treatment) packets. Second, the gradual integration of food markets makes it difficult for average producer of raw milk enter goods and input markets and so they will be faced with price risk. In order to overcome these risks and guarantee minimum revenue, they are forced to enter negotiations including contracts with private firms in the absence of government intervention, where such firms supply credit, inputs, and the know-how to the farmers as well as guaranteed price. Yet, as the old saying goes, there is no free lunch. By entering such contracts, private firms directly or indirectly control the production process by manipulating the standards of production, production quantity, quality, resulting in the farmers' loss of sovereignty over production.

References

Aguiar, D. and Santana, J.A. 2002. Asymmetry in Farm to Retail Price Transmission: Evidence for Brazil. Agribusiness, 18, 37-48.

Asche F., S. Joffry and J. Hartmann, 2007. "Price transmission and market integration: vertical and horizontal price linkages for salmon" Applied Economics ,39 pp:2535-2545.

Bacon R.W., Kojima M., 2010. Rockets and Feathers: Asymmetric Petroleum Product Pricing in developing Countries. Extractive Industries for Development Series #18, June 2010, The World Bank.

Bernard J.C., and L.S. Willet, 1996, "Asymmetric Price Relations in the U.S. Broiler Industry" Journal of Agricultural and Applied Economics 28,2 (December) pp:279-289.

Bor O. and M. İsmihan, 2013. "Gasoline Pricing, Taxation and Asymmetry: The Case of Turkey" Turkish Economic Association, Discussion Paper 2013/7, www.tek.org.tr

Capps Jr. O. and Sherwel P. 2005. "Spatial Asymmetry in Farm-Retail Price Transmission Associated with Fluid Milk Products", Selected Paper Prepared for Presentation at the American Agricultural Economics Association, pp.1-27.

CEEC, 2006. Structure and Competitiveness of the Milk and Dairy Supply Chain in Turkey, Agro Economis Policy Analysis of the new Member States, the Candidate States and the Countries of the Western Balkans Project, D12-3 Third 6 monthly Report, http://www.euroqualityfiles.net

FAO, 2007. Overview of the Turkish Dairy Sector within the Framework of EU-Accession. FAO Regional Office for Europe and Central Asia, Policy Assistance Branch.

Goodwin, B.K. and Holt, M.T. 1999. "Price transmission and asymmetric adjustment in the U.S beef sector" American Journal of Agricultural Economics 81, pp:630-637.

Granger, C.W. J. and Lee, T. H. 1989. "Investigation of production sales and inventory relationships using multicointegration and nonsymmetric error correction models." Journal of Applied Econometrics 4: 135–159.

Hahn, W.F. 1990. Price Transmission Asymmetry in Pork and Beef Markets. The Journal of Agricultural Economics Research, 42, 21-30.

Meyer, J. and S. von Cramon-Taubadel. 2004. "Asymmetric Price Transmission: A Survey", *Journal of Agricultural Economics.* 55: 581-611.

Peltzman, S. 2000. "Prices Rise Faster than They Fall", *Journal of Political Economy*, 108: 466-502.
Serra T., and B.K. Goodwin. 2003. "Price Transmission and the asymmetric adjustment in the Spanish dairy sector" Applied Economics, 35:18 pp:1889-1999.

Turkish Statistical Institute., 2012. Various Agricultural Statistics. www.tuik.gov.tr

Vavra, P. and B. K. Goodwin. 2005. "Analysis of Price Transmission Along the Food Chain", *OECD Food,Agriculture and Fisheries Working Papers*, No. 3, OECD Publishing.