

The Effects on the Red Meats Prices of Feed Price: The Case of Turkey

Ayşe Çoban, Orhan Çoban and Özer Coşkun

Abstract- In this study, using Granger causality test and ARDL bounds testing method, we analyzed the price transmission mechanism between wholesale and retail red meat prices and the impact of some variables on red meat prices in Turkey. In the analysis, the prices of wholesale beef, retail beef prices, fattening feed, milk feed, wholesale milk, corn, retail chicken prices and exchange rate data were used.

According to the results of the analysis, two-way causality relationship between wholesale and retail meat prices was observed. According to the ARDL short-term models, the retail price impact factor of the wholesale prices was 0.44 and the retail prices' wholesale price-affecting coefficient was 0.45. Therefore, these prices affect each other equally in the short term. According to the ARDL long-term models, the retail price impact factor for wholesale prices was 0.54, while the wholesale price of retail prices was estimated to be 0.87. In summary, there is a bi-directional interaction between wholesale beef prices and retail beef prices. Retail prices are more likely to influence wholesale prices. Therefore, there is an asymmetric price mechanism between wholesale and retail meat prices. This indicates the existence of incomplete competition conditions in the meat market.

Keywords: Red meats prices, feed prices, Turkey

I. INTRODUCTION

The increase in red meat prices in Turkey in recent years, has led to scrutiny of the livestock sector. Although there are many different views on supply or demand side on the reasons of fluctuations in red meat prices, it is generally accepted by governments as a speculative phenomenon and importation is used as a remedy to control prices. Cattle numbers, cattle and sheep prices, milk prices, chicken meat prices, climatic conditions, changes in demand, state aids etc. Many factors have an impact on red meat prices. However, cost changes in livestock sector directly affect red meat prices. In the livestock sector, about 70% of the costs are feed prices (RK, 2010: 42; Çoban and Çoban, 2015). In this context, the change in feed prices directly affects red meat prices. According to Aşarkaya (2015), 40 percent of the inputs used in feed production are imported. The fact that feed inflows is high, feed costs and thus meat prices are influenced by exchange rates.

On the other hand, there is also a point of view expressed by government circles that the main reason for the sudden increase in red meat prices is not input costs. From this perspective, the

main reason for the change is that the oligopolistic market structure existing in the retail sector occasionally raises the meat prices by speculative. To destroy the effect of lower prices and speculative movements refers to the cheap meat imports in Turkey. According to Cevger and Sakarya (2006), meat importing feed is not a profitable business and leads farmers to leave the sector and therefore meat production decreases. Is that the main reason for rising input costs in the prices of red meat in Turkey, or to determine whether the speculative movements in the retail sector is of great importance in terms of a solution to this problem.

According to the report prepared by the Competition Authority on the red meat market, producers are deprived of market power due to the existence of small, numerous and fragmented operating structures in the cattle and ovine livestock sector (RK, 2010: 37-39). This situation makes the producers more ineffective in determining the price in the wholesale purchase market in the face of the market power of the retail sector.

According to the Red Meat Strategy Document of the Ministry of Food, Agriculture and Livestock, beef cattle breeding has a significant share in red meat production (MFAL, 2015: 8). Male calves, which are produced by breeding dairy enterprises and small family businesses, constitute the basic input of fattening. In this context, stability and profitability of dairy cattle breeding, especially milk prices, are among the most important factors that ensure sustainability in production. Özertan et al. (2015), meat prices increased with the rise in feed prices due to imports in 2007-2008, but milk prices did not rise. When dairy cattle lost their profitability, the farmers sent the dairy cows to slaughter.

The aim of this study is to determine the factors affecting the prices of red meat and to reveal the price transfer mechanism. For this purpose, price transfer mechanism will be discussed firstly in the formation of wholesale and retail meat prices and then the effects of feed prices on red meat prices will be investigated. In addition, the effects of variables such as cow's milk, chicken meat and exchange rate on red meat prices will be examined.

II. LITERATURE

Studies on red meat prices in the literature have focused more on a particular aspect of the subject. Capps et al. (1994), in the USA between January-1980 and December-1990 period, the factors affecting the prices of cattle slaughtered by regression method. According to the results of the analysis, it was determined that the amount of poultry meat had a significant negative effect on the prices of beef, the amount of pork had a significant positive effect, the price stiffness, the

A. Ç. She is with Department of Logistic, Selcuk University, Konya, Turkey
O. Ç. He is with Department of Economics, Selcuk University, Konya, Turkey.

Ö. C. He is with Turkish Statistical Institute, Van, Turkey

marketing costs and the seasonality had an effect on the wholesale prices of beef cattle.

Norton (2005) examined the reasons of the increase in the prices of beef producers in the USA in 2013. It was concluded that factors such as high animal slaughtering in the previous years, mad cow disease in Canada, stagnation in demand, feed prices and changes in slaughter weights were effective on the increase in beef prices.

Goodland (2010) examined seasonal fluctuations in meat prices in Mongolia. It is seen that meat demand has not changed in months and fluctuations in prices have been caused by supply.

Ahsan et al. (2011) examined the supply and demand side factors affecting food prices in Pakistan between 1970 and 2008 by means of ARDL (Autoregressive Distributed Lag) method with data such as per capita income, agricultural subsidies, money supply, bureaucracy index, agricultural output, world food prices. While supply-side factors such as subsidies and world food prices have significant effects on food prices, demand-side factors such as money supply have been found to be the main reason for the rise in food prices both in the short term and in the long run.

Hebert and Anderson (2011) examined the relationship between corn prices and meat prices in the USA. It was determined that the producers sent their cattle to slaughter and the production decreased in the period when the feed prices started to increase. Therefore, a negative relationship was found between feed prices and meat prices.

Cevger and Sakarya (2006) concluded that meat prices increased at a higher rate when feed prices increased and that meat imports did not reduce red meat prices.

Aydin et al. (2011) compared the changes in red meat prices with livestock prices and feed prices. It was observed that the increase in meat prices was higher than the increase in feed prices, and the fattening parity which showed how many kg of feed can be taken at 1 kg meat price has experienced structural breaks in 1989, 1997 and 2008 and has increased over the years. In addition, it was concluded that meat imports did not decrease meat prices.

Saghaian et al. (2013), Johansen Cointegration, Granger Causality Test and Impact-Response analysis of milk prices and the relationship between beef prices were examined. According to the results of Granger causality analysis, wholesale milk prices affect the prices of farm, wholesale and retail meat; According to the results of the impact-response function, a shock in milk prices increased meat prices and thus the relationship between milk and meat prices was positive.

Özertan et al. (2015) examined the price transfer mechanism and market structure in beef sector by using VEC model. According to the results of VEC model, it is found that the price transfer mechanism in beef is asymmetrical, in other words price increases are reflected to the consumers and price decreases are not reflected to the consumers.

Lloyd et al. (2009) tested by a semi-reduced cointegration method. Data such as labor cost index, CPI and feed prices are included in this analysis. In the beef sector, it was concluded that the market had an oligopolistic structure at the stage of retail price formation and that market power and defective competition emerged.

III. METHODOLOGY

The beef and dairy feed prices used in this study Turkey Feed Manufacturers of the Union (Türkiyem-Bir), the real effective exchange rate for the Republic of Turkey Central Bank of Turkey (TCMB), and other data from the Turkey Statistical Institute (TÜİK) were obtained. A summary of the data set used is shown in Table I.

TABLE I: VARIABLES AND THEIR DEFINITIONS

Short Name of Variable	Unit	Definition	Period Range	Source
PERDANA	TL/kg	Beef meat prices	2006M01-2017M12	TÜİK
TOPSIGIR	TL/kg	Beef wholesale prices	2008M01-2016M12	TÜİK
SUTYEM	TL/ton	Milk feed prices	2006M01-2017M09	Türkiyem-Bir
BESİYEM	TL/ton	Fattening prices	2006M01-2017M09	Türkiyem-Bir
MISIR	TL/kg	Egyptian producer prices	2009M01-2017M12	TÜİK
TOPSUT	TL/Liter	Cow milk producer prices	2009M01-2017M12	TÜİK
PERPILIC	TL/kg	Chicken meat retail prices	2006M01-2017M12	TÜİK
DOVIZ	Index	Yi-ÜFE Based Real Effective Exchange Rate (2003=100)	2006M01-2017M12	TCMB

The causality analysis developed by Granger (1969) was used to determine the causality relationships between wholesale and retail beef prices and other variables. ARDL Model Bound Test approach developed by Paseran et al. (2001) was used to explain the cointegration relationship and short and long term relations.

IV. RESULTS

In this study, only the results of the analysis between the retail beef prices and the wholesale beef prices are given. The results of the Granger Causality Test among these variables are given in Table II.

TABLE II: GRANGER CAUSALITY TEST RESULTS

Pairwise Granger Causality Tests	Lag	Obs.	F-Statistic	Prob.
Sample: 2011M01 2014M12				
TOPSIGIR does not Granger Cause PERDANA	1	47	6.01549	0.0182* *
PERDANA does not Granger Cause TOPSIGIR			3.90637	0.0544* *

Notes: * 10%, ** 5% and *** 1% meaningful significance.

According to Table II, according to the results of single delayed Granger causality test performed between wholesale meat prices and retail meat prices, bi-directional causality relationship was found at 5% significance level. Accordingly, retail prices are affected by the wholesale prices and wholesale prices are affected by the changes in retail prices. As a result of

Granger causality tests among retail variables, retail beef prices were higher than those from retail beef prices to corn prices and retail chicken meat prices to retail beef prices by 1%; 5% meaningful causality has been determined from wholesale cow milk prices to retail meat prices. According to Granger causality tests among the other beef prices, the causality relationship between the wholesale beef prices and the wholesale price of milk at the level of 1% and the 5% meaning towards the corn prices were found.

Then, two-variable ARDL models were created and firstly the robustness of these models were tested with the F-test, Breusch-Godfrey LM test, White variance test, Jarque-Bera normality test, Ramsey Reset test and CUSUM square test. The boundary test was performed for the ARDL models which passed the robustness test (Table III).

TABLE III: ARDL MODEL RESULTS (TOPSIGIR~PERDANA)

(Dependent variable: PERDANA)		Series: 2011M02 - 2014M12	Selected Model: ARDL(1, 0)	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PERDANA(-1)	-0.021883	0.120548	-0.18153	0.8568
TOPSIGIR	0.554864	0.132211	4.196823	0.0001***
C	0.034219	0.024213	1.413259	0.1646
Adj. R ²	0.30781		DW stat.	2.312581
		Test statistics		Prob.
F-statistic		11.22788		0.000115
Breusch-Godfrey Serial Correlation LM Test [12]		1.011397		0.4616
Heteroskedasticity Test: White		0.575655		0.7182
Jarque-Bera Normality Test		1.798364		0.406902
Ramsey Reset test [2]		2.196999		0.1237

According to the ARDL boundary test results in Table IV, a two-way cointegration relationship was found at the level of 1% in terms of retail beef prices and wholesale beef prices. In addition, according to the results of the border test conducted with the prices of wholesale beef, the only cointegration relationship at the level of 1% was seen in the ARDL model where corn prices were dependent variable and wholesale beef prices were explanatory variables. There is a cointegration relationship between the other variables and wholesale beef prices at the level of 5%. Finally, the cohabitation relationship between retail beef prices and exchange rate, corn, retail chicken and wholesale milk prices was 1%.

TABLE IV: ARDL BOUNDS TEST RESULTS (TOPSIGIR~PERDANA)

Dependent Variable	Explanatory Variable	k	I1 Bound (%5 significance)	I1 Bound (%1 significance)	F-statistics
PERDANA	TOPSIGIR	1	4.16	5.58	17.03903***
TOPSIGIR	PERDANA	1	4.16	5.58	11.09421***

Notes: * 10%, ** 5% and *** 1% meaningful significance.

According to Table V, short and long-term coefficients were

estimated for the models with cointegration relationship. Wholesale beef prices positively affect retail beef prices by 0.44 short term and 0.54 long term coefficients at 1% level. Retail veal prices have a positive impact on the price of beef prices by 0.45% and 0.87 long term coefficients. Therefore, it is understood that the price transfer towards retail prices and wholesale prices in the long run is stronger.

TABLE V: ARDL SHORT RUN AND LONG RUN COEFFICIENTS (TOPSIGIR~PERDANA)

(Dependent variable: PERDANA)		Series: 2011M02 - 2014M12	Selected Model: ARDL(1, 0)		
Period	Variable	Coefficient t	Std. Error	t-Statistic	Prob.
Short run	D(TOPSIGIR)	0.438096	0.117285	3.73532	0.0005**
	ECM (-1)	-1.074541	0.124578	-8.625419	0***
Long run	TOPSIGIR	0.542982	0.112198	4.839483	0***
	C	0.033486	0.023851	1.403965	0.1673

(Dependent variable: TOPSIGIR)		Series: 2011M02 - 2014M12	Selected Model: ARDL(1, 0)		
Period	Variable	Coefficient t	Std. Error	t-Statistic	Prob.
Short run	D(PERDANA)	0.453605	0.100908	4.49524	0.0001**
	ECM (-1)	-0.806618	0.136674	-5.90175	0***
Long run	PERDANA	0.873001	0.170762	5.11239	0***
	C	-0.062026	0.026835	-2.311392	0.0257*

Notes: * 10%, ** 5% and *** 1% meaningful significance.

In the short term, Egyptian prices have positively affected the price of beef by 1.64 percent in the short term and by 3.54 percent in the long term at the level of 10%. Wholesale milk prices have a positive effect on the prices of wholesale beef at the level of 1% in the short term and 6.0% in the long term. Wholesale beef prices affect corn prices negatively in the short term and positively in the long term. Retail chicken meat prices have a negative impact on retail beef prices at a rate of 1% and 2.20% in the short term and -4.97 in the long run. Finally, the exchange rate positively affects the retail beef prices by a factor of 0.03 in the short term at the level of 1%.

V. CONCLUSION

In this study, an empirical study was conducted to determine the factors affecting the prices of red meat. Empirical analysis is divided into three parts. In the first part, Granger Causality Test results are given. In the second part, the ARDL boundary test results for the cointegration relationship between the series are explained. In the last section, the coefficients of ARDL short and long-term models between the groups with which the cointegration relationship was determined were examined.

According to the results of Granger Causality Test, two-way causality relation between wholesale and retail meat prices was observed. According to the ARDL boundary test, there is a long-term cointegration relationship between retail and wholesale meat prices. According to the ARDL short-term models, the retail price impact factor of the wholesale prices was 0.44 and the retail prices' wholesale price-affecting coefficient was 0.45. Therefore, these prices affect each other

equally in the short term. According to the ARDL long-term models, the retail price impact factor for wholesale prices was 0.54, while the wholesale price of retail prices was estimated at 0.87. In summary, there is a bi-directional interaction between wholesale beef prices and retail beef prices. Retail prices are more likely to influence wholesale prices. Therefore, there is an asymmetric price mechanism between wholesale and retail meat prices. This indicates a lack of competitive conditions in the retail meat market.

As a result of the analyzes made with the prices of wholesale beef, it has been found that corn and wholesale milk prices on wholesale meat prices have a positive and strong effect in the short and long term. Other variables did not have an impact on wholesale prices. Wholesale beef prices are negatively influenced by corn prices in the short term and positively in the long run. In retail calf prices, it was found that retail chicken prices had a positive effect on retail calf prices and had negative effects on long term. Moreover, it was found that the exchange rate had a weak but significant and positive effect on retail prices in the short and long term.

As a result, it was observed that the price of retail meat prices had a greater impact on wholesale meat prices. This result indicates that there is an asymmetric price mechanism and incomplete competition conditions in the market. In order to control the prices of red meat, it is considered that improving the competitive conditions of the retail meat market as well as lowering the feed prices and supporting dairy cattle breeding.

REFERENCES

- [1] Ahsan, H., Iftikhar, Z., & Kemal, M. A. (2011). The Determinants of Food Prices: A Case Study of Pakistan, *PIDE Working Papers*, <http://pide.org.pk/pdf/Working%20Paper/WorkingPaper-76.pdf>, Available at: 15.02.2019.
- [2] Aşarkaya, A. (2015). *Hayvancılık Sektörü: Küçükbaş ve Büyükbaş Hayvancılık*, <https://ekonomi.isbank.com.tr/UserFiles/pdf/kucukbasbuyukbashayvancilik.pdf>, Available at: 27.10.2017.
- [3] Aydın, E., Aral, Y., Can, M., Cevger, Y., Sakarya, E., & İşbilir, S. (2011). "Türkiye'de Son 25 Yılda Kırmızı Et Fiyatlarındaki Değişimler ve İthalat Kararlarının Etkilerinin Analizi", *Vet Hekim Der Derg*, 82(1), 3-13.
- [4] Cevger, Y., & Sakarya, E. (2006). "Meat Prices and Factors Affecting Them in Turkey", *Turk J Vet Anim Sci*, 30, 1-6.
- [5] Çoban, O., & Çoban, A. (2015). Elmas Modeli Yaklaşımıyla Türkiye de Hayvancılık Sektörünün Yapısal Analizi, *Bartın Sectoral Development Symposium Proceedings Book*, 193-202.
- [6] Engle, R. F., & Granger, C. W. (1987). "Co-integration and Error Correction: Representation, Estimation and Testing", *Econometrica*, 55(2), 251-276. <https://doi.org/10.2307/1913236>
- [7] Goodland, A. (2010). *Meat Sector Policy Note: Reducing Price Instability in the Mongolian Meat Market*. World Bank Other Operational Studies, <https://openknowledge.worldbank.org/handle/10986/12846>, Available at: 15.01.2019.
- [8] Granger, C. (1969). "Investigating Casual Relations by Econometric Models and Cross-Spectral Methods", *Econometrica*, 37(3), 424-438. <https://doi.org/10.2307/1912791>
- [9] GTHB (2015). *Kırmızı Et Stratejisi*, Ankara: Gıda, Tarım ve Hayvancılık Bakanlığı, Hayvancılık Genel Müdürlüğü.
- [10] Johansen, S. (1988). "Statistical Analysis of Cointegration Vectors", *Journal of Economic Dynamics and Control*, 12(2/3), 231-254. [https://doi.org/10.1016/0165-1889\(88\)90041-3](https://doi.org/10.1016/0165-1889(88)90041-3)
- [11] Johansen, S., & Juselius, K. (1990). "Maximum Likelihood Estimation and Inference on Cointegration - with Applications to the Demand for Money", *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210. <https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x>
- [12] Lloyd, T., McCorrison, S., Morgan, W. C., Rayner, A., & Weldegebriel, H. (2009). "Buyer Power in U.K. Food Retailing: A 'First Pass' Test", *Journal of Agricultural & Food Industrial Organization*, 7(5), 1-38.. <https://doi.org/10.2202/1542-0485.1253>
- [13] Norton, M. (2005). "Factors Affecting Beef and Cattle Producer Prices Movements", *Monthly Labor Review*, 32-40.
- [14] Capps, O., Farris, D.E., Byrne, P.J., Namken, J.C. & Lambert, C.D. (1994). "Determinants of Wholesale Beef-Cut Prices", *J. Agr. and Applied Econ.*, 26(1), 183-199. <https://doi.org/10.1017/S1074070800019295>
- [15] Özertan, G., Saghayan, S., & Tekgüç, H. (2015). "Türkiye Kırmızı Et Sektörü'nde Fiyat Aktarım Dinamikleri ve Piyasa Gücü", *İktisat, İşletme ve Finans*, 30(349), 53-76. <https://doi.org/10.3848/iif.2015.349.4317>
- [16] Pesaran, M., & Shin, Y. (1999). An Autoregressive Distributed-Lag Modelling Approach to Cointegration Analysis. In S. Strøm (Ed.), *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium* (Econometric Society Monographs, pp. 371-413). Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9781139052221.011>
- [17] Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bound Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16(3), 289-326. <https://doi.org/10.1002/jae.616>
- [18] RK (Competition Authority) (2010). *Türkiye'de Kırmızı Et Sektörü ve Rekabet Politikası*, Ankara: Rekabet Kurumu.
- [19] Saghayan, S., Özertan, G., & Tekgüç, H. (2013). "Milk and Beef Price Links in Turkey", *Economics Bulletin*, 33(4), 2607-2616.
- [20] TÜİK (Turkish Statistical Institute) (2018). *Tüketici Fiyat Endeksi (2003=100) Madde Sepeti ve Ortalama Fiyatlar (Türkiye)*, <http://www.tuik.gov.tr/Start.do>, Available at: 23.01.2018.



Ayşe Çoban, she was born in 1976 in Kahramanmaraş. He completed his primary, secondary and high school education in Kahramanmaraş.

He graduated from Anadolu University, Department of Public Administration. Niğde University Institute of Social Sciences. He continues his academic career as a lecturer in Logistics Program of Vocational School of Social Sciences of Selçuk University.

He worked in the research program for many years. She has many papers published in national and international refereed journals and many years of papers presented in national and international congresses..