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An assessment of livestock breeding and livestock production in turkey

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Abstract
Human nutrition should be composed of a balanced daily intake of glutens, vitamins and proteins. In contrast to gluten and vitamins, proteins can be retrieved only from animal based products. Accordingly, bovine breeding and poultry are important to secure protein requirements of societies. With changing climatic conditions and declining interest to maintain livestock breeding, the supply has been in declination recently which corresponded to rising consumer prices in Turkey. Within this study, it was aimed to measure the impact of prices of animals per head and changing milked or slaughtered animal stocks on the supply of main outputs of animal breeding, milk and meat. The findings of supply response analyses of meat and milk supplies for the years between 2001 and 2017 indicated that price mostly affects supply in the long term as the breeder can change the aim of animal holding. Yet, short term impact is also visible, despite being lower. However, the analyses showed us that most of the fluctuation in supplies is related with non-price factors. Analysis interrelated with sector supports and international trade is essential for proper inferences specifically for milk supplies. This is related with the input characteristics of milk and meat for the food industry.

Keywords: *livestock breeding, milk, meat, producer, supply response, Nerlove, Turkey*

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Introduction and Objective of the Study

Breeding and slaughter of animals and producing animal based products are important both for the health of the society and economic sustainability. Livestock breeding is essential in maintenance of balanced diet of livelihoods, assuring economic wealth of animal breeders increasing national income via meat, milk, textiles and pharmaceutical sectors. Providing inputs to these sectors is important for agriculture based industrialisation and assisting economic growth and development via reducing imports and increasing exports. Besides, with its high value added, livestock breeding is important to keep rural population in the rural areas and reducing unemployment both in urban and rural areas as well (Simsek, 2018; Saygin and Demirbas, 2017; Karagoz, 2009).

Turning back to adequate and balanced diet requirement, people need to consume protein-based products to maintain a good diet. Animal-based products are the only source of proteins. To consider the situation of Turkish consumers, protein intake of livelihoods in comparison with other parts of the world should be noted. As demonstrated in Table 1 with reference to 2013 figures (Anonymous, 2019a), share of animal based protein intake in Turkey was lower than the world average and only higher than the African countries. However, the total amount of protein intake is almost 30 % more of the world average in grams. Yet, this is a sign of vegetative protein intake, which does not promise a balanced diet.

Considering the climatic effects and lack of intention to deal with livestock breeding, there appeared declination in number of animals, which brought reduction in production and consumption of animal based products in Turkey (Semerci and Celik, 2018). This mainly affected the sector from 1994 to 2009.

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Table 1. Per capita protein consumption per person per day – 2013 averages

Country	Vegetative	Animal Based	Total	Share of Animal Based (%)
The EU	43	60	104	58
The USA	40	70	110	64
African Countries	53	16	69	23
The World	49	32	81	40
Turkey	72	36	108	34

Source: FAO (Food and Agriculture Organization) – Anonymous, 2019a

The lack of public interest in rural activities and limited supports leaded to reduction in livestock breeding. With rising supports number animals bred had reached the level of 1994 by 2013. However, this did not reflect to supplies of animal products directly (Semerci and Celik, 2018).

Turkey has geographical advantages in animal breeding and production of animal-based products. However, due to low production or farm scale and unwillingness of animal breeders to maintain activities with respect to rising costs and changing economic conditions lead to an underdeveloped sector. This can be verified with share of vegetative production among total agricultural production. 54 % of agricultural output was related with vegetable production, while animal husbandry constituted 24 % due to 2010 data (Gul et al., 2010). Checking out the recent figures, it was understood that while gross production value of animal breeding was 30 % of total value of agricultural production in 2014. This was followed with 29 and 28 % in 2015 and 2016 respectively, signing a declination (Anonymous, 2019a).

Besides, unorganised structure of the sector, considering producers, wholesalers and marketers, is similar for animal production as vegetative production. In addition, high dispersion in milk production facilities, low quality, instability of prices corresponding to increasing costs, lack of registered production and animal diseases are the other factors affecting sustainability and improvement of animal breeding (Anonymous, 2019b).

Mainly, there are various reasons affecting rising food prices. The most important cause can be considered as climatic changes and resulting supply losses. Besides, cost accounts as input prices (energy, human power, feeds, etc.), transportation and sheltering results in sector-leaving breeders. Limited vaccination and animal care deficiencies especially in regions where livestock breeding is an essential activity in economic terms, leads to reduction in animal and animal based product supplies (Turan et. al, 2017; Kiymaz and Sacli, 2008). In a study conducted to measure profitability of dairy farms in TRA1 region (Erzurum, Erzincan and Bayburt), it was understood that profitability had declined due to rising costs, especially the feeding costs (Askan and Dagdemir, 2016).

Departing from these facts, it was intended to evaluate the factors affecting meat and milk supplies in Turkey. Meat and milk, being the main outputs of animal breeding, get affected from stocks, prices, supporting systems and periodic impacts. Therefore, it was aimed to measure the effect of price and non-price factors on main outputs, meat and milk, of livestock breeding in Turkey between 2001 and 2017.

The objectives:

- To search inter-period effects of price on meat and milk supplies with a macroeconomic perspective,
- To analyse and interpret supply response of meat and milk to own prices and measure short and long term elasticities.

1. Animal Breeding and Meat and Milk Supplies in Turkey

With its environmental and cultural advantages, Turkey resides on cattle, sheep and goat breeding in terms of animal husbandry. These animals are the main source of meat, milk and milk products' supplies. There exists pig and camel breeding interrelated with meat production as well, but number of animals bred and amount of meat supplied are limited. Yet, buffalo ranks the fourth in bovine availability. Considering the share of cattle, sheep and goat, it is important to observe the change in stocks as demonstrated in the below Figure 1.

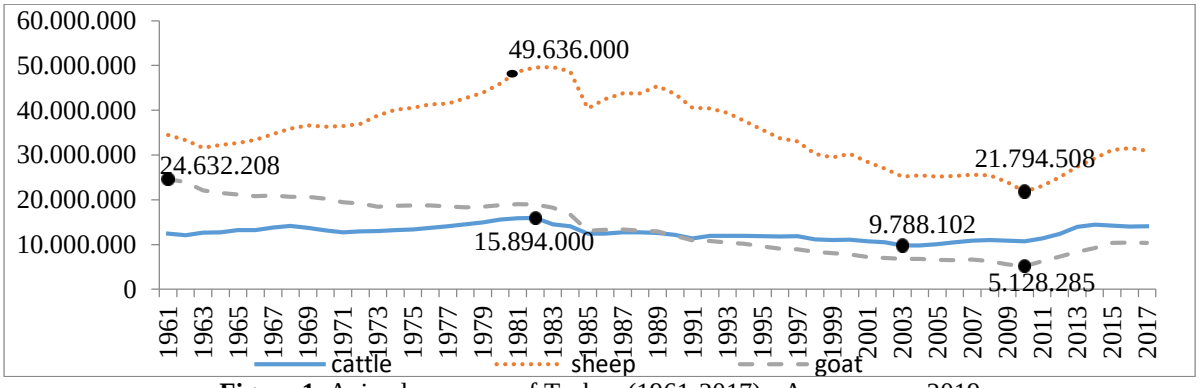

Figure 1. Animal presence of Turkey (1961-2017) - Anonymous, 2019a

There observed a relatively less fluctuation in absence of cattle, when compared with sheep and goat due to FAO data. The highest number of cattle was reached in 1982 with 15,981 million, while there was 49,636 million sheep in 1983. The steady declination was drastic for goat presence that 24,632 millions of goats declined to 5,128 million in 2010. By 2010 for sheep and goat and by 2004 for cattle, a rising trend had appeared again.

When the share of slaughtered number or animals with reference to animal stock was considered, around one out of five sheep and goats and one out of four cattle were slaughtered in Turkey from 2001 to 2017, with a steady trend. In addition, the change in the amount of meat produced is another frame to be considered.

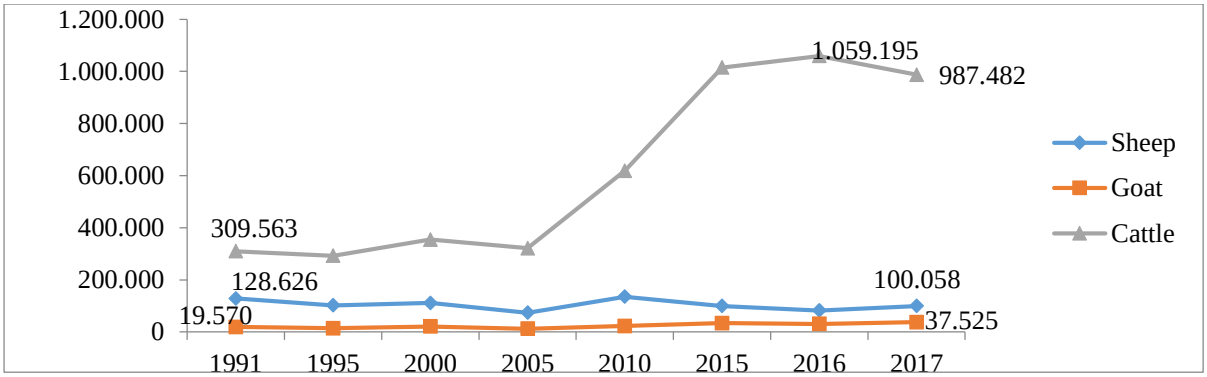

Figure 2. Amount of meat supplied in Turkey for selected years (in tonnes) - Anonymous, 2019a

Checking out these figures, it can be noted that, the meat supplied out of cattle has been rising, while sheep and goat meat was steady since 1991 as demonstrated in Figure 2. When the number of slaughtered animals and meat supplies was cross compared, the parallel movement can be observed. However, while the maximum number of sheep was slaughtered in 1991, the amount of meat was highest in 1998. Besides, 2009 was the year when minimum number of cattle was slaughtered while amount meat production was rising. These figures correspond to the rising yield per animal accordingly.

In addition, when the meat and milk supplies were overviewed since 2001, irrespective of the variety of animal, it was understood that the amount of meat produced had risen by 79 % from 2001 to 2010, while there was a declination in the speed from 2010 to 2017 with 44 %. On the other hand, milk supplies had risen by 43 % in the first ten years, which was followed by a rise with 53 %. This can be noted as the rising milk yield in opposition to declining meat yield. Or else, the food industries using milk as an ingredient can be considered as developing with a higher speed (Anonymous, 2019a).

Table 2. Development of meat and milk supplies (2001-2017)

YEARS	Meat (Tonnes)	Milk (Tonnes)
2001	435.778	9.495.550
2010 - Q	780.718	13.543.674
2010 - %	79 %	43 %
2017 - Q	1.126.403	20.699.894
2017 - %	44 %	53 %

Source: FAO (Food and Agriculture Organization) – Anonymous, 2019a

Following the production and supplies, reviewing the international trade of bovines is also essential. With respect to data retrieved from TURKSTAT (Anonymous, 2019c) ratio of exports to imports were calculated for different varieties between 2002 and 2019. In order to meet import demand for a country, the ratio is expected to be more than 100 %, referring to a positive Terms of Trade. Both for stud and non-stud cattle, Turkey's imports were considerably higher in Dollars. As an instance export revenue for stud and non-stud cattle was almost 2 million Dollars, while imports were 110 million Dollars in 2014. Even though the situation is better for sheep, export revenue exceeded import expenditures only in 2015. In 2018, exports was 2,68 million Dollars, corresponding to 62,54 million Dollars of imports. The situation has been the same for goat trade. This data demonstrates that Turkey is not a self-sufficient country in terms of animal and animal products trade. In other words, domestic demand is much higher than the supplies.

Departing from this brief background information, it is essential to consider which factors influence breeding of animals and production of animal products. Or else, can price affect production supplies considerably, or are there different indicators. Considering these, the factors affecting meat and milk supplies, irrespective of the animal variety, was assessed for Turkey.

Material and Methodology

Main methodological framework to evaluate the impact of price and non-price factors on product supplies can be acknowledged as the Nerlovian supply response mechanism (Nerlove, 1958). This method refers to measuring responsiveness of amount of production to various factors with utilisation of time series data and it is eligible for competitive market

settings. The onset of the methodological equation is as following (Nerlove 1958; Ozkan et al. 2011).

$$Q_t^* = a + bP_t^* + cZ_t \quad (1)$$

$Q_t^* = level\ of\ output\ for\ time\ t$
$P_t^* = expected\ real\ price\ for\ time\ t$
$Z_t = non - price\ exogenous\ variables$

Before proceeding, it is essential to consider specific characteristics of agricultural production. Irrespective of animal or vegetable production, it is easy to note that reacting against changing market conditions requires more time than other sectors. There is a time gap between production decision and production and marketing of the products. Accordingly, we do not expect a supply reaction to change in market prices immediately. Accordingly, planning for animal breeding and producing meat and/or milk out of the bred animals require time-based follow up of the market challenges. In other words, animal breeding decisions cannot be given for short term. However, slaughtering or milking decisions can be changed due to price and non-price fluctuations. Yet, in any terms, the breeder, as well as the vegetable producer, should plan for market expectations and should be well acknowledged on previous prices (Ozkan et al. 2011, Tripathi and Prasad 2009).

Besides, not a lot of producers decide to shift between products year after year as every crop needs different approaches and knowledge. Therefore, the decision is also related with the amount produced in the recent periods. Our main question is 'by how much?' This query refers to the elasticity interpretation of the production with respect to price and previous stocks. Therefore, the following final form of the supply equation needs to be estimated and analysed through adaptive expectations methodology. The estimation output would provide us with the ability to comment on short term and long term elasticities of supply (Tripathi and Prasad 2009).

$$Q_t = a_0 + a_1 P_{t-n} + a_2 Q_{t-n} + a_3 Z_t \quad (2)$$

At this phase, it is also essential to comment over the data characteristics and required methodological adjustment for time series data. For time series estimation, using the data on level would lead to inappropriate elasticity estimates due to afore mentioned data characteristics of agricultural supplies. Accordingly, the data needs to be adjusted with implementation of Error Correction Model (ECM) (Granger 1981; Engle and Granger 1987). ECM would lead proper interpretation of short term supply response for consecutive data (Granger 1981). This is achieved with determination of a lag length explaining time dependence of the data and estimating lagged equation which is called as augmented autoregressive distributed lag model and it is a modified version of a stable long-run relationship of the variables (Ceylan et al., 2018; Mohammed et al. 2007; Banerjee et al. 1998). Therefore, the linear adjustment of the equation with addition of the error terms, including information on time characteristics of the data was demonstrated below.

$$Q_t = a + bP_t + u_t \quad (3)$$

$$\Delta Q_t = a + b\Delta P_t + cu_{t-n} + u_t \quad (4)$$

$$\Delta Q_t = \alpha_0 + b\Delta P_t - c(Q_{t-n} - a - bP_{t-n}) + u_t \quad (5)$$

$$Q_t = (\alpha_0 + ca) + bP_t - bP_{t-n} + (1 - c)Q_{t-n} + cbP_{t-n} + u_t \quad (6)$$

$$Q_t = (\alpha_0 + ca) + bP_t + (1 - c)Q_{t-n} + (cb - b)P_{t-n} + u_t \quad (7)$$

Here t is the concurrent year and t-n refers to the time differenced price and quantity data. Also, n mainly refers to the time lag determined due to the linear relationship. However, considering agricultural and food products and the total data, it was decided to take time lag as 1. Accordingly the supply functions estimated had taken the following form for both meat and milk supplies for Turkey between 2001 and 2017. The quantity supplied in tonnes for meat and milk were estimated against price and, previous supplies and changing number of animals bred as the main supply source of meat and milk. The final form of estimation was decided due to findings of normality tests and adjusted independent variables and inclusion of a trend variable was considered separately. Therefore, Q-stat and Jarque-Bera testing for normality assessment and ADF (Augmented Dickey Fuller) and LLC (Levin Lin Chu) testing for determining existence of time based unit roots were made prior to final estimation (Dickey and Fuller 1981; Levin–Lin–Chu 2002). In addition, the error terms of the long term supplies equation were checked with Johansen Cointegration test to determine potential of linear correction in the short term (Griffiths, 2008) and all procedures were completed with E-Views 5 statistical program.

Results and Discussion

Supply Response for Meat

To consider the relationship between amount of meat supplied and number of animals (bovines) slaughtered in addition to price per head, the data characteristics were overviewed. The data was understood not to be normally distributed due to findings of Jarque-Bera test applied for level and logarithmic transformation of the dependent and independent variables as demonstrated in Table 3.

Table 3. Normality of data for meat supplies (2001-2017)

	Q_{me}	P_{me}	Q_a
Jarque-Bera (ρ)	2,01 (0,37)	1,19 (0,55)	1,73 (0,42)
	$LogQ_{me}$	**$LogP_{me}$**	**$LogQ_a$**
Jarque-Bera (ρ)	2,04 (0,36)	1,68 (0,43)	0,89 (0,64)

The autocorrelation characteristics of data were measured via Q statistics following correlation coefficients that indicated non-stationarity. The test was made both for level and log transformed variables and first lag differenced form of the variables and findings were demonstrated in Table 4. It was understood that, while the data is not stationary on level or after it is normalised by log transformation, the differenced data both on level and logged are stationary and can be used for analysis.

Table 4. Stationarity testing for meat supplies (2001-2017)

Q_{me}	$LogQ_{me}$	$D(Q_{me})$	$D(LogQ_{me})$
14,140 (0,00)	13,363 (0,00)	1,5180 (0,22)	2,0389 (0,16)
Q_a	**$LogQ_a$**	**$D(Q_a)$**	**$D(LogQ_a)$**
12,537 (0,00)	13,303 (0,00)	1,2841 (0,26)	1,6598 (0,2)
P_{me}	**$LogP_{me}$**	**$D(P_{me})$**	**$D(LogP_{me})$**
10,453 (0,00)	11,220 (0,00)	3,5440 (0,06)	1,8827 (0,17)

Afterwards, the existence of a unit root was checked with LLC and ADF tests. Test results for static equation demonstrated in Table 5 signed existence of common unit root for meat supplies and time effect seemed to be purified after taking the first difference of both dependent and independent variables.

Table 5. Individual and Common Unit Root Existence for Milk Supplies (2001-2017)

Level		Log		Difference on Level		Logged Difference	
LLC	4,31 (0,99)	**LLC**	1,80 (0,96)	**LLC**	-3,13 (0,00)	**LLC**	-3,11 (0,00)
ADF	3,42 (0,99)	**ADF**	2,21 (0,99)	**ADF**	-3,55 (0,00)	**ADF**	-3,53 (0,00)

Therefore, the long term and short term estimation of meat supplies were maintained with log transformation and via taking the difference of logged data. The long term estimates and main indicators were provided in Table 6.

Table 6. Long Term Estimates for Meat Supplies in Logged form (2001-2017)

Variable	Coefficient	t- stat (p value)	R^2	0,89
Constant	-10,511	16,93 (0,54)	**Mean Dependent Variable**	
$LogQ_{me}(-1)$	-0,095	-0,27 (0,78)	13,39	
$LogQ_a(-1)$	1,48	1,27 (0,22)	**F (p value)**	24,62 (0,00)
$LogP_{me}(-1)$	0,099	0,41 (0,69)	**Durbin-Watson Statistic**	
Time trend	0,039	0,78 (0,44)	1,98	

When the findings are interpreted, the variation in meat supplies explained with the relevant parameters was appeared as 90 %. It was understood from parameter estimate of time trend that 4 % of current meat supplies was determined by time. Long term price elasticity of the meat supplied in tonnes is 10 %. So, the price variation affects produced and sold amount of meat by 10 %. The short term price elasticity calculated was 9,1 %. Therefore, there is no significant difference between short and long term price elasticity of meat supply. However, the price dependency can be understood from the negative estimate of previous year's meat supply. If the amount of meat was high enough in the previous year, it can

be noted that current meat supply is inversely affected due to declining prices. Previous year's number of bovines leads to rising amount of meat supplied. The negative sign of the constant refers to negative meat supplies or enforcement of imports without consideration of animal existence or price attributed to

meat. Yet, short term supplies were expected to be estimated and Johansen cointegration test was conducted accordingly. The test statistic was -1,02 indicating the time dependence on 1 %. Accordingly, the impact of unexplained errors in the short term was confirmed and these error terms were included in the short term estimation results. The short term estimation results were demonstrated in Table 7.

Table 7. Short Term Estimates for Meat Supplies in Logged form (2001-2017)

Variable	**Coefficient**	**t- stat (p value)**	$\mathbf{R^2}$	0,24
Constant	-0,007	-0,65 (0,95)	**Mean Dependent Variable**	
D(LogQ$_{me(-1)}$)	-0,42	-1,39 (0,19)	0,065	
D(LogQ$_a$)	2,15	1,21(0,26)	**F (p value)**	24,62 (0,00)
D(LogP$_{me}$)	0,23	0,58 (0,57)	**Durbin-Watson Statistic**	
D(error terms)	1,96-e7	0,58 (0,57	1,99	

The short term impact of the price is around 23 %. If the positive impact of estimated short-term price fluctuation was considered, it can be said that a rising price would lead more meat supplies. Yet, the unexplained spill-over is very low as understood from the low value of difference of errors. In opposition of 9-10 % impact of meat price per ton determined in the long run, the 23 % of short term effect can be read due to breeders' market view. In reality, bovines can be slaughtered in a few months watching the prices. Besides, short term positive price variation of sales per head would lead slaughtering decision easily. However, negative sign of the constant should be read as the producers' short term indifference between animal breeding objective as in slaughtering or keeping for the consecutive season. The determinative statistics enable us to conclude that the findings are reasonable for this short term evaluation.

Following interpretation of meat supplies, the milk supplies were overviewed as well.

Supply Response for Milk

The same methodological framework was watched up for meat supplies, between 2001 and 2017. The normality, stationarity and cointegration level of variables were tested and results are demonstrated in the below tables 8 and 9 consecutively.

Table 8. Normality of variables for milk supplies (2001-2017)

	Q$_{mi}$	**P$_{mi}$**	**Q$_a$**
Jarque-Bera (ρ)	1,42 (0,49)	1,16 (0,56)	1,74 (0,42)
	LogQ$_{mi}$	**LogP$_{mi}$**	**LogQ$_a$**
Jarque-Bera (ρ)	1,02 (0,60)	0,69 (0,71)	1,68 (0,43)

Jarque-Bera test results indicated that neither dependent nor the independent variables were distributed normally. Following this non-normality detection, autocorrelation characteristics of the data was measured with Q-stats.

Table 9. Stationarity testing for milk supplies (2001-2017)

Q$_{mi}$	**LogQ$_{mi}$**	**D(Q$_{mi}$)**	**D(LogQ$_{mi}$)**
13,40 (0,00)	13,47 (0,00)	0,35 (0,55)	2,06 (0,15)
Q$_a$	**LogQ$_a$**	**D(Q$_a$)**	**D(LogQ$_a$)**
12,54 (0,00)	13,30 (0,00)	1,28 (0,26)	1,66 (0,19)
P$_{mi}$	**LogP$_{mi}$**	**D(P$_{mi}$)**	**D(LogP$_{mi}$)**
10,43 (0,00)	11,16 (0,00)	3,06 (0,08)	1,69 (0,19)

As understood from the table, while the non-normal data on level and log were non-stationary, the data achieved stationarity characteristics after its one year lag was taken. Therefore, the differenced data on level

and logged forms can be used for the rest of the analysis. Accordingly, the autocorrelation characteristics were measured and demonstrated in the below table with reference to LLC and ADF tests.

Table 10. Individual and Common Unit Root Existence for Milk Supplies (2001-2017)

Level		Log		Difference on Level		Logged Difference	
LLC	4,37 (0,99)	**LLC**	1,97 (0,97)	**LLC**	-3,25 (0,00)	**LLC**	-4,94 (0,00)
ADF	0,09 (0,99)	**ADF**	1,29 (0,99)	**ADF**	21,61 (0,00)	**ADF**	-29,01 (0,00)

Accordingly, first order autocorrelation was confirmed for milk supplies. Therefore, the static estimation was conducted with reference to logarithmic transformation of the data as it was the case for meat supplies. The coefficients were evaluated departing from these figures and the error terms of this relationship were assessed for cointegration relationship.

Table 11. Long Term Estimates for Milk Supplies in Logged form (2001-2017)

Variable	Coefficient	t- stat (p value)	R^2	0,98
Constant	12,22	3,65 (0,004)***	**Mean Dependent Variable**	
$LogQ_{mi}(-1)$	-0,37	-1,18 (0,26)	16,45	
$LogQ_a(-1)$	0,86	2,38 (0,04)**	**F (p value)**	109,25 (0,00)
$LogP_{mi}(-1)$	0,28	3,18 (0,004)***	**Durbin-Watson Statistic**	
Time trend	0,02	1,20 (0,26)	1,75	

** significant at 5 %; *** significant at 1 %

Looking at the figures, it was understood that 98 % of the variation was explained by the existing variables in the long term. However, the constant of the regression explains 75 % of the variation. So there should be other factors affecting milk supply, in addition to these indicators. Considering the worth of the industry using milk as an input, this is an expected situation. Yet, long term price elasticity of the milk supplied in tonnes is 29 %. So, the price variation affects produced and sold amount of milk by 29 % in the long term. It was understood that the previous year's number of bovines leads to rising amount of milk supplied. The short term price elasticity is 39 % and 2 % of current milk production was determined by time which may be interpreted as the impact of rising population. The higher short term response is interrelated with changing intermediaries and fluctuation in raw milk sales. Therefore, there appeared a different term related price response in milk supplies, which is in opposition with meat supplies.

In order to infer about short term relationship, the cointegration potential was checked via the error terms. The Johansen cointegration test indicated that unexplained effect of the previous year was significant at 1 % with -1,05 parameter estimate of the lagged error terms. So, the short term relationship could be estimated with regards to VEC methodology as well. The short term supply dynamics were demonstrated in Table 12.

Table 12. Short Term Estimates for Milk Supplies in Logged form (2001-2017)

Variable	Coefficient	t- stat (p value)	R^2	0,81
Constant	0,04	2,40 (0,04)	**Mean Dependent Variable**	
$D(LogQ_{mi(-1)})$	-0,19	-1,18 (0,26)	0,06	
$D(LogQ_a)$	0,73	3,63 (0,04)	**F (p value)**	10,97 (0,01)
$D(LogP_{mi(-1)})$	-0,014	-0,19 (0,85)	**Durbin-Watson Statistic**	
D(error terms)	0,76	4,17 (0,00)	1,92	

The unexplained spill-over seemed to be very high as the estimate indicated 76 % of timely impact. The short term impact of the price is below 1 %, with -0,014 parameter estimate, when time effect and non-classified impacts were considered additionally. Therefore, short term impact of prices was negative and low. This can be read as the breeders' preference on slaughtering animals rather than maintaining milking even if the price rises. This is also related with ageing of the animals and need for reproduction of the animal on this sense. This is also confirmed with the negative parameter estimate of milking animal supplies, while rise in number of animals lead to rising milk supplies. The estimated variation is considerable with 81 %. However, most of the variation in milk supplies was not related with previous supplies, milk prices and changing animal stock. Accordingly, while the time effect in the long run is low with 2 %, the unexplained variation is high in the short term. And the short term price elasticity is considerably lower than that of long term. This is also related with the nature of animal breeding and purpose of breeding.

Conclusion

Before concluding, it is essential to note that the time series data used for the analysis is limited. Despite the time data length, it was aimed to understand the impact of price and non-price factors affecting meat supplies. Here non-price variables refer to the number of animals bred and slaughtered and amount of milk and meat in corresponding analyses. However, the analysis was maintained in order to reach some insights for the sector.

Mainly, the positive price elasticity of meat supplies per head of slaughtered animals is an awaited situation. There is no obvious difference between short term and long term elasticities. This is due to the fact that breeding decision especially for slaughtering is mostly a long-term decision. On the other hand, even if the long term price response for amount of milk produced is positive and similar with that of meat supplies, there appeared a negative elasticity for the short term even if the impact was very low. This outcome is mainly related with easy shift between milking or slaughtering and changing demand of the industry that use milk as an ingredient.

The negative effect of previous animal stocks on both milk and meat supplies also is in conformity with the characteristics of animal breeding sector. Even though there observed a rising trend in supports since the last 10 years, the supports seemed not to affect animal products supply in opposition to number of animals bred. In real terms, share of financial supports provided to animal breeding was 4,4 %, which rose to 29,02 % in 2012 (Ata and Yilmaz, 2015) signs the importance of the sector. Yet, it is well known that animal husbandry for milk and meat production falls behind the potential in Turkey with small scale animal farms, low yield per farm and per animal and inadequate supports (Gul et al., 2010). Even though the sector has been supported since the mids of 1990s, the small scale production units, rising costs and unorganised structure of the sector leaded below expectations efficiency of supporting schemes.

Departing from these findings it was understood that the sector, especially milk production, should be analysed in depth with inferences on the food industry using milk and meat as inputs. Besides, the yield of error correction estimation for short term supplies indicated that there are other factors affecting the supplies besides price, previous stocks and timely changes. This is mostly valid for milk supplies with 76 % of variation explained by error terms. Considering the changing supporting schemes and status of interrelated industries, as well as the fluctuating foreign trade balances for bovines and milk and meat, this non-price impact is understandable. This outcome also leaded us to consider in-depth analysis of the sector once more.

Consequently, the findings of the analyses residing on a short time frame indicated the need to increase data based knowledge on the sector both for Turkey and comparable countries. Mostly, field level studies measuring the changing conditions of the sector would lead more proper policy indications. However, existing analyses findings emphasized the role of prices for the long term especially in increasing the supply of milk and meat.

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