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Price determinants and interactions specifics in beef production in Bulgaria

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Abstract

A major component of the supply function - product price - is dissuasive for the Bulgarian beef producers and the authors set the objective to examine the price determinants considering price determination (market) and price manifestation (transaction) as two interconnected concepts. The trend of prices and price ratio in Bulgarian beef production are studied as well as the leading factors determining the level and dynamics of procurement prices for the period 2008-2016, using economic-statistical analytical methods and models: the assessment of the price and income elasticity by applying the model by Workman, King, Hooper; cointegration model is applied for determining correlation between the beef wholesale and retail prices on one hand and on another hand the correlation between procurement and retail prices. The descriptive decomposition of the price determination and price manifestation is conducted. Conclusion about the main price features of Bulgarian beef market are presented and their key factors, as well as proposals for solving the adverse effects.

Keywords: Beef price, beef market, price transaction, price determinants, cointegration analysis, Bulgaria

JEL: C22, E31, Q11

1. Introduction

Global shortages of protein, the openness of national economies, support for the agrarian sector in EU countries, the existence of still unused resources are all serious market prerequisite, which turns out to be insufficient to stimulate the beef production sector in Bulgaria. Based on the fact that the producer price[1] - a major component of the supply function - is dissuasive for the Bulgarian beef producers, the authors set the task of examining the price determinants.

Price determination in the market-oriented economy, incl. the beef sector, on the one hand, is a natural result of the interaction of the forces of supply and demand. Obviously, in the context of market-based relationships and institutional structures, the main factors of supply of fattened cattle include: the number of animals available, the cost of production factors (e.g. fodder fed), the technology applied, the product prices (procurement prices of fattened animals). Demand forces, in turn, include such components as: final product price (beef retail price), substitute commodity prices (mainly pork and chicken meat), consumer incomes, consumer tastes and preferences. In the absence of market equilibrium, usually the low price at a given moment is interpreted as a result of oversupply (supply more than demanded quantity). But if we analyze the dynamics of producer prices (in time and space) we need to take into account other factors concerning as well the so called "price discovery" (Clement et all, 2002, p.1). In the same paper the authors consider "price determination" and "price manifestation"

[1] Regarded as procurement price of fattened animals

as two interconnected, but still self-contained concepts. They consider price manifestation as a “transaction price” that is the result of a particular deal between a seller and a buyer for a certain quantity and quality of a good at a specific time and place. On its part, this process is related to the concepts of "market structure (number, size, location and competitiveness of buyers and sellers); market behavior (buying and pricing methods); market information and price recording (quantity, timeliness and reliability of information); futures markets and alternative risk management practices".

Given the relatively low producer prices of fattened beef cattle in Bulgaria (compared to the EU average and the beef retail prices), the authors study the price trend and price ratio in beef production in Bulgaria (producer, wholesale and retail) as well as the leading factors determining the level and dynamics of producer price in the period 2008-2016, using economic-statistical analytical methods and models: the assessment of the price and income elasticity by applying the model by Workman et al (1972). The cointegration model is applied for determining correlation between the beef wholesale and retail prices on one hand and on another hand the correlation between procurement and retail prices. The descriptive decomposition of the price determination and price manifestation has been conducted.

2. Materials and Methods

2.1 Prices in Bulgarian beef sector

In absolute terms, the producer price of fattened beef cattle in Bulgaria is lower than those in the EU (Fig. 1 and Fig. 2). At the end of 2016, the average price of purchased cows is 174 euros/100 kg of carcass weight, which is 65.9% of the EU average, and 61.3% for young bulls. Producer prices (100 kg. carcass weight) - after their peak in 2014 - fall and in 2016 are around the level of 2008. National Statistical Institute (NSI) data show that the producer price of young cattle is 22% to 32% higher than that of cows, which corresponds to the ratio in EU.

It is a specific practice in Bulgaria the producer price of the fattened beef cattle to be based on the live weight of the purchased animals. In 2016, the price per kg of live weight of fattened calves between 1 and 2 years old ranges from 1.2 euros/kg to 3.06 euros/kg. The variation is related both to the productive traits and the breed of the herd, as well as other characteristics of the beef farm (size, location, contractual relationship).

The other group of prices along the supply chain - wholesale prices, unlike purchase prices, increased by 32% (Agromarket Information System) over the period 2008-2016. For the same period, the retail price also increased by 33% (for bone beef steak) (Fig. 3) to 35% (boneless beef). While there have been no major changes in retail prices over the last three years, a gradual increase has been reported in the second half of 2016 and early 2017.

The producer's share at the highest price (young bulls price) in the retail price (bone beef) is about 48% in 2016, which is significantly lower than in 2008 (Fig. 4). The share decreases further if an average incl. adjusted) producer price is reported in relation to the price of the boneless beef (Agra, 2007).

Prices in the beef sector in Bulgaria have the following features: unstimulating level of prices of the fattened beef cattle; discrepancy between the dynamics of producer price and retail prices in recent years; established relatively big "scissors" between producer prices and the retail prices of beef. The issue is whether the retention of low producer prices is more the result of the factors of the common market forces or the factors influencing the transaction prices have stronger effect and how the trend in these factors will affect price dynamics.

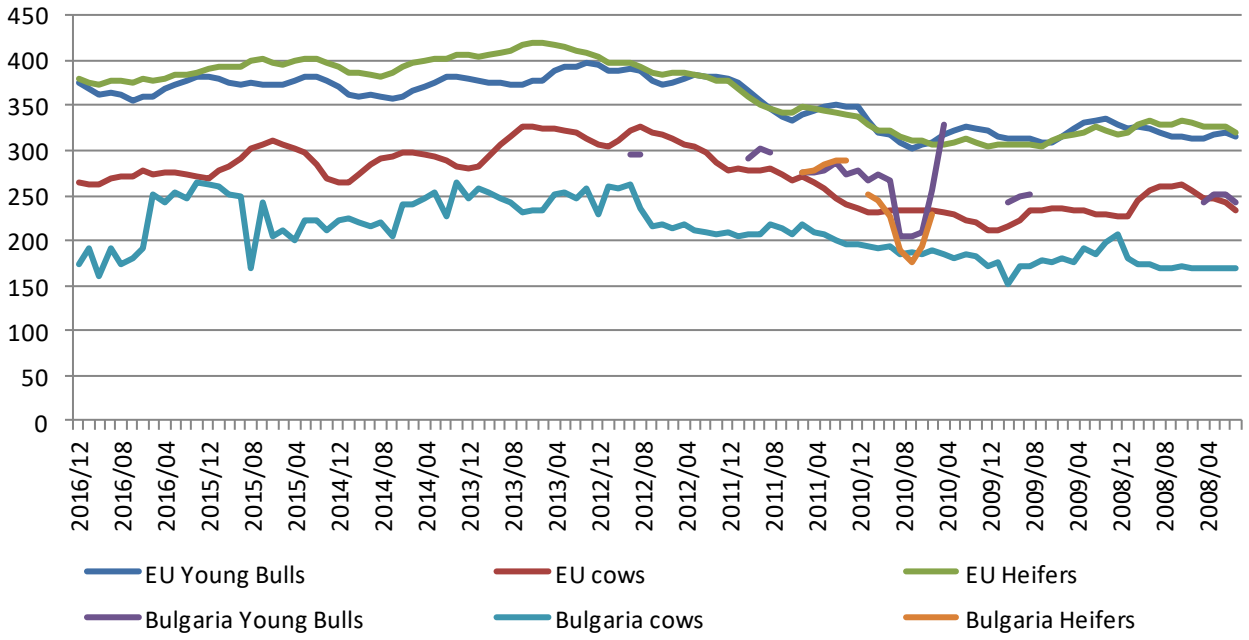

Fig. 1. *- Producer prices per 100 kg slaughter weight for the period 2008-2016, Bulgaria and EU, euro*

Source: Own graphic according to data by the European Commission, Agriculture and Rural Development, EU market prices for representative products, European Commission information based on Member States notification, Animal Products, AGRIVIEW: Animal Products V1.0 - Last Refresh Date :14/2/2017, https://ec.europa.eu/agriculture/market-observatory/meat_en

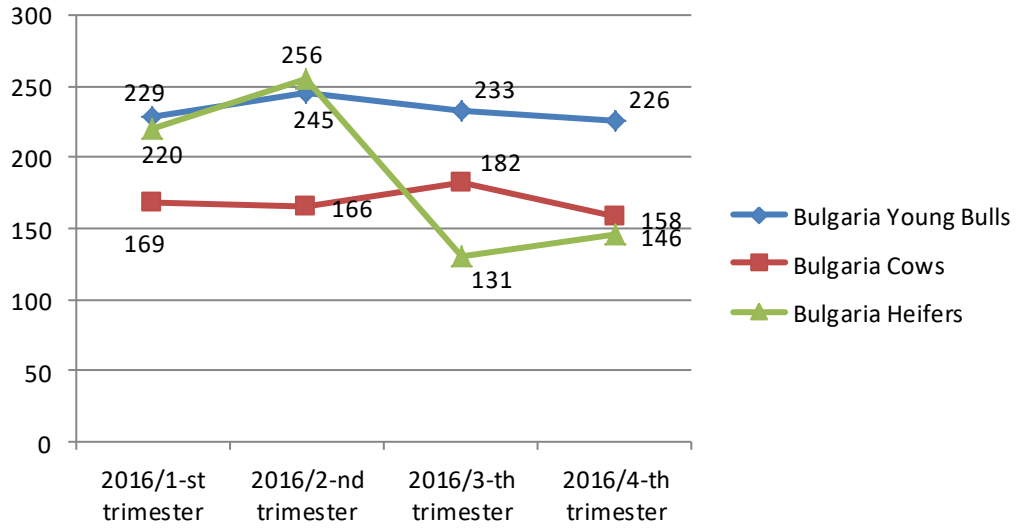

Fig. 2. *- Producer prices per 100 kg slaughter weight by animal categories and quarters, 2016, Bulgaria, euro*

Source: NSI, http://www.nsi.bg/bg/content/843/ prices-of-agricultural-production- per years

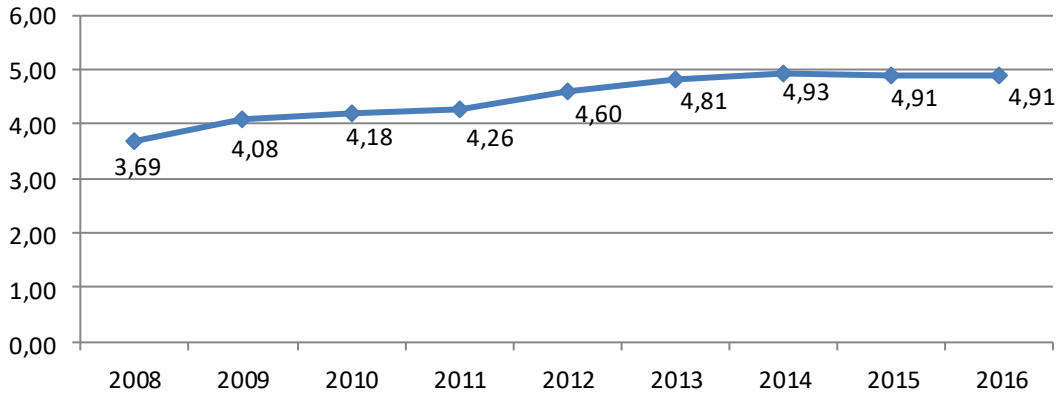

Fig. 3. - *Retail prices of bone beef, for the period 2008-2016, Bulgaria, euro/kg2*

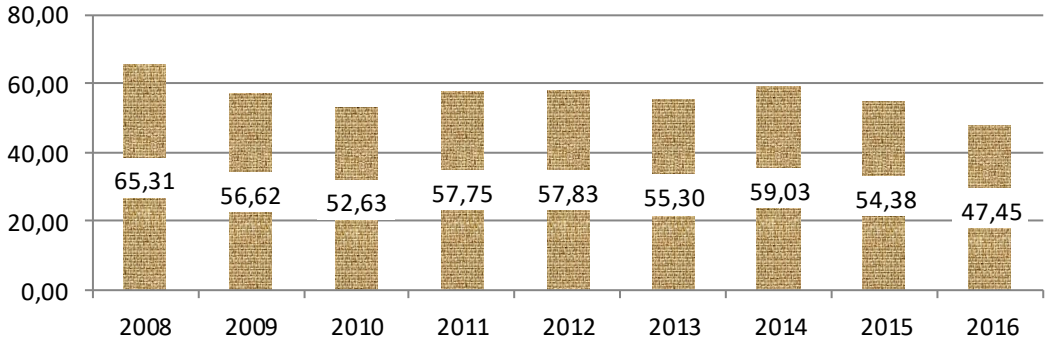

Fig. 4. - *Share of producer price of young bulls in beef retail price, Bulgaria, %*

Price determinants in procurement of fattened beef cattle

Diagram 1 presents the descriptive decomposition of factors influencing the level both of the price determination and price manifestation in the beef sector.

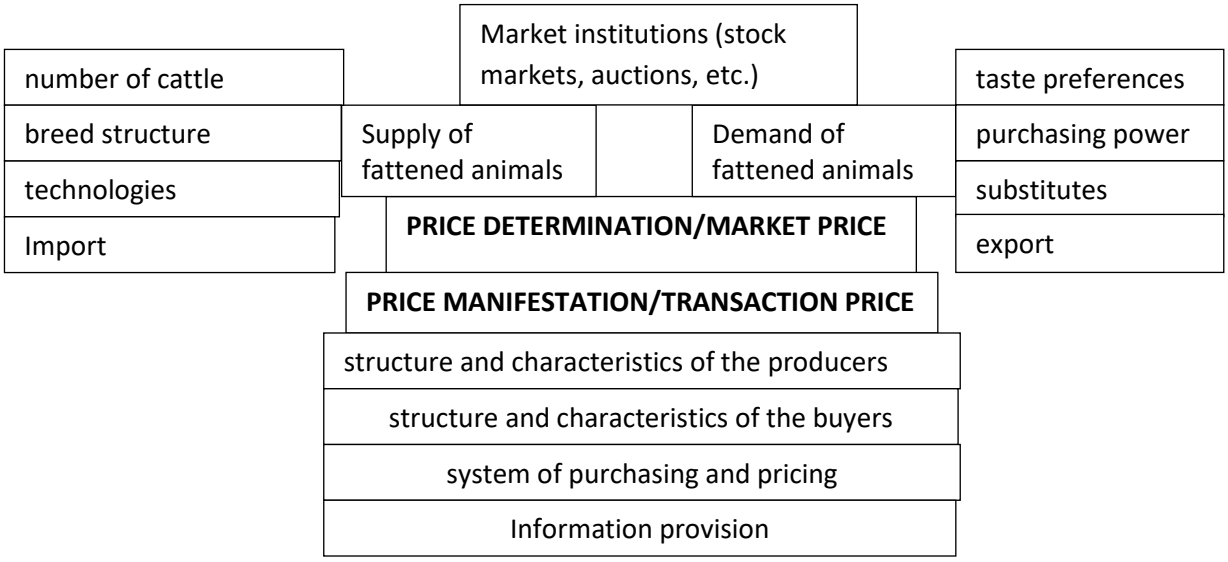

Diagram 1. - *Factors determining the producer price of fattened beef cattle in Bulgaria*

Source: Authors' interpretation

[2] In euro according to the exchange rate of BNB 1,95583 BGN/1 euro

2.2 Market determinants in producer price

In the European Union, the competitive prices and food safety are the main drivers of consumption level. Consumer purchasing power as a key determinant of consumption is particularly true for beef, where prices are higher than other forms of animal protein. Therefore, during the period of economic crisis after 2008, consumers, incl. in Bulgaria returned to the consumption of lower-priced food products, resulting in a more limited demand for beef. As it became clear, retail prices rose until 2014, and after some retention, in the second half of 2016, prices again started to go up exceeding the 2014 levels. Traditionally, beef is poorly presented in the Bulgarian diet, but both the rapid economic development of the capital Sofia and some of the big cities in recent years and the increasing visits of tourists, has expanded the growth potential of beef consumption. The average consumption of beef and beef products per person is around 4.4 kg/yr including 1 kg of fresh meat/year (NSI). The persisting demographic problems in the country (birth reduction, aging) are among the factors for the low growth rate of total beef consumption after the end of the crisis period -2013 (2.4% in 2016), and a decrease of 24% compared to 2008 (MAF, Agrostatistics department). In analyzing the beef demand, we must take into account the fact that the HoReCa sector has a very high growth potential in the country. According to Valkanov (2016), it already accounts for nearly one-third of the domestic beef demand, rising by more than 10% in 2014, compared to 2013. Recently, high-quality beef, incl. from local suppliers, started to make its way both in public catering and along the short supply chains.

Figure 5 shows the structure of meat consumption in Bulgaria. Although a low increase in beef consumption has been reported for the period after the economic crisis, beef meat still has a decrease in the share it occupies in the consumption structure. For the period 2008-2016, the relative share of beef fell by 2.9 percentage points. In pork, as a commodity substitute and competitive in meat consumption, there is also a decrease in the share of 2015-16 after the peak in pork consumption in 2013. Chicken meat has a sustainable consumption within the range of 39-41 % for the last four years.

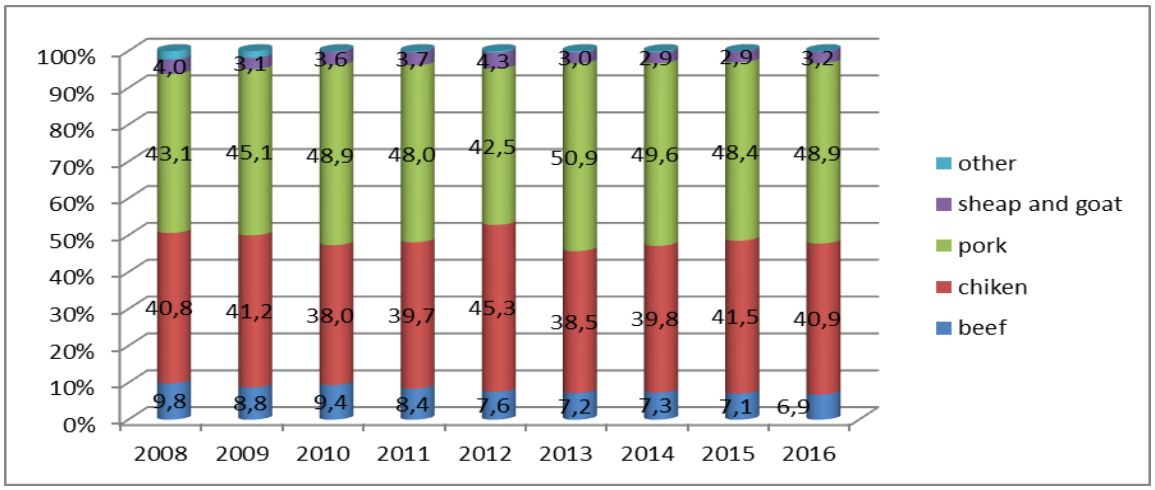

Fig. 5. *- Structure of meat consumption in Bulgaria, 2008-2016, %*

Source: MAF, Agrostatistics, Business of slaughterhouses for white and red meat in Bulgaria, from 2008 to 2016

Forecasts of the Center for Economic Analysis in Agriculture until 2020 indicate that domestic beef consumption will continue to be about 30,000 tons per year, covering both the use for the meat processing industry and direct consumption Ivanov and Sokolova (2015).

Trends for the development of the meat sector, Updated midterm forecasts up to 2020, Center for economic analyses in agriculture, Institute of Agricultural Economics – Sofia in associate partnership with Institute of food and agricultural policy of the University of Missouri.

3. Results

Assessing the consumption of beef as a function of several factors, the major of which are the beef price and the income of consumers, we examine the price and income elasticity by applying the model Workman et al. (1972). The demand for beef is presented as a function of the two variables - the retail price and the income of consumers is described in equation (1):

log Q = const + a1 log P + a2 log I, where Q is beef consumption designated, P – retail price, I – income of consumers (1)

The studied period is 2008-2016. The data about beef retail prices have been taken from Agromarket Information System, consumer incomes and the total index of meat and meat products from NSI, beef consumption has been calculated using data (MAF – Agrostatistics department). With data about the studied period the model can be written as (2):

log Q = 1,57 – 0,731 log P – 0,067 log I (2)

Results from the regression analysis are presented in table 1:

Tab. 1. *- Price and income elasticity of beef demand, Bulgaria, 2008-2016*

	a_i	*Std. error*	*t*	*Sig.*
Constant	1,57	0,694	2,26	0,065
Income	-0,067	0,294	-0,229	0,826
Price	-0,731	0,439	-1,665	0,147

Source: own calculations

In terms of price elasticity, the model shows that there is reverse proportional dependence - beef consumption is down by 0.73% at 1% price increase. This confirms the results by other authors Bett et al., (2012), who also report a similar value of price elasticity -0.87 Baharumshah et al, (1993). In fact, in terms of the income elasticity factor (-0,067), the results are the closest to a survey conducted in China in 2015, showing a value of "-0,129". Negative values are an indicator that income growth is not accompanied by an increase in beef consumption, i.e. weak consumer preferences for this type of meat are confirmed. Countries where income elasticity in food demand, incl. of a particular type of meat is lower than zero means that changes in income no longer affect the demand for these goods. In terms of statistical significance, the two coefficients do not fall within the range of 0.10, which is explained by the relatively small length of the surveyed time series of data (9 years).

The presented feature of the sectoral market is also complemented by the determined correlation between the dynamics of beef wholesale and retail prices, on one side and the absence of a correlation between purchase prices and retail prices, on another side, applying a cointegration model.

The first step in the test for co-integration is to investigate the order of stationarity or econometric integration to avoid a spurious relationship. The most commonly used test for determining whether or not a series is non-stationary is the Augmented Dickey-Fuller (ADF) unit root test Dickey and Fuller, (1979). ADF was used in this study for its simplicity and ease of interpretation of results. A null hypothesis is imposed that the data are non-stationary (that is contains a unit root) against the alternative hypothesis of being a stationary variable.

Essential in testing the order of integrity is to determine the optimal number of lags to be included. In Gretl 1.8.0, the optimal lag in stationarity testing with ADF and ADF-GLS criteria is determined automatically. Then all series in levels have been transformed into natural logarithms. We perform the standard ADF tests in both the first and second differences of the variables. The results of the verification for the existence of a single root in the first differences and in the logarithms of the variables are presented in Table. 2.

Tab. 2. *- Result of Test for Stationarity for 1st differences and levels of variables*

variables		Model without constant			Model with constant			With constant and trend		
		ADF statis-tics	p-value	Decision	ADF statis-tics	p-value	Decision	ADF statis-tics	p-value	Decision
L_retail-1st difference		-3,313	0,0009	stationary at first difference	-6,59	7,272e-008	stationary at first difference	-7,39	2,534e-008	stationary at first difference
l_wholesale-1st dif-ference		-9,396	1,354e-037	stationary at first difference	-9,68	1,716e-013	stationary at first difference	-10,15	3,949e-013	stationary at first difference
l_farm_price-1st difference		-5,68	2,526e-008	stationary at first difference	-5,83	1,862e-006	stationary at first difference	-6,45	1,362e-006	stationary at first difference
l_retail		-1,18(7)	0,68	Nonstationary I(1)	-1,09	0,929(7)	Nonstationary I(1)	-3,51	0,109(11)	Nonstationary I(1)
l_wholesale		2,87	0,99(0)	Nonstationary I(1)	-2,74	0,069	Nonstationary I(1)	-2,90	0,167(0)	Nonstationary I(1)
l_farm_price		1,04	0,92(1)	Nonstationary I(1)	-2,76	0,064	Nonstationary I(1)	-1,31(1)	0,885	Nonstationary I(1)

Note: The optimal lag is given in brackets

In this case, all the series are found to be non-stationary at levels and stationary at first difference. Thus, all price series are shown to be integrated of order one i.e. I(1) and this is a necessary condition for including the data in a cointegration equation.

For analysis of the selected three variants: a model without constant, with constant, with constant and trend.

In two models (with constant, with constant and trend) of the 3 options reviewed, the p-values for root in the surplus values are higher than the accepted theoretical values of 0.05. This means that there is no cointegration between the two dynamic lines in the variants with constant and with constant and trend. However, in the model without constant, all conditions for cointegration are met. The conclusion applies to the particular situation in which neither the constant nor the trend is included in the cointegration regression. Therefore, our conclusion that the overall relationship between retail and wholesale prices can be represented by the following equation (3)

$$Log\_retail = 1{,}07 \times log\_wholesale \qquad (3)$$

In fact, the trader, as a participant in the supply chain, has an impact on retail prices, as opposed to producers themselves, which is confirmed by the analysis of the relationship between farm gate prices and retail prices. (Tab. 4)

Tab. 3. *- Cointegration analysis of the relationship between retail and wholesale prices of beef, Bulgaria, 2008-2016*

Variable	Model without constant			Model with constant			Model with constant and trend		
	value of criteri-on: tau	p-value	Conclusion	value of criteri-on: tau	p-value	Conclusion	value of criteri-on: tau	p-value	Conclusion
check for single root in l_retail	-1,46	0,965	**I(1)**	-1,185	0,6833	**I(1)**	-1,o9	0,929	**I(1)**
check for single root in l_whole	-2,87	0,999	**I(1)**	-2,74	0,069	**I(1)**	-2,90	0,167	**I(1)**
cointegration regres-sion	R=1,07	7,79e-215 ***		const 0,028 l_whole 1,05797	0,5572 3,27e-071 ***		const 0,45 l_whole 0,828 time 0,0007	7,11e-05 *** 3,37e-026 *** 4,84e-05 ***	
check for single root in surplus values	-3,04	0,027	Presence of cointegration	-3,01	0,112	Lack of cointegration	-2,66	0,442	Lack of cointegration

Tab. 4. *- Cointegration analysis of the relationship between purchase prices and retail prices of beef, Bulgaria 2008-2016*

Variable	Model without constant			Model with constant			Model with constant and trend		
	value of criteri-on: tau	p-val-ue	Conclu-sion	value of criterion: tau	p-val-ue	Conclu-sion	value of criterion: tau	p-value	Conclu-sion
Stage 1 check for single root in l_retail	1,47	0,965	**I(1)**	-1,18	0,683	**I(1)**	-1,38	0,867	**I(1)**
Stage 2 check for single root in l_farm_price	1,04	0,922	**I(1)**	-2,76	0,064	**I(1)**	-0,725	0,97	**I(1)**
Stage 3 cointegration re-gression	R=2,14	7,66e-144 ***		const r=1,10 l_farm_price r=1,06	9,18e-051 *** 9,63e-050 ***		const 1,485 l_farm_price 0,586 19,90 time 0,0016	1,69e-080 *** 2,04e-037 ***8,09e-038 ***	
Stage 4 check for single root in surplus values	-2,12	0,19	Lack of cointegration	-1,55	0,744	Lack of cointegration	-2,91	0,304	Lack of cointegration

In other words for all three tested models, there is no rejection of the single-root check-in surplus values, meaning that there is no correlation between producer prices and retail prices of beef. Obviously, this confirms the strong market position of traders who are able to increase their profits without having to incur extra expenses for purchasing meat from producers. For the same reason the weak position of producers is also related to the absence of any form of unions/cooperatives in the sector, there are no such important market structures as stock markets and auctions. This leaves the individual form of supply of fattened animals strong.

4. Discussion

4.1 The structure of the meat market

It is worth pointing out that beef consumption in the EU is not only related to economic factors because its production, economic, social and environmental results are inseparable and positively linked. Consumers are influenced by technological innovations that make meat well suited to their expectations (practical use of the product, taste, tenderness, utility and safety for human health Yarkova and Otuzbirov (2012). Moreover, certain ethical factors (animal welfare, methods of slaughtering) and environmental protection (water quality, biodiversity) are increasingly respected by consumers. The development of this type of consumer attitude in Bulgaria has been hindered until recently by the lack of quality domestic production and the predominant import of frozen meat, but signs of positive change have already been pointed out.

Though in principle the export is a price factor, during the monitored period the export of beef cattle and meet is symbolic with almost no effect on the sector due to the small quantities and low relative share.

In general terms, beef supply in Bulgaria is formed by domestic production and import. Domestic meat production has got a structure that is largely in line with consumption (Figure 6), which again places beef after pork and chicken as a logical consequence of the preferences of the Bulgarian consumer as well as of the economic crisis force during the period under review. Beef is ranked third, with a share of about 9% with some fluctuations. We cannot fail to note that in 2016 it presents the lowest share of 8,3%.

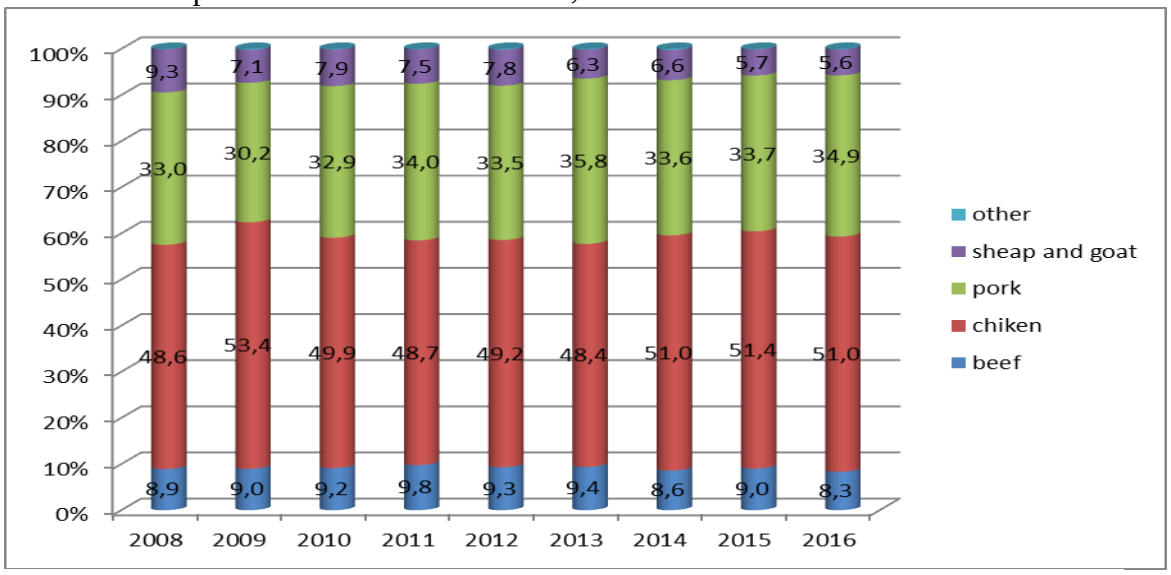

Fig. 6. *- Structure of meat production in Bulgaria, 2008-2016, %*

Source: MAF, Agrostatistics, Business of slaughter houses for white and red meat in Bulgaria, from 2008 to 2016

Trends in domestic meat production in Bulgaria are presented in Table 5. There is a variation in the beef production, but the overall trend for the period is a decline in production. Since short-term supply is associated with low price elasticity, despite the increase in producer prices in 2011-2014, national beef production is unable to expand sufficiently. Higher price elasticity of supply to the drop of prices leads to the fast reduction in production in 2014, mainly due to the adverse change of producer prices of fattened beef cattle.

Tab. 5. *- Beef production 2008-2016, Bulgaria (tons)*

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
tons	19929	21921	19608	20886	20377	19107	17210	18548	17463
change %	-	109,99	98,39	104,80	102,25	95,87	86,35	93,07	87,6

Source: MAF, Agrostatistics, Bulletin "Business of slaughter houses for white and red meat in Bulgaria", from 2009 to 2017

The issue about the beef production is also related to its economic efficiency. In general, beef production is characterized by low competitiveness, mainly due to the long production cycle and the lower efficiency of feed utilization compared to that of poultry and pigs. Many European countries have benefited from breed-improvement and selection, on one hand, and on the other, by introducing technology systems based on a predominantly pasture regime. In Bulgaria, however, specialized meat breeds (Aberdeen Angus, Limousin, Galloway) are being started to introduce for breeding and fattening just recently and the path to production of "natural beef" is sought in order to respond both to the new preferences of consumers and to the intention of increasing efficiency. The greater share of beef production in the country comes from cattle that are not meat breeds. Meat is mainly derived from dairy cows and their calves. According to data from the Agrostatistics department, MAF, the slaughtered cattle in slaughterhouses in 2016 are as follows: 15900 cows, 3200 heifers and 8200 male cattle over 12 months. Even the reported increase in the number of beef cows (more than six times) over the period 2007-2016 (Figure 7) is due to the fact that dairy farms non-compliant with the requirements for production of quality milk are being allowed to re-categorize their animals in the beef sector (2015, 2016).

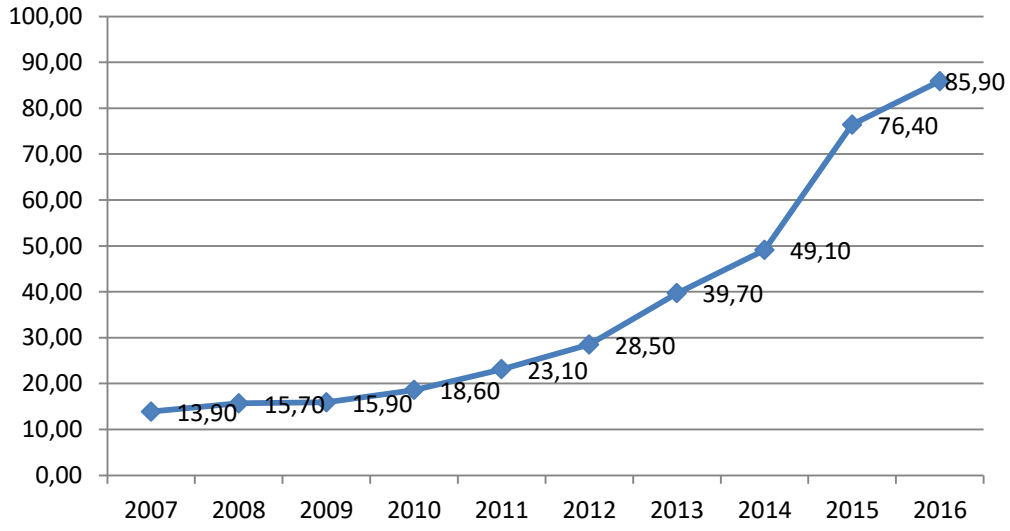

Fig. 7. *- Number of beef cows Bulgaria 2007-2016, '000 pcs.*

Source: own graphic representation of data by MAF, Agrostatistics, Bulletin „Farm animals in Bulgaria as of 1 November", from 2008 to 2017

Regardless of the limited consumption (due to the mentioned economic factors and consumer taste preferences), domestic beef production is far below the demanded quantities (Figure 8). In 2016, only 44.9% of the meat consumed was domestic. Yet, unlike pork and chicken, the beef owns the lowest share of imports in total consumption. In pork there is a tendency to increase the relative share of imports to total consumption 2016 - 66.3%. In chicken it also moves within a sustained range of 60-62% over the last 4 years.

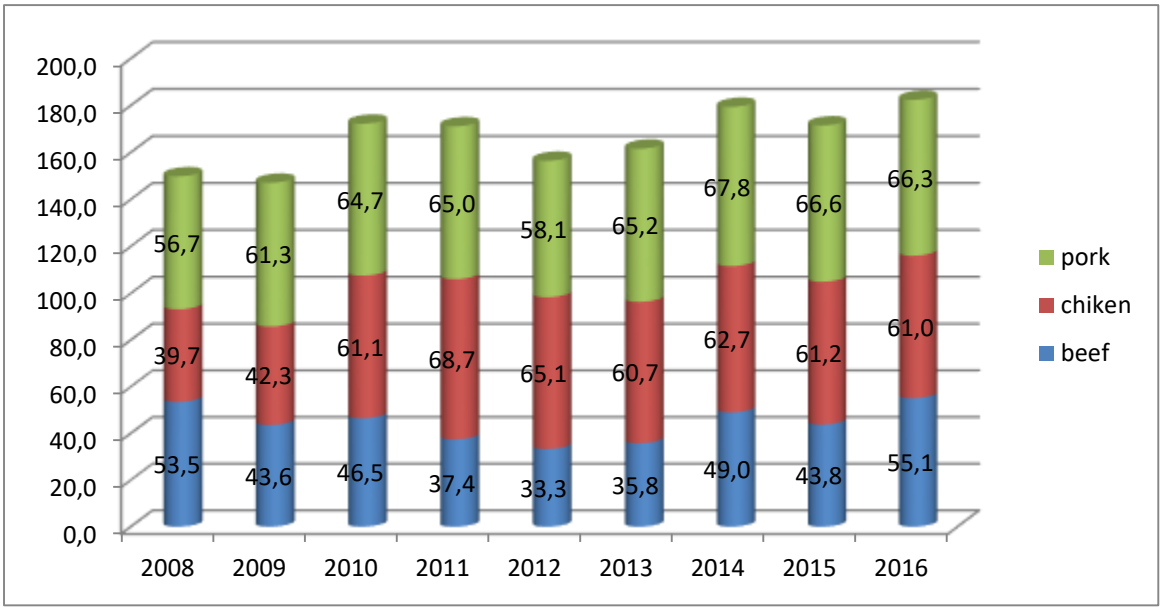

Fig. 8. *- Import share in domestic meat consumption in Bulgaria, 2008-2016,%*

Source: MAF, Agrostatistics, Business of slaughter houses for white and red meat in Bulgaria, from 2008 to 2016

The import of beef includes frozen and freshly chilled meat. An indirect confirmation of the increase in beef demand for fresh consumption can be found in the data on imports of fresh and chilled cuts, increasing more than three times in 2014 compared to 2013. In imported freshly chilled meat, prices for the main types of cuts vary. For premium cuts, prices in 2015 are between € 5.50-8/kg (the Netherlands and France). The most expensive fresh meat costs € 8-13/kg (from Italy). It makes an impression the imports of whole and half carcasses from Romania in 2015, which occupies 80% import share in this segment with a price of € 2.23/kg (Valkanov, N., 2016) and according to MAF it is probably reexported. In the quarters cuts, competitive prices from under € 2/kg are offered from Italy. The prices quoted are one of the prerequisites for suppression of domestic production due to the higher costs of the fattened animals in Bulgaria.

4.2 Factors for price manifestation (transaction prices)

Indeed price manifestation as transaction price is formed by the characteristics of producers and procurement entities, the procurement method, method of pricing, quality of fattened animals, purchase period, level of regional compliance between producers and purchasers of fattened animals, access to information of both parties and its characteristics, market structure.

4.3 Characteristics of producers

The total number of farms specialized in rearing beef cattle in 2016 (7725 pcs.), is 2,3 times more than in 2007 and 2,6 times more compared to the end of the economic crisis (Figure 9).

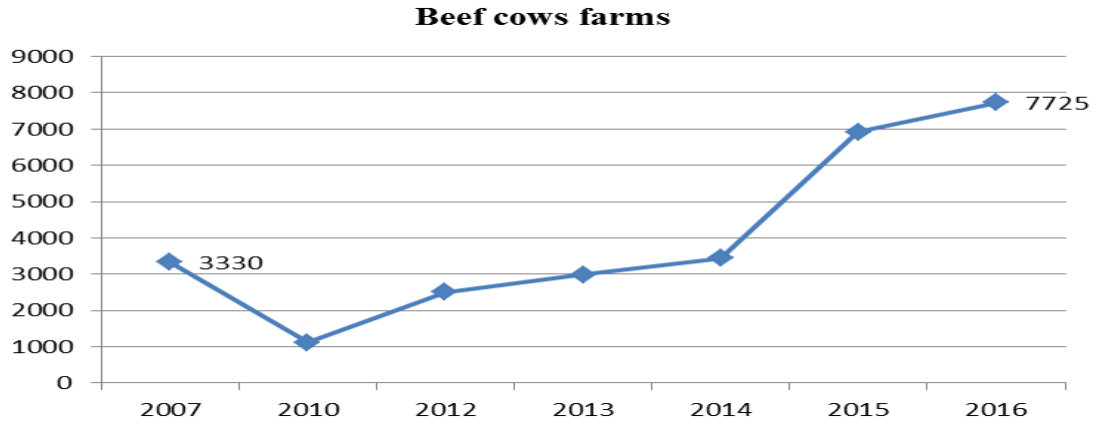

Fig. 9. *- Beef cows farms (number) 2007-2016*
Source: own graphic representation of data by MAF, Agrostatistics, Structure of farms

In the census and analysis of farms (2013), 35.3% (MAF, Agrostatistics, Structure of farms, 2013) have economic size below 2000 EUR, 38% have economic size between EUR 2000 and EUR 8000, from EUR 8000 to EUR 15000 are 13.9%, from EUR 15000 to EUR 50000 being 11.1% and only 1.6% between EUR 50000 and EUR 2500000. These farms are concentrated mainly in South Bulgaria (75.3%), with a leading share of the South Central Region (32.4%) (Figure 8).

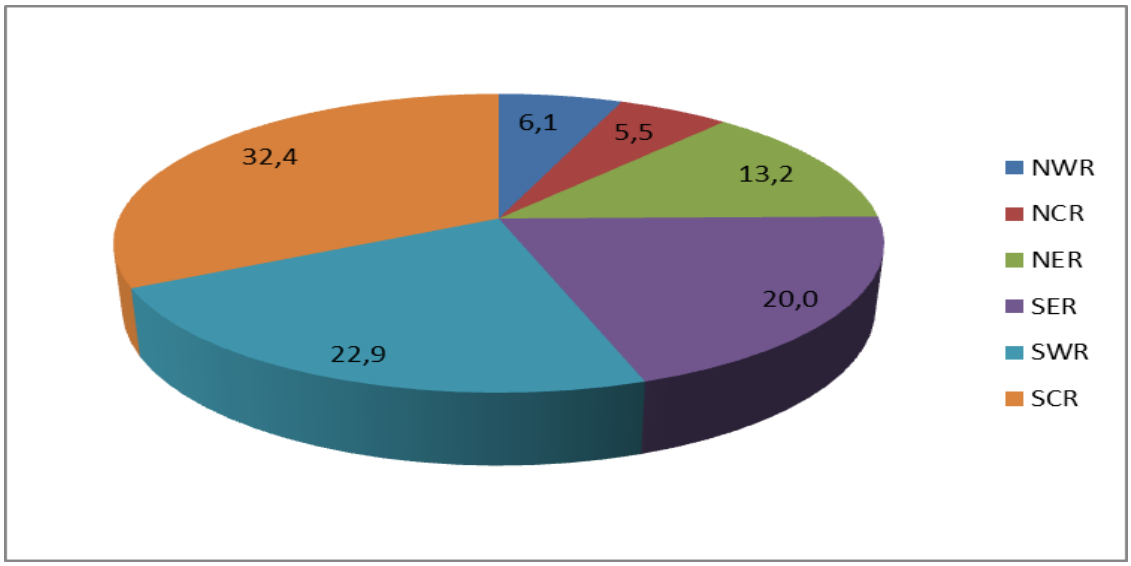

Fig. 10. *- Share of regions (NUTS 2) in the total number beef cows farms (%)*
Source: author's graphic representation of data by MAF, Agrostatistics, Structure of farms, 2013

Furthermore, it is evident from Figure 11 that the largest by economic size farms (between EUR 100 000 and EUR 250 000) are concentrated mainly in the regions from Southern Bulgaria.

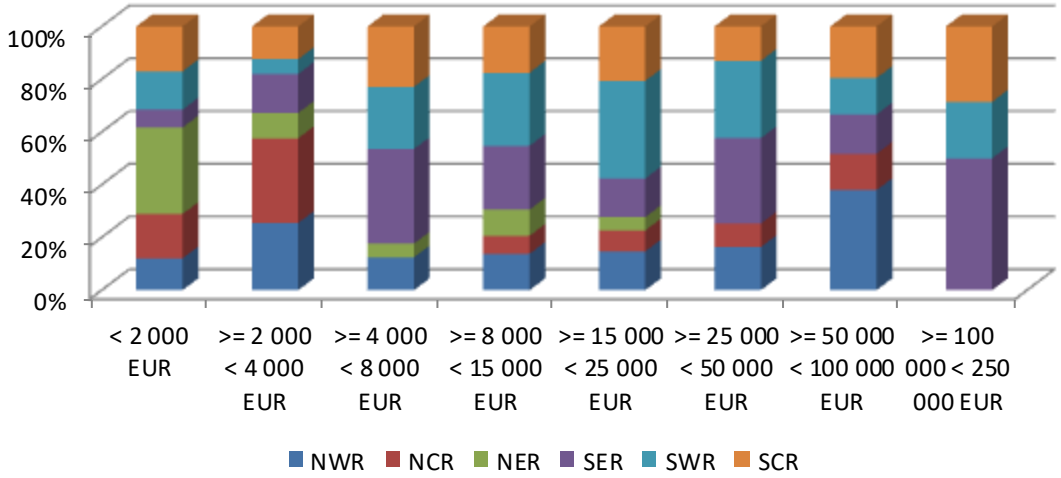

***Fig. 11.** - Distribution of beef cows farms by regions NUTS 2*
Source: authors representation of data by MAF

Even in the region with the largest concentration of meat farms (SCR), most of the farms (75.6%) are small and very small farms- (Small farms have economic size >= 2 000 < 8 000 EUR, as per ORDINANCE No. 10 dated 10 June 2016). This means that farms offer small number calves, which is associated with higher costs for the procurement entities (for transport and documents). The biggest is the share of large farms in the SWR, part of which is the capital city with the largest and diversified market, but most of them are without selling contracts with slaughterhouses.

A significant difference in the weight of the fattened calves is observed - calves of 240 kg, 290 kg, 350 kg are available, which in practice need further fattening, very limited is the supply of fattened calves over 500 kg. The average live weight of cattle for slaughter was 451.2 kg in 2015 - between 70% and 85% of the accepted standards. The yield ranges between 46% - 49% at accepted standards of 55-70%. The quantities of fattened calves offered are inconsistent.

As mentioned above, a significant proportion of cattle for slaughter are of dairy breeds. This situation affects another technological element as well - the nutrition system. On farms with dairy cows, incl. the ones transformed into beef type, the cowshed-pasture regime is applied. Considering that the main share of beef cows and farms is concentrated in South Bulgaria, we can state that the average length of the grazing period is about 8 months for the plain and 5-6 months for the mountainous and semi-mountainous regions. Thus the cost of fattening is also dependent on the dynamics of the price of the main feed used. Professional farms keeping specialized meet breeds and taking care of proper selection and nutrition to improve the results and achieve quality produce are still developing. That's why the interest in importing animals from meat breeds from abroad (Germany, France, Italy, Denmark, Belgium) is growing as well as more investments in the sector. Accurate data about the number of animals by breeds are missing. There was also no link between farms specialized in the beef production until recently and organizations to maintain and develop breeds were absent. In 2011 the National Association of Meat Cattle Breeding in Bulgaria (NAMCB) was established, and in 2015 the Association for the Breeding of Meat Cattle Breeds in Bulgaria, Aberdeen Angus, Hereford, Limousin, Simmental beef and Galloway (ABMCBB) setting up the beginning of breeding organizations keeping her books.

4.4 Procurement (purchasing) entities and method of purchasing

Procurement entities for fattened animals are closely related to the marketing channels: directly to slaughterhouses, to retailers, directly to consumers (shops, restaurants, households). The direct sale to households is small 3-5% Valkanov, (2013). While sales to specialized butcher's shops and restaurants are on the rise, the difficult access of farmers to a licensed slaughterhouse keeps that marketing channel at a low level as well. In 2015, a total of 73 slaughterhouses for red meat were in operation, of which 63 were approved for supplying products in the EU countries, according to Regulation 853/2004EC, cattle were slaughtered in 38 slaughterhouses. The change in 2015 was a positive one - 25.5 thousand animals were slaughtered in slaughterhouses, which is 10% more than in 2014 and accounts for 18.5% of all slaughtered cattle. This increase is 2.3 percentage points more than the increase in the number of farms.

The greater concentration of slaughterhouses in North Bulgaria (52%) does not correspond to the higher concentration of meat farms in South Bulgaria, which creates additional conditions for the presence of resellers (intermediary agents) in the sector.

Due to the poor contracting of slaughterhouses with producers (farmers) and the uncertainty of information about the search for fattened animals, producers receive different prices in time and space and still the price level is low (sometimes below costs for production). Procurement agents (buyers) are better informed about livestock supply and therefore have a leading role in determining transaction prices. And a serious factor affecting transaction prices is the presence of a gray sector - not less than 45% of the market - from the birth of male animals, which are often not registered on the dairy farms, through cases of uncontrolled transport in the country to unregulated fattening farms and problems at the slaughterhouse entrance and exit Valkanov, (2013). In 2015, a total of 28.9% of beef was produced in slaughterhouses and the rest - on farms (MAF, Agrostatistics, 2016). Thus the key issue remains the controversy between participants in the beef supply chain.

In order to determine more specifically the degree of effect of major factors on the producer (procurement) price, authors use an appropriate econometric model. Some authors Harrell and Frank (2015) recommend at least ten observations of each independent variable in order to provide the necessary accuracy in using regression analysis. Other author Green (1991) limits this recommendation to five observations of an independent variable. Because of the number of years which we have data for (nine years) we cannot fulfill these conditions and apply a logarithmic equation (4) for each independent variable individually:

$$Log\ Price_i = const + log\ x_i \qquad (4)$$

The dependent variable is the average weighted purchase price of fattened animals and for independent variables (predictors) we use those of the discussed factors which we consider as primary and data for dynamic order is available: the share of beef consumption, the share of imports to total consumption, the share of beef cows and the average slaughter weight of fattened animals. After applying regression analysis, we get the following results:

Tab. 6. *- Effect of some independent variables on the procurement price of fattened animals*

Independent variable	Coeffi-cient	Standard error	p-value	R - square
l_consum.share	-0,642	0,176	0,0083 ***	0,677
const	8,757	0,385	8,10e-08 ***	
l_import	-0,208	0,139	0,178	0,128
const	8,206	0,505	8,18e-07	

			***	
l_beef cows share	0,123	0,056	0,0635 *	
const.	7,14	0,113	6,74e-011 ***	0,534
I_sl. weight	2,07	0,361	0,0007 ***	
const	-3,65	1,91	0,0974 *	0,371

Of the four independent variables studied, one (the share of import from total consumption) had no effect on the purchase price. There are two predictors with positive effect - the share of beef cows (p-value 0,0635* and R^2=0,534) and carcass weight (p-value 0,0007*** and R^2=0,371). The factor with the strongest, but negative impact is the share of beef consumption (p-value 0,0083***) and (R^2=0,677). One main reason is that during the monitored period both the share of beef consumption and purchase prices were low, and with the additional withdrawal of consumers from beef, the only way to compensate for the weakening domestic market is to raise procurement prices.

5. Conclusion

Prices in the beef sector in Bulgaria have the following features: unstimulating level of prices of the fattened beef cattle; the discrepancy between the dynamics of producer price and retail prices in recent years; established relatively big "scissors" between producer prices and the retail prices of beef.

Market factors that are important for the formation of low procurement prices are: slow growth rates of demand (internal and external) due to internal traditions in the structure of the meat consumption and weak external channels for marketing; domestic supply is individual, in volatile quantities; imports take a significant share at competitive prices. What we can expect a change in these factors is first of all with regard to consumer demand - the changing attitudes of the Bulgarian consumer towards beef and the increasing tourist flow justifies the assumption that the trend of consumption will go up in the medium term period.

Understatement of the producer's contribution to the final price is manifested most strongly through the transaction prices at the stage of purchasing fattened animals. This is a consequence of: the size structure of most beef farms (SME); poor access to licensed slaughterhouses and poor contract practice; low average weight of fattened animals and low yield due to the predominantly dairy origin of the slaughter animals; unfavourable regional structure of slaughterhouses for red meat and farms offering fattened animals; strong grey economy sector.

The results of the analyses show that the low share of the producer in the market price of the final product is mainly the result of strong disagreement along the beef supply chain (between farmers and procurement entities, between farmers and slaughterhouses, between slaughterhouses and wholesalers). This reduces the efficiency, creates an uneven distribution of value added between the actors in the chain and creates prerequisites for a deterioration of quality and traceability of the products in the beef sector.

The fair market and prices in the beef sector can be achieved by increasing the relative market of producers and thus increasing their market power along the supply chain. This is possible first of all by establishing cooperative forms of business in the sector. Since targeted support for creating such forms was unsuccessful in the 2007-2013 period, alongside the known measure “Producer Groups and Producer Organizations”, the new type of measures ("Cooperation", "Knowledge Transfer and Information Actions") under the Rural

Development Program (RDP) 2014-2020 must be presented as quickly and efficiently as possible to stakeholders and provide maximum technical assistance when applying in 2018.

On the other hand, it will be decisive to support the emerging market niche for a high quality product - beef with new characteristics for the Bulgarian market, which are in line with the requirements for healthy nutrition and ecologically responsible production. The potential is in both the emerging beef cattle farms and existing dairy farms - by crossing dairy cows that are not used for reproduction, with meat bulls, for the production of stock animals with higher values of weight and yield, and better meat quality.

In the medium term period (until 2020), the solutions of the problem - low procurement prices of fattened animals - are the subsidies from European structural funds and state co-financing of the support: head animal subsidies - for coupled and uncoupled production, for land (for all measures if it is a mountainous and semi-mountainous area), additional payments if they are under the Nature 2000 scope, and direct payments.

Undoubtedly, the effect will be improved by utilizing the funds to support marketing initiatives provided to individual producers within the framework of the relevant measures under the 2014-2020 RDP, but to this end, it is necessary to reduce administrative constraints for SMEs and to overcome any discriminatory element in business support, incl. by providing tax and financial instruments.

Active measures are needed to reduce bureaucracy, including by speeding up the deployment of e-services on a national and regional/local level. National and local governments are responsible for providing an administrative and territorial environment for opening "market institutions". In order to accelerate the genetic breeding work in the sector and to build strong meat cattle breeding that produces high quality fattened animals, support for the import of pure-bred animals from meat breeds is needed.

Expansion of export of the final product (beef and its products) should become a market determinant of price levels in the sector and be provided at an international level, incl. through intergovernmental contracts, market opportunities for products from the sector outside the country. The EU scale for the classification of carcasses S(Europ) introduced in Bulgaria in 2010 is a good basis for building the purchase system in Bulgaria by carcass weight and its association with the quality sought after on the international market.

A faster and more effective result could be achieved through the transfer and adaptation of foreign experience and knowledge, which requires opening up opportunities for the national beef sector to get acquainted with the experience already gained in the EU countries.

Expectations for the real development of the beef sector after 2020 are mainly related to neutralization of the grey economy sector, drive for competitive market relations, professional, science-based approach at all levels related to the management of this sector.

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