EFFECTS OF MARKET STRUCTURE CHANGES ON DAIRY SUPPLY CHAIN IN SERBIA

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Abstract:
The paper discusses changes in structure of dairy supply chain in Serbia during recent period and their effect on market position participants in each level of chain. The analysis was done on data analysis, research of economics of milk production in lowland region, interviews with stakeholders and literature review. In the paper are identified key drivers on dairy supply chain, examples of vertical integration, differences in market power and key constrains for further development.

Kay words: dairy chain, structure, vertical integration, market power, economics of milk production, Serbia

1 Introduction

The process of transition in Serbian food sector is still ongoing. Many changes happen on every level of dairy chain, as well as on related agriculture policy, that influenced current situation with some new and some old constrains. Market structure is now quite different than ten years ago. Measures of agricultural policy moved focus from market regulation to market stimulation. Structural changes are happening through all dairy supply chain.

This paper examines factors that influenced and their effects of market structure on Serbian dairy industry in recent years. The paper is based on research, with focus on understanding nature of changes in dairy supply chain. Research include conducted questionnaire with sampled dairy farmers in lowland region, semi-structured interviews with middle management level in dairy input industry, processing and retail sector along dairy chain. Collected data were analyzed using software E-views 3.1, to define cost function of milk production.

2 Dairy policies

Dairy policy in Serbia, in last decade, underwent significant changes directed to market deregulation. Until 2001, a maximum retail price and subsidies for pasteurized milk were in use. In the same year, import tariffs were reduced to 30% for cheese and butter and 20% for other milk products. There are also variable levies for imported dairy products (Dunn J. and Popovic R. 2005). The raw milk market is now free. The price for raw milk was adjusted formerly only by the percent of butterfat. Since May 2002 the government adopted new milk regulations designed to improve dairy standards, which are closer to EU regulations. Since June 2003, when the regulation was put into force, the raw milk price depended on the percent butterfat, percent protein and number of microorganisms. Nowadays, the milk price depends significantly also on the amount and stability of milk delivery.

Raw milk subsidies have increased substantially in period 2000–2004, when reached about 56% of all agricultural subsidies. After that year significance of this measure

decreased and reaches 5.2% of all market measures in 2009. There were two levels of subsidy, one for milk from the lowlands and the second, higher for milk from the highland regions. In 2009 this subsidy equalized for all regions, but begin to recognize differences in milk quality, milk that satisfied EU raw milk regulation gets higher premiums. Raw milk subsidies in Serbia are cash payments per liter for milk that farmers sold to the dairy plant. The payments are made periodically direct to farms. In 2002 the share of raw milk subsidies of the farm gate milk price was highest with over 37%. Since than it decreasing and in 2007 was 12% for lowland region and further decreased in 2009. Market-oriented producers benefit most from this direct support. For example dairy farms in the Province of Vojvodina (lowland) had 14% of the cows in 2003 and received 33% of the total raw milk subsidies. Since lowland herds are larger and have a larger share of milk delivered, these farmers receive more of the total subsidies.

Additionally, dairy farmers in recent years received subsidies for first time calving cows, intended to improve genetic potential of herds. Another direct subsidy is intended for all farmers in crop and vegetable production was for inputs (fuel, seed and fertilizer). This subsidy is fixing per 1 hectare of arable land on beginning of each year.

Globalization process exposes Serbian dairy chain to higher level of competition. In November of 2008 the Serbian government ratified a Stabilization and Association Agreement with EU. Unilaterally decided, Serbia began with the implementation of trade part of the Interim Trade agreement with EU, from January 1. 2009. For the dairy sector this decision means that during 2009 to 2014 the border protection will gradually reduce, and the dairy sector in Serbia will be exposed to a higher level of competition. Reduction of border protection would not be same for all milk products, for example, liquid milk products will be depleted and on cheese it can remain approximately 10%. There is also in use free trade agreement with Western Balkan countries, Russia and agreement with Turkey which will be implemented since 2010.

Two the most important dairy policy measures in Serbia in last decade were raw milk subsidies and import tariffs. Perspectives in forthcoming years for dairy policy measures are the further harmonization with EU regulations. That means, for example, that raw milk subsidies, subsidies for first time calving cows and other will be substituted with decupled payments.

3 Dairy supply chain structures and key drivers
3.1 Dairy input sector
Development of dairy input sector follows structural changes of dairy farms. Concentration is obvious in feed industry. From big number of locally oriented enterprises in feed component production, this sector moves to few big companies oriented on national market.

3.2 Dairy farms
Milk production is traditionally based on family farms which produce 91.3% of total cow milk. Farms in property of companies produce additional 8.7 %. Number of dairy

farms decreasing in Serbia, and now there is about 285 thousands[1] farms producing 1.7 million tons of cow milk. Total milk production in Serbia is stable in last 10 years. Stability (Figure 1) is result of constant decreasing farm numbers, cow numbers and increase of average milk yield. In total milk production, 75% were produced in Central Serbia, and 25% in Province Vojvodina.
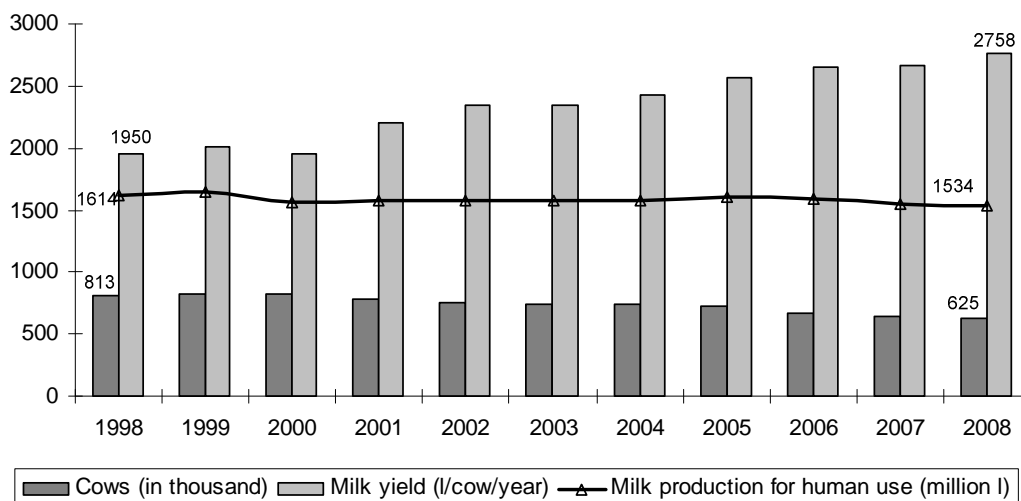

Figure 1. Cow population, average milk yield and milk production in Serbia.

Average number of cows per farm increase, but it is still small, just above 2 cows. This is extremely small if compared with EU-15 where the average herds size is around 40 cows, ranging from 14 cows per holding in Greece to 80 in the UK (Berkum, 2007, p. 5). The most of decreases in number of farms and cow population comes from farms with 1 to 5 cows per herd in highland regions.

Because there were no precise information about farm number and also number of dairy farms, Ministry of agriculture, forestry and water management (MAFW) started a process of farm registration in 2004. It is a voluntary and ongoing process. Established register of farms is using for distribution subsidies directly to farmers. Until 2007 (Table 1) in the register were collected data from 65,534 farms which deliver milk and own 209,682 cows. Out of register are still the majority of dairy farms, but mainly farms that own 1 or 2 cows.

Table 1. Herd size and cow numbers in Registered in 2007[1].

Cows number	Farms	Total cows	Farm share	Cows share
1 to 3	53,693	107,386	81.93%	51.21%
4 to 5	6,922	31,149	10.56%	14.86%
6 to 12	3,937	35,433	6.01%	16.90%
13 to 50	890	26,700	1.36%	12.73%
51 to 100	44	3,256	0.07%	1.55%
101 and over	48	5,760	0.07%	2.75%
TOTAL:	65,534	209,684	100.00%	100.00%

[1]Source: MAFW Register of farms.

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[1] According data from Register of Ministry of agriculture, forestry and water management (MAFW) and author calculation

In period from 2002, when was last census to 2007, according data from farm register absolute number of farms with 6 and more cows in herd increased from 4.3 to 4.9 thousands. At same time this group of dairy farms doubled their number of cows, and their share in total number of cows (648,000) increased up to 11% in 2007.

Commercial farms (mostly family farms) during transition, since 2001, significantly changed structure and increased capacity of production. Measures of agricultural politics were aimed mainly to dairy farmers. At same time, newly privatized dairies, where new owners invested tens millions Euros to expand capacities, actively influenced on farms to ensure suppliers of good quality milk. That also provided positive effect on average herd increase. According data of farm register from MAFW, milk processing sector bought 814.5 million liters milk which represents 52.6% of the total milk production intended for human consumption. It is highest level of milk intake ever recorded in Serbia.

An important characteristic of dairy farms, as well as the majority of other farms is lack of cooperative action. In practice there are just few associations of dairy farmers, which don't have any economical or political influence on market or related institutions. Cooperatives in dairy farming don't exist, and it is partially result of negative experience from socialistic cooperatives.

3.3 Milk processing sector

In Serbia in 2007 operated 202 dairy processing companies, that is less than in previous year (211). There is a significant diversification of companies by operating capacities from a very small to big scale. Four biggest milk processor companies (Table 2) has share in total milk intake 60.3%. The biggest player on the Serbian market is Danube Food Group B.V. which has majority ownership in five companies and participates with 44.4% in total milk processing. Rest of row milk market (39.7%) is controlled by 16 middle sized and 180 small sized dairy companies. Those companies increased market share for 2.2% compared with previous year.

Table 2. Structure of dairy processing sector[1] with milk intake and market share.

	Company name	Deliveries of milk to dairies (in liters)		Market share	
		2006	**2007**	**2006**	**2007**
	Dairies in structure of				
	DANUBE FOODS GROUP B.V.	**350,374,975**	**361,959,880**	**47.4%**	**44.4%**
1.	- IMLEK, IMPAZ and Zemunska mlekara	230,587,554	243,462,640	31.2%	29.9%
	- Novosadska mlekara	60,697,564	61,205,680	8.2%	7.5%
	- Mlekara Subotica	59,089,857	57,291,560	8.0%	7.0%
2.	„Mlekara Šabac", Šabac	43,187,653	56,945,950	**5.8%**	**7%**
3.	„Somboled", Sombor	40,256,713	43,665,250	**5.4%**	**5.4%**
4.	„Mlekoprodukt", Zrenjanin	28,977,976	28,720,080	**3.9%**	**3.5%**
5.	Dairies from 5 to 15 millions liters of processed milk	126,563,765	158,097,080	**17.1%**	**19.4%**
6.	Small sized dairies with less than 5 millions liters processed milk	150,584,654	165,139,540	**20.4%**	**20.3%**
	TOTAL:	**739,945,736**	**814,527,780**	**100.0%**	**100.0%**

[1]Source: MAFW Register

Privatization of milk processing companies was one of the most successful in Serbian economy. New owners heavily invested in modernization and expanding capacities to be able to accept bigger amounts of milk in the short term, expecting increase of marketed milk.

Level of competition between milk processing companies on input market is low, because they are mainly oriented on dairy farms geographically closer to processing plant. From other side, farmers with small amounts of milk are not able to offer milk to more than one processor which organizes milk collecting station in that village. Dairy companies usually buying milk directly, on contract base, from farms that own 10 or more cows in herd. With increase of capacity of production on commercial family farms, dairy processors interest for milk from small producers decreased during 2008. Dairy processors are particularly merit for vertical integrations with dairy farmers, and rationalization of supply base.

After the privatization processors provided some extension services to commercial farms and in some cases also financial support for the purchase of inputs such as: feed, mechanization, cows, equipment and so on. All inputs provided were contracted with farmers in specific amounts of milk they had to deliver to processors in an agreed period of time. All those services should be done by cooperatives but, in the absence of farmer's initiative to organize cooperatives, processors used this space to assure long term supply of milk. The organization of milk collecting stations and transport are in the hand of processors. Row milk prices are establishing based on control of milk quality, but that service is conducted only by the milk plants.

3.4 Retail sector

Last link in dairy supply chain is distribution of milk to consumers. The most important role in milk distribution in Serbia plays retail chains. According results of earlier conducted research for 2006 (Popovic 2007, p. 67) it is concluded that milk and liquid milk products are mainly distributed through retail sector, and just small amount through food service. Retail stores participate in distribution of fresh milk with over 99%, UHT milk 93.8% and yoghurt products 97.2%. Several domestic and foreign retail chain companies operate on the Serbian market. Among the domestic retailers the biggest are: Delta (Maksi, Tempo and Pekabeta), C–Market, Univerexport and Si Market. The most important foreign retailers, which originate from Slovenia and Croatia, are: Mercator, Idea, KTC and Tus. From other well known foreign retailers there is Metro.

Level of competition in retail sector is increasing slightly in last years with entering domestic market by foreign retail chains. Until now retail sector still didn't take strategic steps in this sector to ensure stability and competitive milk prices through own labels. In recent period retailers practice market power with pushing dairy processors to ensure credit period for 90 and more days. That situation caused negative boomerang effect on other levels of dairy supply chain. Also, higher retailer margins causing relatively high prices in market for milk and liquid milk products which are particularly important in consumption structure.

3.5 Consumers

Consumers, their dietary habits and tastes, are the most important segment in food supply chain. Total demand for milk and milk products is limited by two factors population and income per capita. Population in Serbia decreases by 0.4% rate, while income per capita slightly increases.

Like on other market with lower income per capita, in Serbia milk is consumed mainly in shape of pasteurized or UHT milk and fermented liquid milk products. Consumption of all kinds of cheese and butter is not significant, according official statistical data. But it should be treated with care, because there is a not included farm processing and informal market.

From data presented in Table 3 can be concluded that milk consumption per capita is slightly decreasing in recent years. At same time consumption of cheese and butter has positive trend. The difference between milk production and milk consumption per capita is the net trade per capita. Serbia has a small positive net trade balance and exports mainly to former Yugoslavia republics.

Table 3. Milk production and milk products consumption[1] per capita.

Year	Milk production	Milk consumption	Milk and liquid milk products	Cheese	Butter and cream
Per capita					
2005	215.3	208.2	174.3	3.3	0.6
2006	214.1	205.7	170.8	3.3	0.5
2007	209.7	201.3	165.3	3.4	0.6
2008	208.3	200.6	163.3	3.5	0.7

[1]Source: Statistical office of Republics Serbia and author calculation.

4 Economics of milk production

Two research projects of milk production economics in lowland region (Province of Vojvodina) where conducted in 2003 and 2007 production year. Both researches were focused only on milk production enterprise, with sample size 20 and 24 commercial family farms respectively. Rearing herd replacement and calves were treated as separate enterprises. Methodology was identical, based on economics concept of costs, and including all cash and noncash revenues. Profit was measured as entrepreneur profit and net farm income.

Using E-views software numerous of independent variables were examined in estimation of milk production cost function. Finally the model with four independent variables showed the best results and function of average cost in 2007 was estimated as:

$AC = 35.72586651 - 0.2190378845 \cdot COWS + 0.001650302384 \cdot COWS^2 - 0.00297647414 \cdot MY + 0.6007004142 \cdot CONC + 0.06894880067 \cdot WR$

$R^2 = 81,88$

$F_0 = 16,26 > F_{(0,01;5;19)} = 4,17$

where:

COWS = average cow numbers
MY = average milk yields (liter/cow/year)
CONC = concentrate costs (din/kg)
WR = wage rates (din/working hour)

Statistical properties of the model are good. The R^2 value of 81.88 indicating that above 80% of inter-farm variance in costs is explained and that is emphasized by F-statistics which indicate that model is significant at 99% level. Since the main control variable for the farmer is the number of cows, there was made an assumption that milk yield is fixed for all farms (weighted average yield in sample). That enables to represent cost function as simple quadratic function which is much easier for analytics.
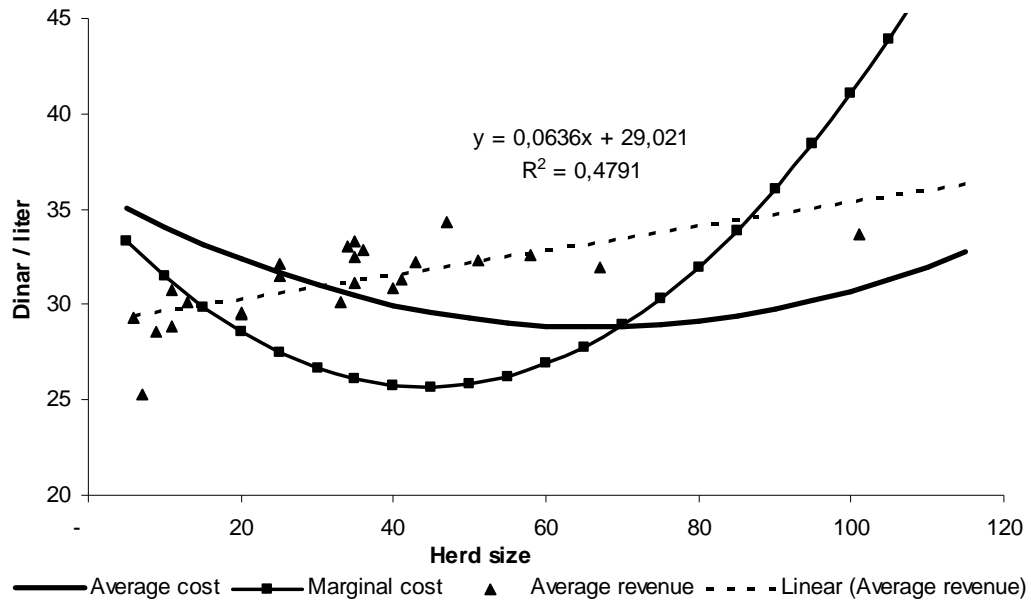

Figure 2. Estimated cost function of milk production in lowland region in 2007.

According model in 2007 only farmers with 30 and above cows in herd could earn entrepreneur profit. Results for 2003 production year shows that only farms with 10 and more cows could earn entrepreneur profit (Popovic R, 2006). It's indicates that bottom line of profitability in milk production is moving to the bigger herd size. If farmers are profit maximizing, as model assumes, they should expand herd size to cost minimization level of 69 cows and beyond this to profit maximizing level of 87 cows.

From quartile analysis by entrepreneur profit can be inferred that entrepreneur profit was achieved by bigger farms. Top 25% of sampled farms (6 of 24) are not the biggest farms by land area and don't have significantly bigger herds. Source of their profitability could be found basically on revenue side and partially on cost side. Those farms earn highest revenue due to high average milk yield and the highest average milk price.

Table 4. Quartile analysis by entrepreneur profit in 2007.

	Highest Quartile	Up/Mid Quartile	Mid/Low Quartile	Lowest Quartile
Average land used (ha)	72	108	33	41
Own land (ha)	23	33	19	17
Average cows number	48	46	26	15
Average milk yield (l/cow)	6,645	5,282	5,776	5,660
Revenue (€/cow)	2,627	2,065	2,166	2,023
Revenue from milk sale (€/cow)	2,106	1,591	1,692	1,512
Milk price (€/100l)	32	31	30	27
Variable cost (€/cow)	1,241	1,226	1,434	1,317
Fixed cost (€/cow)	871	793	896	1,076
Occupier's income (€/cow)	860	427	326	360
Entrepreneur profit (€/cow)	514	46	-164	-369

No one national market is entirely isolated from world market trends in long term. The milk price transmissions on Serbian market (Figure 3) in period 2006 to 2008 shows, it is asymmetric and time lagged. In 2007 when world market experienced extremely milk price increase, wave of that increase came with 9 months delay on Serbian market. In same year milk price transmission on German and Poland market, was faster and less asymmetric. The reasons for this might be linked to two major facts. Firstly, the Serbian market is not well integrated in to the world market, what is emphasized with fact that either smaller farms or commercial farms didn't get higher prices until September 1. Because of the rapid increase of input prices in the period June-August farmers suffered a loss in dairy enterprise during this three months period. Secondly, slow milk price transmission could be a sign that farmer's position on market wasn't favorable in relation with milk processors. Additional analysis of milk prices for commercial dairy farms shows that when eventually milk processors decide to increase the price for raw milk, they pay much higher prices to commercial farms. Those farms produce high quality of row milk. Only over three months milk prices, achieved by commercial family farms, reached the level of world prices and since April 2008 where close to average prices those dairy farmers got in Germany.
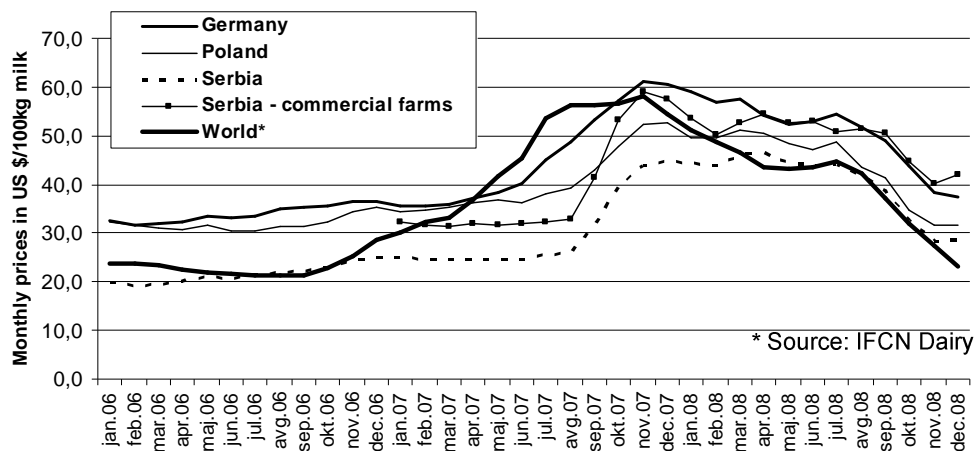

Figure 3. Average monthly farm gate milk prices in Germany, Poland, Serbia and estimate for World.

5 Conclusions

Dairy supply chain is one of the most important between other food chains. Just value of row milk produced represents 13.5% of total agriculture production. Changes happened in past 10 years along dairy chain are characterized with: market deregulations, concentration of row milk production, strengthening of formal row milk market, successful privatization and development of dairy processing sector, concentration in retail sector, and slightly decrease of dairy consumption with changing structure of its consumption. The most proactive link of dairy chain in the recent past was processing sector which is responsible for vertical integration with farmers and strengthening of formal milk market. Main constrains identified in dairy supply chain are: lack of dairy cooperatives, low transparency of economics of all links in dairy chain, retailers' market power and lack of transparency and consistency in agriculture long term policy. In close future Serbian market of dairy product, as well as other food will be exposed to higher level of globalization and competition

High number of farms, small scale production and shortage of awareness for cooperative action makes this ring in whole dairy chain the weakest. Improvement of their market position will help to increase competitiveness of whole dairy chain in Serbia. Because of that one of the main measures of agricultural policy should be aimed to education and stimulation of dairy farmers through Extension service to organize cooperatives.

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