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Patterns of structural breaks of competitiveness of manufacturing facilities in the Russian cheese market

Patrones de rupturas estructurales de competitividad de las instalaciones de fabricación en el mercado ruso del queso

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ABSTRACT:

Issues of management accounting and analysis taking into account the specifics of agribusiness guarantee an increase in the efficiency of agricultural production. The practical significance of the work lies in the modeling of trade flows, the justification of the strategic priorities of regional policy in order to increase the competitiveness of cheese-making enterprises. The result is the formation of a sectoral profile of the territory based on a rating system; selection of competitiveness indicators and their combinations according to the intensity of their impact on competitiveness.
Keywords: forming of industrial profile of a territory, competitive advantages, structural breaks of competitiveness, modelling of trade flows, scenario forecasting

RESUMEN:

Las cuestiones de contabilidad y análisis de gestión que tienen en cuenta las características específicas de los agronegocios garantizan un aumento en la eficiencia de la producción agrícola. La importancia práctica del trabajo radica en la modelización de los flujos comerciales, la justificación de las prioridades estratégicas de la política regional para aumentar la competitividad de las empresas productoras de queso. El resultado es la formación de un perfil sectorial del territorio basado en un sistema de calificación; selección de indicadores de competitividad y sus combinaciones según la intensidad de su impacto en la competitividad.
Palabras clave: formación del perfil industrial de un territorio, ventajas competitivas, rupturas estructurales de competitividad, modelación de flujos comerciales, pronóstico de escenarios.

1. Introduction

Over the recent decades tendency towards reduction of number of dairy producers and level of their competitivness has been clearly seen. In the competitive environment, problems of supporting such enterprises is the most relevant because of channels of marketing. Methods developed by foreign and domestic scientists for industrial sectors have proved the importance of improving competitiveness of an economic entity (Program of development and distribution of productive forces …, 2008).

The purpose of APK development is to move into a new phase of production and social

development through introduction of high technologies and machinery. As a result of this purpose implementation, the Republic should achieve the volume in table 1. This level will be reached through development of such areas of agriculture production as program of recovery and support of land fertility, breeding, elite seed production, using food additives of new generations and support of staffing in science.

Table 1
Forecast of production volume food-industry
APK in the Republic of Tatarstan

	I option (inertial)				II option (innovation)			
	2010	2015	2020	2030	2010	2015	2020	2030
Whole milk products, thousand tons.	205	210	215	230	208	215	255	305

Source: Program "Development and deployment of productive forces of the Republic of Tatarstan on the basis of cluster approach till 2020 and for the period till 2030

2. Analysis of the Russian cheese market growth

From 2014, Russian cheese market continues to grow (fig. 1). Along with this, reduced growth rate of cheese production has been notices in 2016 – 2017. In 2014 – 2015, annual growth rates of cheese production were about 15-18%. In 2016 and 2017 positive directions were kept, but annual increase rates were 2.8% and 1.8% respectively (Federal State Statistics Service …, 2018; Official statistical data …, 2008; Dairy news …, 2013).

Analysis of the current demand is based on dynamics of trade flows of cheese in RF entities for 2009-2017 according to the data of Federal State Statistics Service on the Republic Kazakhstan, (Official statistical data …, 2008) (table 2).

The main reasons of production slowing down are the following:

- Belarus cheap cheeses are highly competitive.
- Insufficiency of raw material base to produce cheeses.

The Order of the Ministry of Health of the Russian Federation No. 614 of August 19, 2016, mentions the consumption rate of cheese in Russia. According to this document, the consumption rate of cheese in Russia is 7 kilograms per person a year. According to the data of the Federal State Statistics Service, in 2010-2016, consumption of cheese and brynza in RF was 6.1-6.5 kilograms per person a year (Dairy news …, 2013) (Fig. 2).

Figure 1
Production and import of cheese in the RF

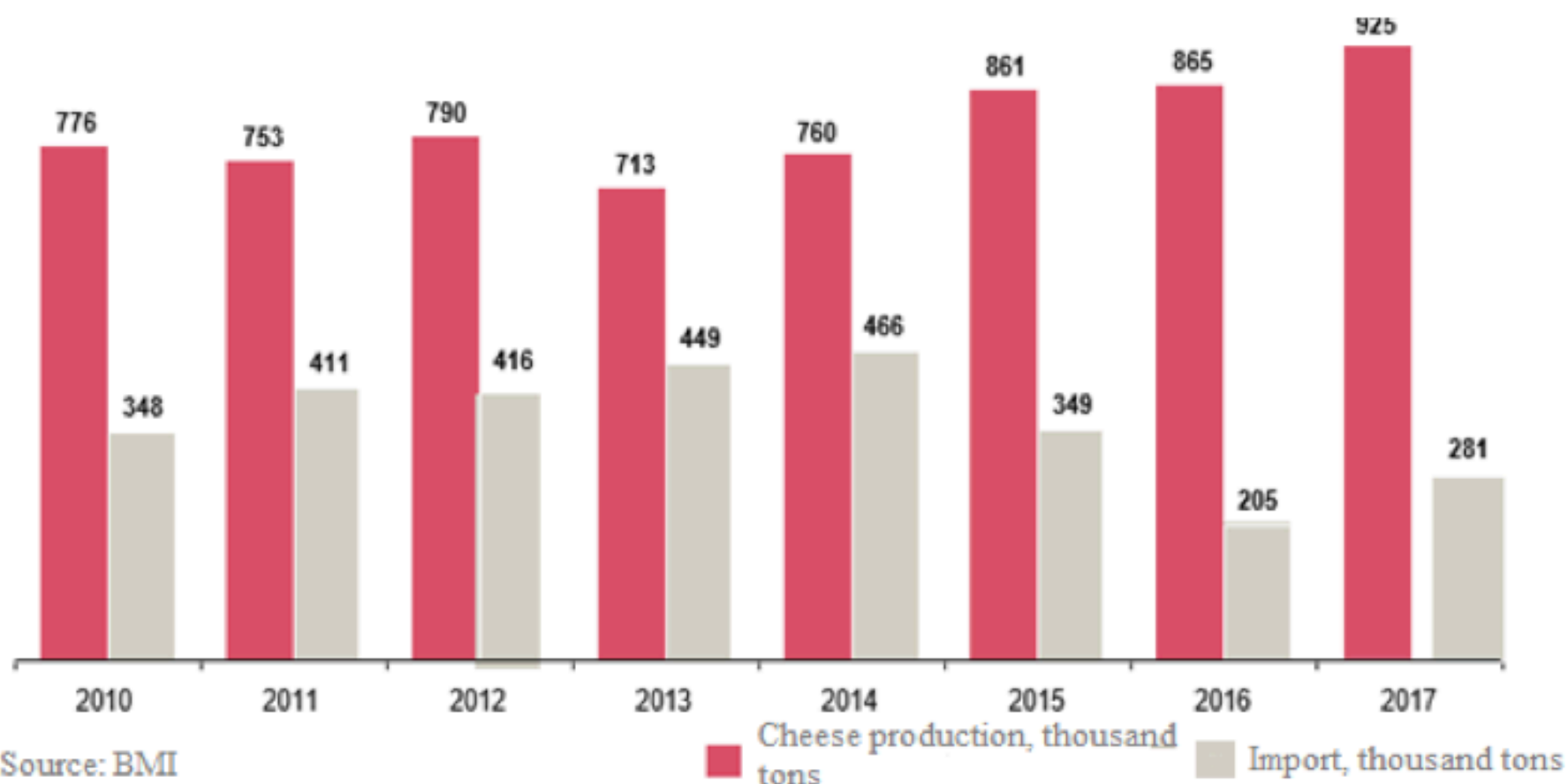Source: BMI   Cheese production, thousand tons   Import, thousand tons

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Table 2
Geography of cheese supplies from the regions of RF

Export of cheese by manufacturers and wholesale organizations from constituent entities of the Russian Federation, tons

	2009 [1]	2010 [2]	2011	2012 [3]	2013	2014	2015	2016	2017 [4]
Bryansk oblast	17189	20844	20109	21759	20779	24921	28349	32678	45913
Voronezh oblast	28058	29043	28297	24923	28803	36268	42234	49224	17294
Moscow oblast	29354	34056	39323	47730	47091	51056	41092	40937	44177
Krasnodar oblast	4327	4255	1797	2522	684	522	434	4039	4387
The Republic of Tatarstan	9918	8825	9981	11054	7882	10730	12553	10504	17291
Udmurtia	12433	8736	8127	8677	10363	12025	16851	22160	10866
Altay region	4835	6306	6153	5626	4361	6414	15379	14084	11604
Omsk oblast	6997	12666	15065	13484	17287	22408	26805	27165	918

Figure 2
Consumption of cheese per person a
year in Russia and the world, kg (2017)
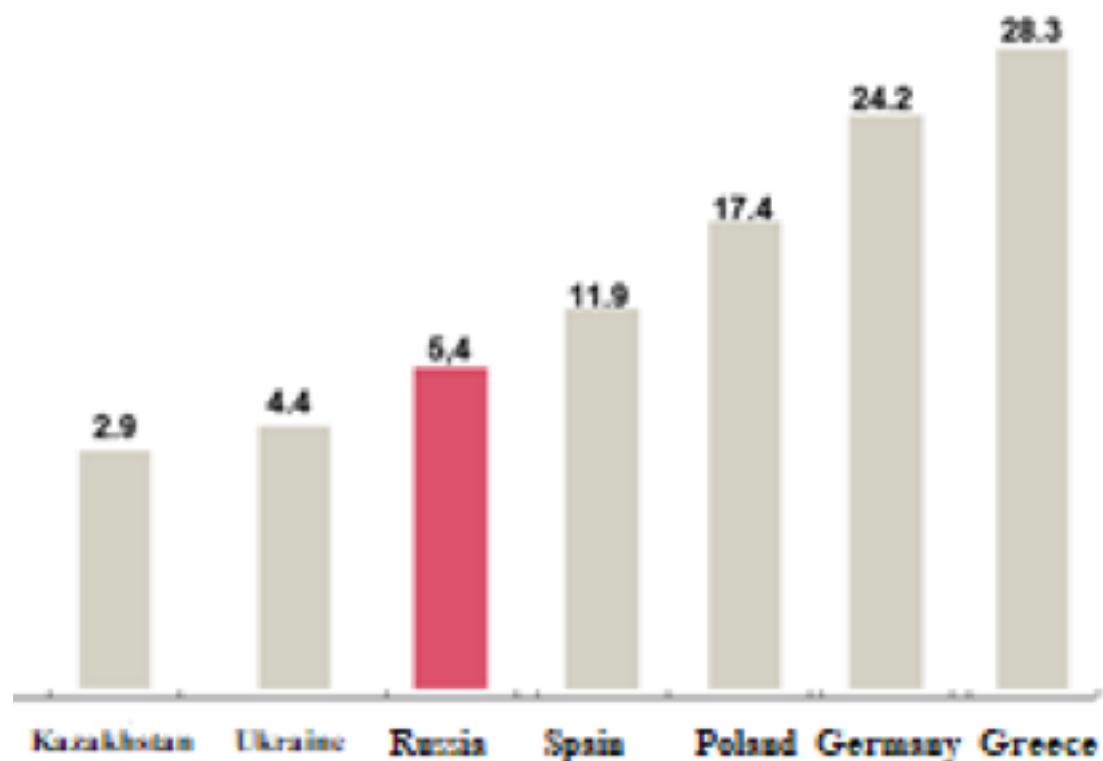
In the opinion of many specialists, primary tasks of the industry are: stabilisation of a raw material base, technical re-equipment and modernisation of the industry, expansion of the assortment and improvement of product quality, production of import-substituting products, maintenance of human resources (Belov *et al.*, 2018; Bezpalov, 2014).

Production increase is limited by milk shortage. Growth of enterprise's economy is directly proportional to investment aimed at overcoming of technical dependence, increase of work productivity, increase of competitiveness of products in the market, export promotion, import-substituting production, job creation, and etc. Figure 3 reflects the dynamics of investment potential in the Republic of Tatarstan (Ministry of economy …, 2000; Takhumova *et al.*, 2016).

Figure 3
Dynamics of investment potential in the RT

Investment potential of the RT

	2007	2008	2009	2010	2011	2012	2013	2014	2015
	2,07	2,12	2,15	2,17	2,26	2,31	2,45	2,45	2,58
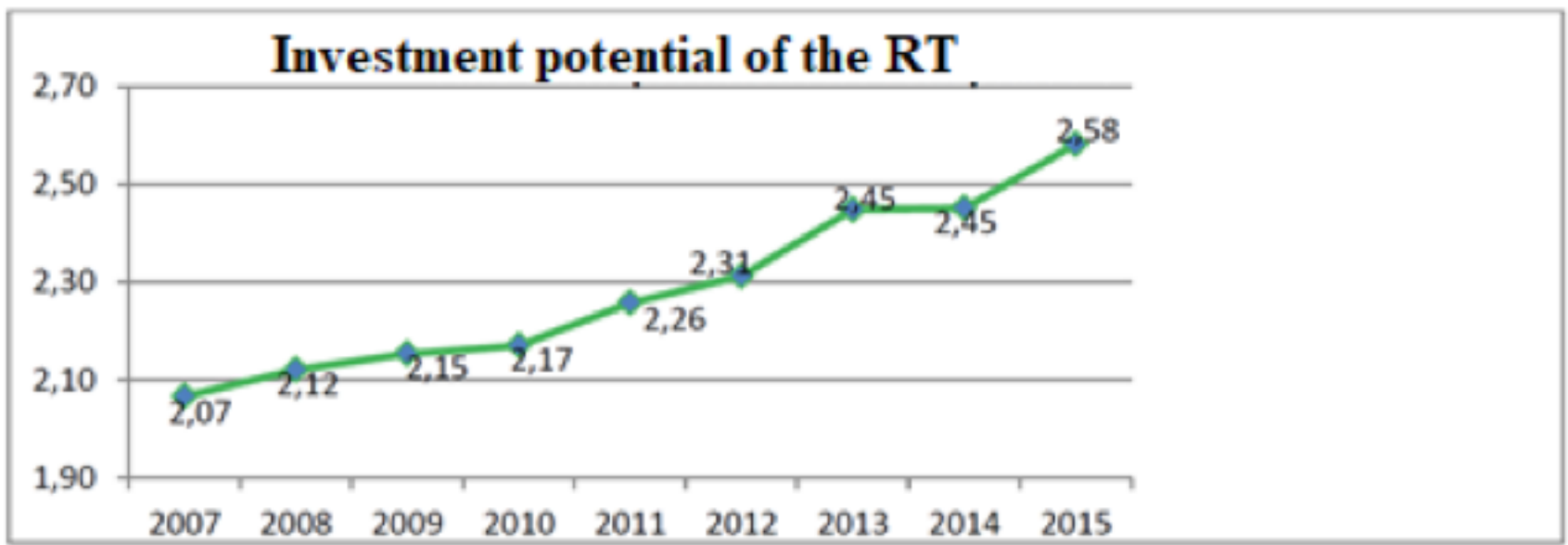
In such way, in industrial police, a strategic purpose of competitiveness is suggested to be determined as an increase in demand for products due to developing competitive advantages of enterprises that provide stable social and economic development and strategic competitiveness. A. Smith thought that under market conditions, total satisfaction of consumers' needs and the best use of resources in community in general are possible (Fatkhutdinov, 2002). Conception of forming the industrial profile is in figure 4.

Figure 4
Conception of forming the industrial profile
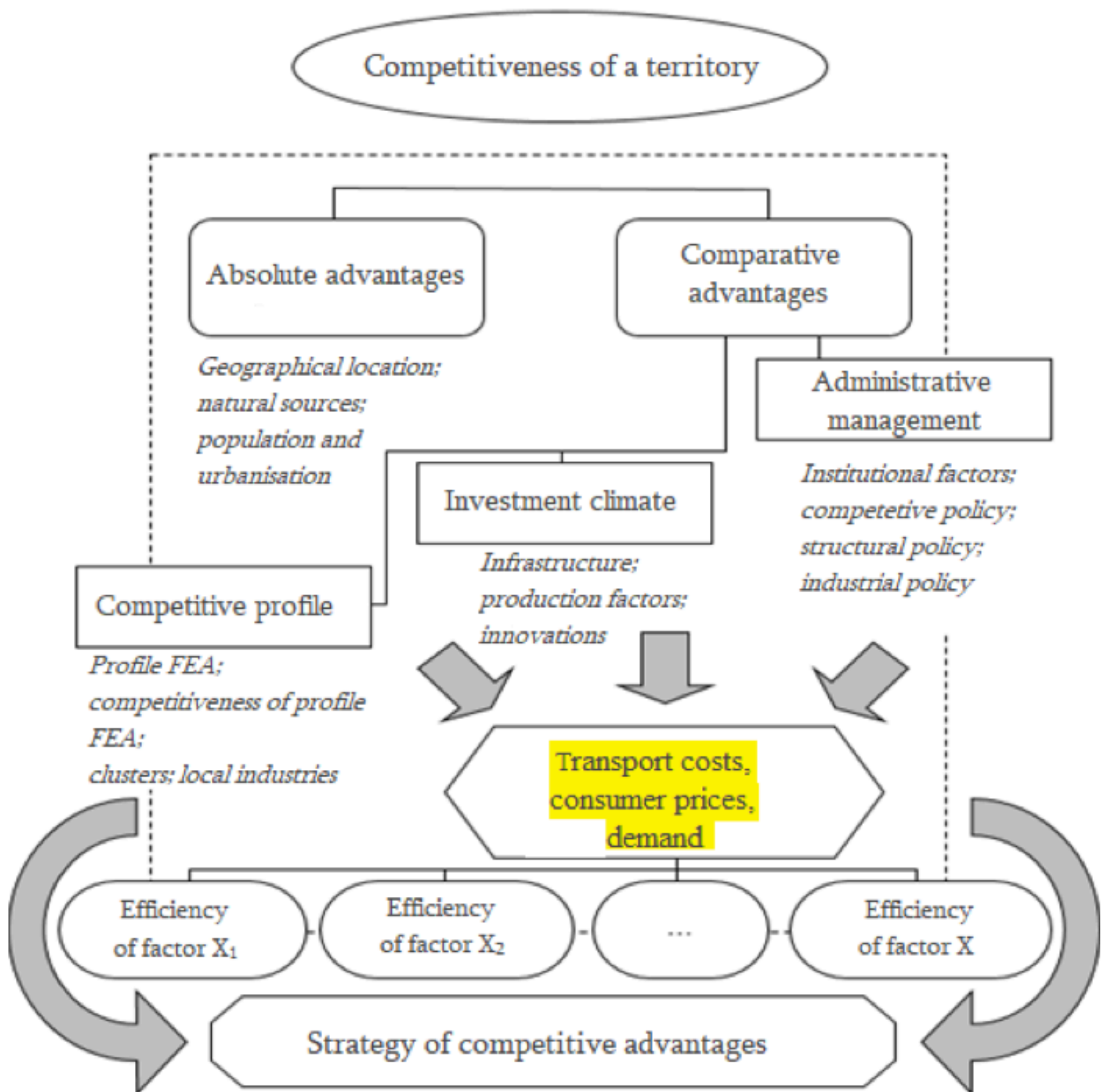
Evaluation of possible perspectives of competitive advantages considering influence of uncertainty factor is prior to choosing mechanisms of managing impact. Such evaluations can be obtained using scenario forecasting. To optimise a location of cheese manufacturing facilities on the territory of the Republic according to economic zones and more precise accounting of the important factor – distance between the points of production and consumption, it is necessary to model trade flows.

3. Determination of the value of production capacities in points of production (potential or real production capacities)

The Republic of Tatarstan is among the leading regions of the Russian Federation by the main macroeconomic indicators. By the gross regional product, the Republic is the six of entities of the Russian Federation, third place by agriculture, fourth place by the amount of fixed investment, fifth place by industrial production and building, eighth place by housing, and eighth place by retail trade turnover (Ministry of economy …, 2000; Ostanina et al., 2016).

Figure 5
Dynamics of GRP of the Republic of Tatarstan and GDP of the Russian Federation.

105,7	105,5	102,4	102,1	100,0	102,5	102,8
104,3	103,7	101,8	100,7	97,5	99,8	101,5
1 305,9	1 437,0	1 551,5	1 661,4	1 833,2	1 944,1	2 115,5
2011	2012	2013	2014	2015	2016 evaluation	2017 evaluation

Legend:
- GRP of the RT, bln rbl
- GRP of the RT, in comparable prices, in % to the previous year
- GDP of the RF, in comparable prices, in % to the previous year
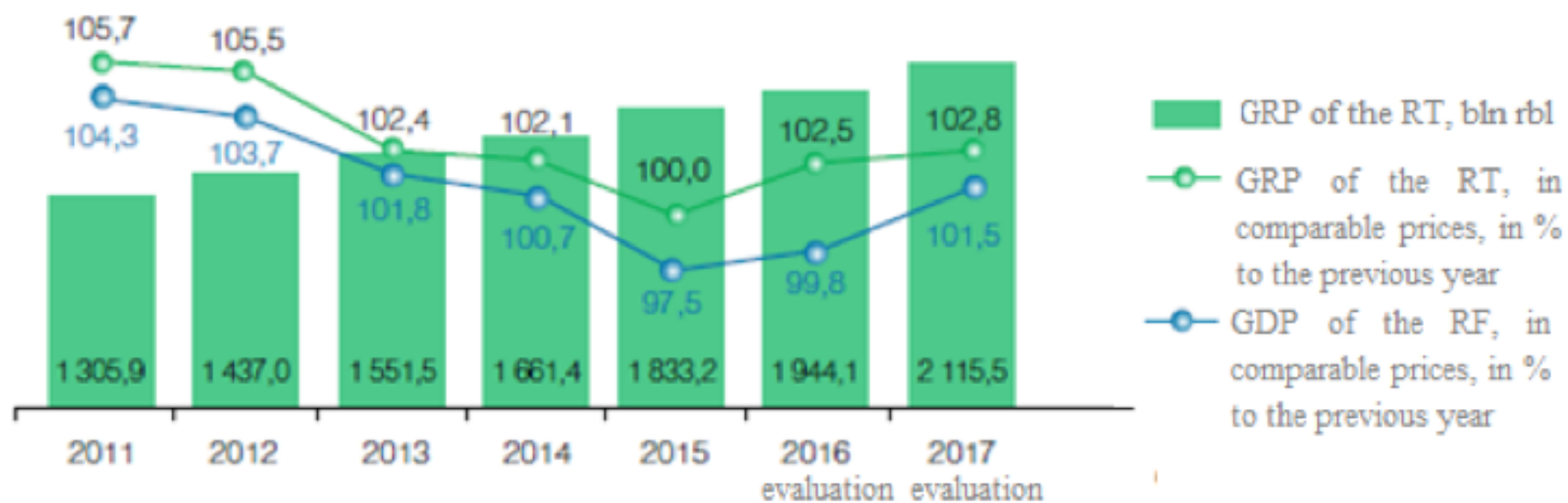
An amount of gross regional product of the Republic of Tatarstan in 2017, was 2 115.5 bln rbl, or 102.8% in comparable prices to the level of 2016 (fig.5). The main contribution to economy growth has been made by industrial production, agriculture and trade. In the structure of GRP, the main types of economic activity are extraction of minerals, manufacturing enterprises; production and distribution of electricity, gas and water; building; wholesale and retail trade; transport and connection. The structure of GRP is represented in fig. 6 (Ministry of economy …, 2000).

Improvement of competitiveness of economy of the Republic is connected to amounts of investment. Over past years Tatarstan is among the most attractive to invest regions that is due to combination of high investment potential and low investment risk. In 2017, the fixed investment was 637.6 bln rub, or 99.3% in comparable prices to the level of 2016. On January-September of 2017, by investment in fixed capital the Republic of Tatarstan was the first among regions of Volga Federal District and fourth among entities of the Russian Federation after Tyumen region, Moscow and St. Petersburg (Schoemaker, 1993; Akhmetshin *et al.*, 2018).

Along with this, there is the analysis to reveal potential sources to grow. Thus, in September of 2017, there was meeting of the Security Council under the leadership of the President of the Republic of Tatarstan, the result of which was developing of the set of solutions aimed at reduction of administrative barriers, optimisation of entrepreneurs' interaction with oversight bodies. On January 9, 2018, information Internet resource "Revised business" started working. This is mutual project of Ministry of Economy of the Republic of Tatarstan and Prosecutor's Office of the Republic of Tatarstan created for entrepreneurs that contains practical recommendations on passing business inspections.

Figure 6
The structure of GRP of the Republic of Tatarstan

| 21,5 | 18,5 | 2,1 | 0,7 | 7,4 | 7,7 | 14,1 | 5,9 | 2,2 | 0,9 | 19,1 |

2017 evaluation

- Extraction of minerals
- Manufacturing enterprises
- Providing electricity, gas and steam; air conditioning
- Water supply; water disposal, collection and utilisation of waste, activity on decontamination
- Agriculture
- Building
- Wholesale and retail trade
- Transportaition and storage
- Activity in the field of information and communication
- Activity of hotels and catering enterprises
- Other types of activity

Priorities of state investment policy for 2018 have been determined: forming and development of competitive enterprises using advanced technologies; stimulation of development of small and medium-sized business; creating conditions to provide infrastructure for investment objects; information and staff providing of investment process ant other.

In Tatarstan, such mechanism of state support of enterprises and business as tax breaks is developed in details and actively applied. According to positions of the law of the Republic of Tatarstan dated November 25, 1998 №1872 "About investment activity in the Republic of Tatarstan", investors implementing investment projects are provided with a reduction in the rates of regional profits taxes – up to 13.5% – channeled to the budget of the Republic of Tatarstan and reduction of tax rate up to 0.1% for property newly created or purchased by an organisation to implement a project (The law of the Republic of Tatarstan …, 1998; Shvets, 2006; Heywood and Outsourcing, 2012; Solow, 1974). These breaks are provided for entities of investment activity for the pay-back period of a project but no more than seven years, and in the engineering industries, tax breaks can be provided for a period for a period of up to 13 years from the start of investment.

Priority directions of development of investment activity in the Republic of Tatarstan are implementation of the Model "Tatarstan+5+3" (Program of development and distribution of productive forces …, 2008); Novoselov, 2007), which includes 7 directions of competition, 5 basic economic complexes and 3 areas around three agglomerations. Medium-term dynamics of development of agri-business still will depend on natural and climatic conditions, state support, internal and world market situation. According to the basic scenario, in 2020 regarding 2016, production increase of agricultural products by 5.4%, food – by 15.2% that will be connected with an increase of real income of population and recovery of demand for food in the internal market and development of new export focuses and expansion of existing export focuses on food and agricultural commodities.

According to the program "Development and deployment of productive forces of the Republic of Tatarstan on the basis of cluster approach till 2020 and for the period till 2030" (Program of development and distribution of productive forces …, 2008; Lambin, 2007), the objective of food production is to form a stable and efficient producing of food, which would provide food safety and respond to needs of citizens in food in amounts and assortment enough to form balanced meals.

Mentioned objectives imply the solution of the following issues:

- To provide the development of food productions;
- To create agro-industrial complexes connecting suppliers and processors of agricultural products
- To modernise existing production capacities;
- To increase innovation activity of food enterprises;
- To develop new types of product;
- To increase efficiency of enterprise managing by introduction of modern managing technologies;
- To introduce international quality systems ISO: 9000 and HACCP;
- To train staff, preserving and creation of new jobs;
- To saturate the Republican food market with competitive products that meet all the requirements for quality and safety;

To bring the share of food in the total volume of consumption produced by Republican producers to 95% (Toyne and Walters, 1989).

4. Sales of chees products in the Republic of Tatarstan

As it was mentioned above, in the Republic of Tatarstan, in 12 municipalities, there are cheese enterprises; they are independent in marketing policy. It is expedient to develop one sale plan of products of the whole branch network to optimise transport costs and equipment loading basing on proximity to the regions where the demand for products is highest (Filosofova, 2006; Fatkhutdinov, 2002; Lvov and Porshnev, 2004). Data on using production capacities of cheese-making factories of the Republic of Tatarstan in 2018 is represented in table 3.

Table 3
Capacity of cheese-making factories of the Republic of Tatarstan

	Municipalities	Production capacity, tons	Demonstrated capacity
1	Aznakayevsky	2920	1460

2	Apastovsky	1825	0
3	Arsky	1095	0
4	Baltasinsky	8760	8395
5	Bugulma	2920	2555
6	Buinsky	5475	3650
7	Kukmorsky	1095	0
8	Leninogorsky	912,5	730
9	Mamadyshsky	13140	12657
10	Menzelinsky	1825	0
11	Sabinsky	3650	2920
12	Tyulyachinsky	1825	0
		45 443	32 367

Starting data for modelling:

- Cost of 1 t/km from municipalities of the Republic of Tatarstan where factories are located to points of consumption (Table 4);
- Production capacities of cheese factories;
- Calculation of a supply route (table 5);
- Demand for products to alleged places of supply;
- Consumer prices for 1 kg of cheese less transport expenditures and contribution margin (table 6).

To transport cheese, special conditions are necessary according to international and Russian standards: temperature (0 – 12°C), humidity (not more than 80%), mutual transportation with other products, consistent stack. Refrigerators or isotherm cars are used to transport cheese. Cheese producers to deliver products to Russian regions use hired transport (realisation by themselves is much more expensive). Transportation companies get an opportunity to price more attractively due to second loads of a car for a way back. It is worth noting that an amount of transportation does not affect pricing.

Table 4
Cost of 1 t/km production from the municipalities of
the Republic of Tatarstan to points of consumption

Municipalities	Cost of 1 t/km from municipalities of the Republic of Tatarstan where factories are located to points of consumption						
	1	2	3	4	5	6	9
	Bryansk oblast	Moscow oblast	Voronezh oblast	Belgorod oblast	Altay region	Pskov oblast	Udmurtia
Aznakayevsky	60	40	50	70	175	65	45
Apastovsky	60	40	50	70	175	65	45
Arsky	55	35	45	65	170	60	40

Baltasinsky	70	50	60	80	185	75	55
Bugulma	60	40	50	70	175	65	45
Buinsky	55	35	45	65	170	60	40
Kukmorsky	70	50	60	80	85	75	55
Leninogorsky	60	40	50	70	175	65	45
Mamadyshsky	62	45	53	73	178	70	50
Menzelinsky	62	45	53	73	178	70	50
Sabinsky	70	50	60	80	185	80	60
Tyulyachinsky	55	37	47	65	170	60	40

Table 5
Calculation of a supply route

	Municipalities	Cost of 1 t/km from municipalities of the Republic of Tatarstan where factories are located to points of consumption						
		1	2	3	4	5	6	7
		Bryansk	Moscow	Voronezh	Krasnodar	Barnaul	Omsk	Izhevsk
1	Aznakayevsky	1550.7	1138	1180.5	1859.9	2453.5	1569.6	321
2	Apastovsky	1219.8	859	963.6	1691.5	2881.4	1997.5	604
3	Arsky	1276.6	881	1099.4	1859.4	2751.2	1867.3	345
4	Baltasinsky	1303.7	925	1135.8	1895.8	2670.5	1839	383
5	Bugulma	1463	1141	1135.5	1814.9	2443.6	1559.7	345
6	Buinsky	1200.3	825	931.8	1659.6	2909.2	2025.3	543
7	Kukmorsky	1372.2	1020	1195	1955	2682.4	1798.5	304
8	Leninogorsky	1521.5	1131	1129.8	1809.2	2473.3	1589.5	366
9	Mamadyshsky	1387.2	994	1210.1	1931.6	2613.8	1729.9	233
10	Menzelinsky	1511.4	1113	1287.8	1967.2	2479.6	1595.7	245
11	Sabinsky	1321.7	926	1144.5	1904.5	2718.4	1834.5	342
12	Tyulyachinsky	1299.2	906	1122.1	1882.1	2711.5	1827.6	321

Table 6
Consumer prices for 1 kg of cheese less transport

	Municipalities	Average annual production capacity, tons	Consumer prices for 1 kg of cheese less transport expenditures and contribution margin						
			1	2	3	4	5	6	9
			Bryansk oblast	Moscow oblast	Voronezh oblast	Belgorod oblast	Altay region	Pskov oblast	Udmurtia
1	Aznakayevsky	2920	398.6822	478.5164	424.128	364.062	263.6418	446.0206	427.7846
2	Apastovsky	1825	398.68	478.52	424.13	364.06	263.64	446.02	427.78
3	Arsky	1095	403.38	483.22	428.83	368.76	268.34	450.72	432.48
4	Baltasinsky	8760	389.28	469.12	414.73	354.66	254.24	436.62	418.38
5	Bugulma	2920	398.68	478.52	424.13	364.06	263.64	446.02	427.78
6	Buinsky	5475	403.38	483.22	428.83	368.76	268.34	450.72	432.48
7	Kukmorsky	1095	389.28	469.12	414.73	354.66	348.24	436.62	418.38
8	Leninogorsky	912,5	398.68	478.52	424.13	364.06	263.64	446.02	427.78
9	Mamadyshsky	13140	396.80	473.82	421.31	361.24	260.82	441.32	423.08
10	Menzelinsky	1825	396.80	473.82	421.31	361.24	260.82	441.32	423.08
11	Sabinsky	3650	389.28	469.12	414.73	354.66	254.24	431.92	413.68
12	Tyulyachinsky	1825	403.38	481.34	426.95	368.76	268.34	450.72	432.48
Total		**45442.5**							

*data as of December 31, 2018 (Federal State Statistics Service … 2018).

The advantage of this method is accounting of a distance between human settlements where cheese making factories are located and regions where product is sold according to road infrastructure of Russia. This distance has been formed with a use of special calculation programs in the Internet presenting an optimal transport routes in accordance with modern navigation systems that consider the diversified network of road infrastructure of Russia. A distance is calculated between human settlements and capital cities of regions, because there is a wide network of shops to sale products, road traffic junctions and in capital regions the bigger part of population is concentrated, consequently, consumption of cheese is bigger than in a periphery. Structure of sale of Tatarstan cheese and cheese product in 2017 is represented in tables 7, 8.

Table 7
Structure of sale of Tatarstan
cheese in 2017

Types of product and Russian regions	Export form Republic	Import into Republic
Cheeses, t	17291.4	3383.4
Bryansk oblast	–	1812.7

Moscow oblast	11600.5	243.3
Ryazan oblast	70	25
Moscow city	419.7	19.3
The Komi Republic	128	–
Pskov oblast	5	–
St. Petersburg	1545.9	–
Republic of Adygea	–	4.3
Krasnodar oblast	856	–
Republic of Bashkortostan	102.3	24
Mari El Republic	5.6	149.7
The Republic of Mordovia	–	23.1
Udmurtia	137	1013.6
Chuvash Republic	0.5	–
Perm oblast	2.1	2
Kirov oblast	102	2.4
Samara oblast	75	–
Saratov oblast	68	–
Ulyanovsk oblast	39.2	–
Sverdlovsk oblast	1193.4	32
Tyumen region	0.9	–
including:		
Khanty – Mansiysk		
Autonomous Region Ugra	0.9	–
Chelyabinsk oblast	910.3	–
Novosibirsk oblast	30	32

Table 8

Cheese products, t	180.8	2005.2
Ryazan oblast	–	299
Tambov oblast	–	64.6
Yaroslavskaya oblast	–	15.4
Novgorod oblast	5	–
Republic of Bashkortostan	45	–
Mari El Republic	–	122.4
The Republic of Mordovia	–	1
Udmurtia	48	328
Chuvash Republic	1	–
Perm Krai	–	363.8
Sverdlovsk oblast	38	–
Chelyabinsk oblast	43.8	–
Omsk oblast	–	811

Structure of sale of Tatarstan cheese and cheese product in 2018 is represented in tables 9, 10.

Table 9
Structure of sale of Tatarstan cheese in 2018

	Sold production in January-September of 2018		
	In total	including	
		Export to regions of the Russian Federation	Sold in the Republic of Tatarstan
Cheeses	11368.5	9995.4	1373.1
Cheese product	9536.7	4789.6	4747.1
Types of products and Russian regions	Export form Republic	Import into Republic	
Cheeses, tons	9995.4	2797.9	
The Central Federal District	8472	1429.8	

Bryansk oblast	–	1110.5
Kaluga oblast	–	2
Moscow oblast	8472	194
Ryazan oblast	–	58
Tambov oblast	–	0.1
Yaroslavskaya oblast	–	0.5
Moscow	–	64.7
Northwestern Federal District	85.4	0.3
The Komi Republic	7.4	–
Pskow oblast	–	0.3
St.Petersburg	78	–
South Federal District	929	7.9
Republic of Adygea	–	7.9
Krasnodar oblast	929	–
Volga Federal District	186.9	1315.3
Republic of Bashkortostan	18.5	106
Mari El Republic	2.5	122
The Republic of Mordovia	–	67.2
Udmurtia	121.6	999.5
Perm kray	–	17.8
Kirov oblast	17	1.6
Nizhny Novgorod oblast	7	–
Samara oblast	17	1.2
Ulyanovsk oblast	3.3	–
Ural federal district	322.1	27.4
Sverdlovsk oblast	239.5	27.4
Chelyabinsk oblast	82.6	–
Siberian Federal District	–	17.2

Omsk oblast	–	17.2	

Table 10
Structure of sale of Tatarstan
cheese product in 2018

Cheese products, tons	4789.6	2219.7
The Central Federal District	1670	284.1
Bryansk oblast	–	14.2
Kaluga oblast	10	–
Moscow oblast	855	–
Ryazan oblast	88	235
Tambov oblast	–	17.9
Tver region	58.5	–
Yaroslavskaya oblast	–	8.4
Moscow	658.5	8.6
Northwestern Federal District	572.2	–
The Komi Republic	76.2	–
St.Petersburg	496	–
South Federal District	17	–
Rostov District	17	–
Volga Federal District	1021.8	774
Republic of Bashkortostan	32.3	–
Mari El Republic	10	7.8
Udmurtia	88.4	227
Chuvash Republic	2.8	–
Perm kray	–	539.2
Kirov oblast	25.6	–
Nizhny Novgorod oblast	2.7	–
Samara oblast	48	–
Saratov oblast	785	–

Ulyanovsk oblast	27	–
Perm kray	–	
Ural federal district	1463.6	
Sverdlovsk oblast	850.8	
Tyumen oblast	13.2	
Chelyabinsk oblast	599.6	
Siberian Federal District	45	1161.6
Novosibirsk oblast	45	–
Omsk oblast	–	1161.6

5. Options of modelling of allocation of products supply flows

5.1. First option of modelling

Allocation of flows has been modelled based on demonstrated capacity of production capacities (in total 32 367 tons a year). To solve this problem in Excel using "Find solution", it is necessary to make two matrixes, the first contains starting data, the second – to calculate and reflect results.

Restrictions of production capacities imply that calculated values cannot exceed existing. Thus, for production capacities of Baltasinsky district, this limitation can be represented as follows:

$$a_4 = x_{41} + x_{42} + \ldots + x_{4n} < 8395$$

Restrictions on the volume of satisfied demand imply the achievement of a level not less than the actual value of the implementation; for the Moscow oblast the restriction looks like as follows:

$$b_1 = x_{11} + x_{21} + \ldots + x_{n1} \geq 10579{,}2$$

Consequently, target function that minimises transport costs will be as follows:

$$Z_{X(min)} = C_{1raw} * X_{1\,cost\,of\,transportation\,t/km} + C_{2\,raw} * X_{2\,cost\,of\,transportation\,t/km} + C_{n\,raw} * X_{n\,cost\,of\,transportation\,t/km}$$

Table 11
Allocation of flows according to the first option of modelling

Municipalities		Allocation of flows, tons						
		1	2	3	4	5	6	9
Municipalities	32 367.00	Bryansk oblast	Moscow oblast	Voronezh oblast	Belgorod oblast	Altay region	Pskov oblast	Udmurtia
	1 460.00	0.00	**1 460.00**	0.00	0.00	0.00	0.00	0.00
Aznakayevsky	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Apastovsky	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsky	**8 395.00**	0.00	1 963.46	0.00	1 050.57	2 778.85	0.00	2 602.12
Baltasinsky	**2 555.00**	0.00	75.60	2 479.40	0.00	0.00	0.00	0.00
Bugulma	**3 650.00**	0.00	3 650.00	0.00	0.00	0.00	0.00	0.00
Buinsky	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kukmorsky	**730.00**	0.00	510.16	0.00	0.00	0.00	219.84	0.00
Leninogorsky	**12 657.00**	10 994.95	0.00	1 662.05	0.00	0.00	0.00	0.00
Mamadyshsky	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Menzelinsky	**2 920.00**	0.00	2 920.00	0.00	0.00	0.00	0.00	0.00
Sabinsky	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tyulyachinsky		10 994.95	10 579.22	4 141.45	1 050.57	2 778.85	219.84	2 602.12
		100%	100%	100%	100%	100%	100%	100%
Maximum income	12850370.86							

Basing on calculations of option 1 of modelling, it is expedient to export product only from 7 municipalities: Aznakayevsky, Baltasinsky, Bugulma, Buinsky, Leninogorsky, Mamadyshsky, Sabinsky (table 11). The following geography of supplies is expedient economically: producers of Mamadyshsky to Bryansk oblast (87% of production volume), Aznakayevsky – to Moscow oblast (100% of demonstrated production capacities in 2018), Baltasinsky – to Moscow (22%) and Belgorod (12%) oblasts, Altay (33%), Udmurtia (33%), Bulguma – to Moscow (3%) and Voronezh oblasts (97%), Buinsky – in 2018, all capacities to Moscow, Leninogorsky – to Moscow (70%) and Pskov oblasts (30%), Sabinskiy – in 2018, all capasities to Moscow oblast.

$$\text{Max income} = \text{SUMPRODUCT (H45:N56; H28:N39)} = 12\ 850\ 370{,}86$$

5.2. Second option of modelling

Allocation of flows has been modelled based on demonstrated capacity of production capacities (in total 45 442,5 tons a year). To solve this problem in Excel using "Find solution", it is necessary to make two matrixes, the first contains starting data, the second – to calculate and reflect results.

Restritions of production capacities imply that calculated values cannot exceed existing. Thus, for production capacities of Baltasinsky district, this limitation can be represented as follows:

$$a4 = x41 + x42 + \ldots + x4n < 8760$$

Restrictions on the volume of satisfied demand imply the achievement of a level not less than the actual value of the implementation; for the Moscow oblast the restriction looks like as follows:

$$b1 = x11 + x21 + \ldots + x\,n1 \geq 14\ 852{,}98$$

Table 12
Allocation of flows according to the second option of modelling

			Allocation of flows, tons						
			1	2	3	4	5	6	9

	Municipalities	45 442.50	Bryansk oblast	Moscow oblast	Voronezh oblast	Belgorod oblast	Altay region	Pskov oblast	Udmurtia
		4 015.00	0.00	4 015.00	0.00	0.00	0.00	0.00	0.00
1	Aznakayevsky	3 650.00	0.00	617.98	515.09	0.00	0.00	0.00	2 516.93
2	Apastovsky	2 920.00	0.00	2 920.00	0.00	0.00	0.00	0.00	0.00
3	Arsky	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Baltasinsky	4 380.00	0.00	0.00	4 380.00	0.00	0.00	0.00	0.00
5	Bugulma	7 300.00	0.00	7 300.00	0.00	0.00	0.00	0.00	0.00
6	Buinsky	3 901.44	0.00	0.00	0.00	0.00	3 901.44	0.00	0.00
7	Kukmorsky	1 825.00	905.59	0.00	919.41	0.00	0.00	0.00	0.00
8	Leninogorsky	14 531.06	14 531.06	0.00	0.00	0.00	0.00	0.00	0.00
9	Mamadyshsky	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Menzelinsky	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Sabinsky	2 920.00	0.00	0.00	0.00	1 474.98	0.00	308.65	1 136.38
12	Tyulyachinsky		15 436.65	14 852.98	5 814.50	1 474.98	3 901.44	308.65	3 653.31
			100.0%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	Maximum income	18 563 505.90							

Basing on calculations of option 2 of modelling, it is expedient to export product only from 7 municipalities: Aznakayevsky, Apastovsky, Arsky, Bugulma, Buinsky, Kukmorsky, Leninogorsky, Mamadyshsky, Tyulyachinsky (Table 12). The following geography of supplies is expedient economically: producers of Mamadyshsky – to Bryansk oblast (100% of production amount), Aznakayevsky – to Moscow oblast (100% of demonstrated production capacities in 2018), Apastovsky – to Moscow (14%) and Voronezh (14%) oblasts, Udmurtia (69%), Arsky – to Moscow oblast (100%), Bugluma – in 2018, all capacities to Voronezh oblast, Tyulyachinsky – to Belgorod (51%), Pskov (10%) oblasts and Udmurtia (39%), Buinsky – to Moscow oblast (100% of demonstrated production capacities in 2018).

Max income =SUMPRODUCT (H45:N56;H28:N39) = 18 563 505,90

6. Conclusions

Initially, modelling of trade flows is aimed at determining manufacturing facilities on the basis of accounting of consumption, production capacities, optimisation of transport costs. However, transport costs in monetary terms can be corrected in value of any other costs directly connected with manufacturing facilities allocations. The advantage of this method is the ability to take into account factors affecting cost of manufacturing facilities allocation (for example, capital investment or advantages of system of preferences given on this territory) by correcting a sum of transport costs. Also, transport modelling allows considering and comparing economic benefits of introduction of certain productions.

Further, it is necessary to consider which municipal areas have opportunities for the development and placement of cheese production. For this purpose, republics should be evaluated and combined in similar or complementary clusters. Based on the results of the application of the proposed methodological approach and toolkit for the "cheese" product group, proposals on forming the industrial profile of the Republic of Tatarstan and recommendations on territorial development of this production inside the Republic, which may be strategic and tactical focus of industrial policy of a territory, have been developed.

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