

The impact of macroeconomic factors on the structure of the Russian economy*

* The study is supported by the Russian Fund of Humanities in framework of scientific project "Influence of Macroeconomic Policy with Monetary and Currency Restrictions on Dynamics and Structure of a Raw-Export Oriented National Economy with Imperfect Markets", a project №14-02-00359.

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A problem under consideration within the project is:

Extension of the macroeconometric GE IO model of the Russian Economy with supply side

The key issues for this study are:

1. Changes in factor's productivity of the main sectors of the Russian Economy in 2003-2013.
2. Estimation of impact of the supply's factors on production in the main sectors in the short-term and middle-term periods for the Russian Economy in 2003-2013.

Table 1. The dynamic of the labor productivity of the main sectors of the Russian economy in 2003-2013

Type of economic activity	Labor productivity by gross output, \$/employed		Labor productivity by VA, \$/employed	
	2003 year	2013 year	2003 year	2013 year
Agriculture and Forestry	5365	21181	2790	10498
Fishing	30205	50880	16691	23892
Electricity, gas and water supply	20459	91647	7140	31444
Construction	10454	51078	5030	23148
Trade and Services	11222	44687	8013	26749
Transport and Communications	13911	59985	7790	28250
Finances	23199	102136	16401	72380
Investments	12793	58311	8362	38074
Science and Information Technology	2451	12642	1701	9552
Public Health Services, arts, culture and other social services	4591	24162	2741	14801
Other community, social and personal services	5772	20962	3099	11644
Mining and quarrying	47176	273403	22561	180775
Manufacturing	17207	92800	5183	26303
Hotels and restaurants	4940	30032	2660	14640
Public administration and defense; social insurance	13730	60958	6499	32336

Table 2. Growth rates of the labor productivity and capital productivity of the main sectors of the Russian economy, in 2013 to 2003

Type of economic activity	Growth rate	
	Labor productivity	Capital productivity
Agriculture and Forestry	1,628	1,318
Fishing	0,935	1,133
Electricity, gas and water supply	1,050	0,803
Construction	1,496	1,521
Trade and Services	1,635	1,027
Transport and Communications	1,585	1,176
Finances	2,093	1,624
Investments	1,598	1,614
Science and Information Technology	1,057	0,76
Public Health Services, arts, culture and other social services	1,113	0,777
Other community, social and personal services	1,021	0,757
Mining and quarrying	1,207	0,698
Manufacturing	1,650	0,858
Hotels and restaurants	1,627	1,324
Public administration and defense; social insurance	1,031	0,668

Fig. 1. The dependence of the Russian sectors' output on the employment and fixed assets indexes (2013 to 2003).

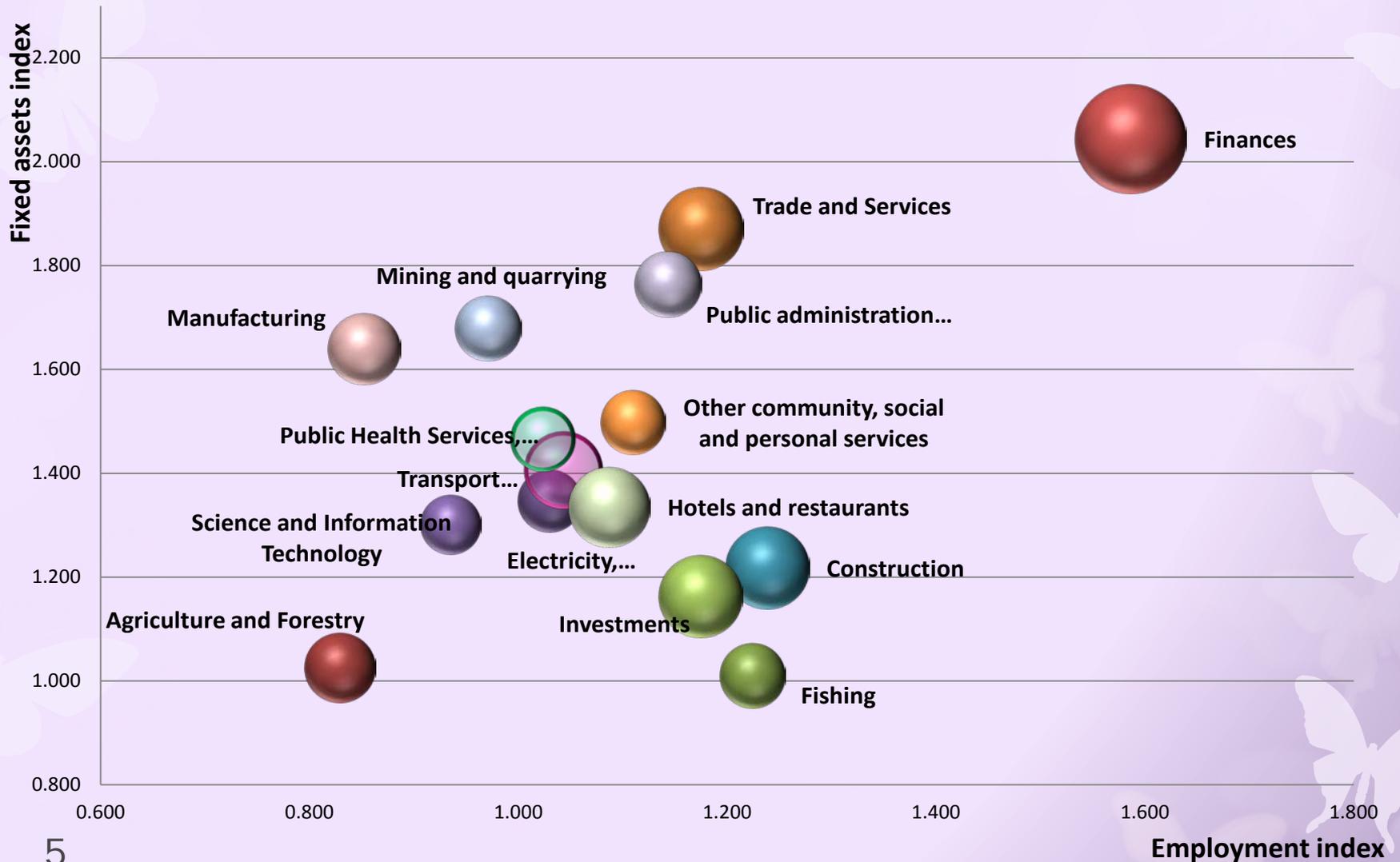


Fig. 2. The dependence of the Russian sectors' output on the labor productivity an capital productivity indexes (2013 to 2003)

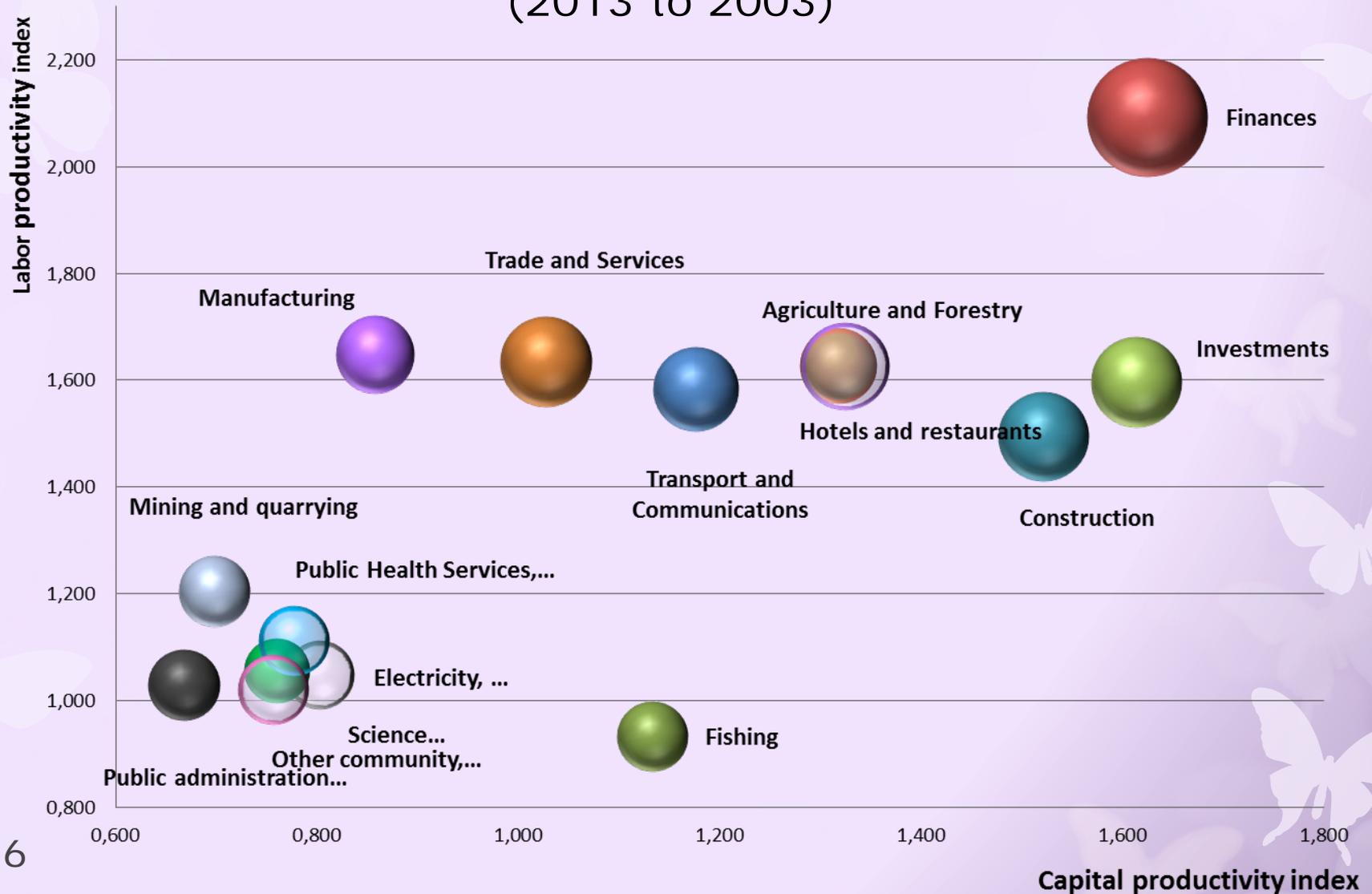
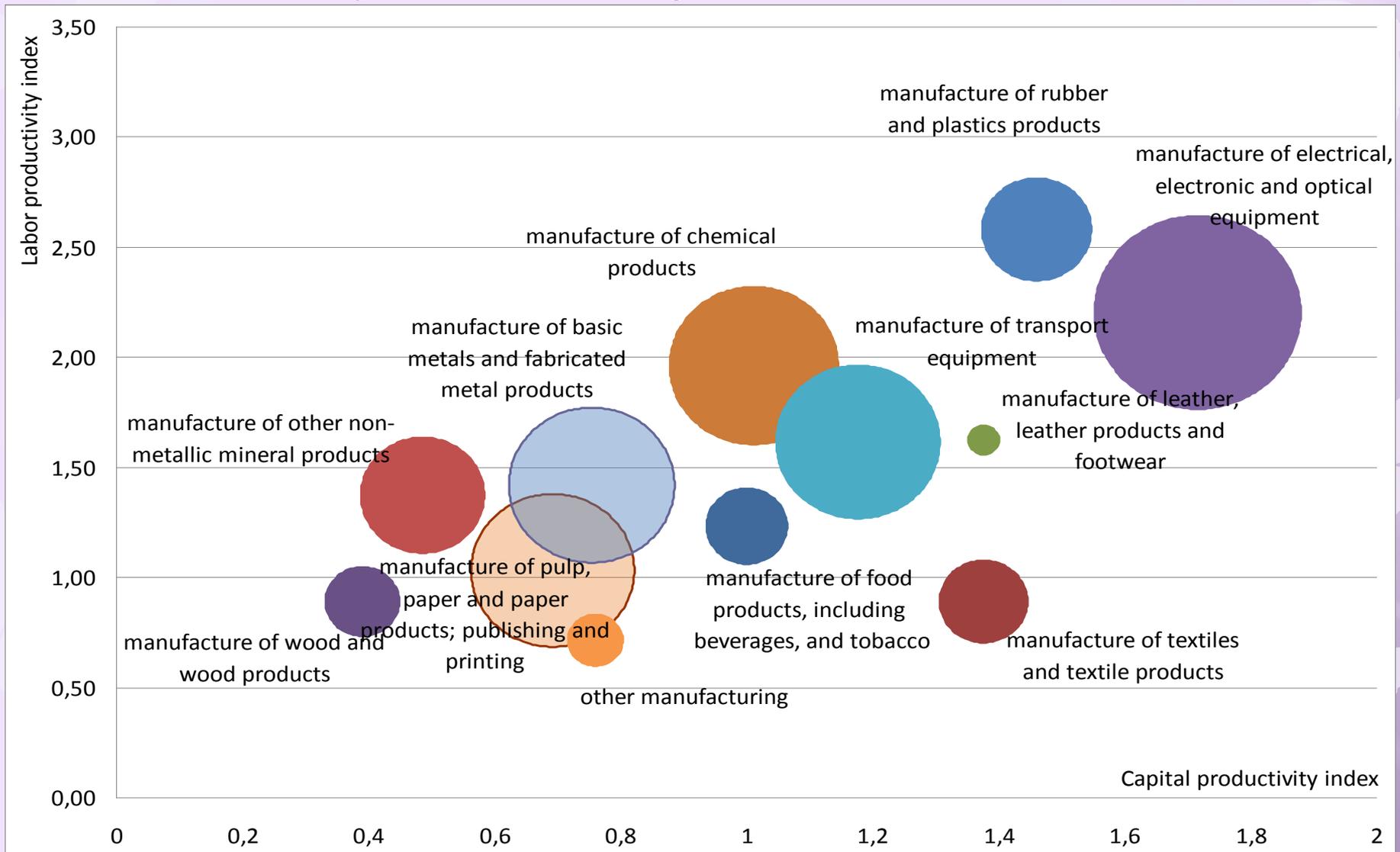


Table 3. The dynamic of the labor productivity for sub-sectors of manufacturing of the Russian economy

The detalization of manufacturing sector	Labor productivity by gross output, \$/employed	
	2003 year	2013 year
manufacture of food products, including beverages, and tobacco	26578,0	80751,7
manufacture of textiles and textile products	7463,7	14488,1
manufacture of leather, leather products and footwear	8437,8	26025,7
manufacture of wood and wood products	12079,1	27851,0
manufacture of pulp, paper and paper products; publishing and printing	25013,1	59068,0
manufacture of chemical products	24775,1	141935,2
manufacture of rubber and plastics products	20497,6	78048,4
manufacture of other non-metallic mineral products	13265,6	63241,1
manufacture of basic metals and fabricated metal products	32786,7	119548,7
manufacture of electrical, electronic and optical equipment	9186,9	59663,9
manufacture of transport equipment	15555,6	82490,4
other manufacturing	46003,9	83054,0

Fig. 3. The correlation of share expenses on the technological innovation in volume of sales and the labor productivity and capital productivity indexes. (detailed by manufacturing sector)



Methodological approach includes the 6 following steps:

1. Making a classification of factors affecting the dynamics of industries under consideration.

2. Identification of indicators, corresponding with the factors determined by the previous step.

3. Analysis of the dynamics of production for industries under consideration.

4. Evaluation of the sensitivity of the production volume to the selected factors for each industry under consideration.

5. Ranking industries according to the degree of sensitivity of a variety of production volumes to selected factors.

Table 5. Factors classification, influencing on basic industries development and economy as a whole (fragment)

	Factor name	Short-term period	Medium-term period	Long-term period	
Factors having an impact on supply	An impact on the enterprise level	Flow of costs	+	+ -	
		Production capacity		+	+
		Degree of utilization of production capacity	+	+	
		Rent, electricity	+		
		Bringing the product to the end consumer	+		
		Investments		+	(+)
		Goods and services quality		+	+
		Scale of production		+ -	+
		Production internalization level	+	+	+
		Capital internalization level		+	+
		Mobility of labor	+	+	+
		Recreation services		+	
		Labor costs	+	+ -	
		Creative potential	+	+	+
	A sectoral impact	Technology opportunities - innovative activity - science and technology development level	+ -	+	+
		Character of techniques in operation		+	
		Flow of costs	+	+ -	
		ation	+	+	+ -
		Government support level (targeted)	+	+ -	- +
		Expectations of manufacturers	+	+	
		Inventory level	+		
		Production capacity Production capacity (загруженность)		+	+
		Degree of utilization of production capacity (backlogs)	+	+	
		Labor accessibility		+	+
		Bringing the product to the end consumer	+		
		Investments		+	(+)

Model 1. The impact of the short-term and the medium term factors on the current economic capacity

The purpose of the research is to understand how the factors from the supply side operate in the short-term. Whether they have an impact on manufacturing now or not.

$$Y=f(L,K,W,V,N), \quad (1.1)$$

L – labour force,

K – fixed assets,

W – relative wages,

V –value added (VA),

N – profitability.

$$\ln \left(\frac{dY}{Y} \right) = \alpha_0 + \alpha_1 \ln \left(\frac{dL}{L} \right) + \alpha_2 \ln \left(\frac{dK}{K} \right) + \alpha_3 \ln \left(\frac{dV}{V} \right) + \alpha_4 \ln \left(\frac{dN}{N} \right) + \varepsilon (1.2)$$

Table 6. Assessment results of the impact of the medium-term factors on the gross output in the short-term of the Russian economy (Model 1)

Type of economic activity	Constant	Salaries	Value added	Employment	Fixed assets	Profitability	R ²
Agriculture and Forestry	0,018	0,989 (0,260)		0,694 (0,138)			0,493
Fishing	-0,004			0,691 (0,089)			0,639
Electricity, gas and water supply	0,008			0,933 (0,125)			0,620
Construction	-0,720	1,096 (0,175)	2,206 (0,491)	1,030 (0,134)			0,845
Trade and Services	-2,133	0,465 (0,154)	4,403 (1,246)	1,181 (0,194)			0,749
Transport and Communications	-0,613		1,590 (0,735)	1,492 (0,274)			0,575
Finances	0,055	-0,138 (0,220)		1,270 (0,181)			0,601
Investments	0,043	1,829 (0,518)		1,040 (0,438)			0,286
Science and Information Technology	0,003			0,512 (0,177)			0,197
Public Health Services, arts, culture and other social services	-1,263		2,689 (1,407)	0,464 (0,127)			0,332
Other community, social and personal services	-0,005			1,612 (0,310)			0,443
Mining and quarrying	0,150			0,863 (0,204)	-2,713 (0,844)		0,428
Manufacturing	-1,467	1,797 (0,243)		1,114 (0,099)	-5,283 (0,722)		0,915
Hotels and restaurants	0,046			1,465 (0,140)			0,786
Public administration and defense; social insurance							

Model 2. The impact of the medium-term factors on the dynamics of production in short-term

$$Y_t = L_{t-1}^\alpha K_{t-1}^\beta I_{t-1}^\gamma \quad (2.1)$$

I - technological innovations,

$$\ln Y_t = \alpha \ln L_{t-1} + \beta \ln K_{t-1} + \gamma \ln I_{t-1} \quad (2.2)$$

Table 7. Assessment results of the impact of medium-term factors on the gross output in the Medium-term of Russian economy (Model 2)

Type of economic activity	Constant	Fixed assets	Accumulated technological knowledge	Employment	R2
Agriculture and Forestry	0,054	3,454 (0,669)			0,51
Fishing					
Electricity, gas and water supply	-0,215		0,811 (0,298)	-11,446 (3,210)	0,34
Construction	0,310			4,637 (1,538)	0,26
Trade and Services	0,047			3,476 (0,495)	0,66
Transport and Communications	0,030	0,978 (0,132)		4,037 (0,656)	0,76
Finances	0,116			2,141 (0,166)	0,86
Investments	multicollinearity is close to 1				
Science and Information Technology	0,004			0,751 (0,134)	0,546
Public Health Services, arts, culture and other social services	-0,008	0,273 (0,050)		1,867 (0,347)	0,680
Other community, social and personal services	0,059	-0,427 (0,141)		3,271 (0,764)	0,566
Mining and quarrying	0,052		0,287 (0,053)		0,533
Manufacturing	0,201		0,813 (0,167)	2,613 (0,548)	0,501
Hotels and restaurants	0,144	1,052 (0,207)		1,759 (0,331)	0,694
Public administration and defense; social insurance	0,060	0,325 (0,024)		-0,580 (0,084)	0,893

Multiplicative effect of the medium-term factors and the impact of integrated medium-term factor made it possible to get following analysis.

$$Y_t = L_{t-1}^\alpha K_{t-1}^\beta I_{t-1}^\gamma \quad (2.1)$$

$$Y_t = (L_{t-1} K_{t-1} I_{t-1})^\delta \quad (2.2a)$$

$$\ln Y_t = \delta \ln(L_{t-1} K_{t-1} I_{t-1}) \quad (2.3a)$$

$$\ln Y_t = \delta e^{(l+k+i)(t-1)} \quad (2.4a)$$

- If we suppose in model 2 that $\alpha + \beta + \gamma = 1$ (refer to formula 2.1), it is true that:

$$\frac{Y_t}{L_{t-1} I_{t-1}} = \frac{L_{t-1}^\alpha K_{t-1}^\beta I_{t-1}^\gamma}{L_{t-1} I_{t-1}} = \left(\frac{K_{t-1}}{L_{t-1} I_{t-1}} \right)^\beta \quad (2.2b)$$

$$\ln \left(\frac{Y_t}{L_{t-1} I_{t-1}} \right) = \beta \cdot \ln \left(\frac{K_{t-1}}{L_{t-1} I_{t-1}} \right) \quad (2.3b)$$

Table 8. Assessment of the multiplicative effect impact of the medium-term and integrated factors on the physical volume of gross output for the Russian economy

Type of economic activity	Multiplicative effect of medium-term factors (δ)	Integrated factor (β)
Agriculture and Forestry	-1,442	2,014
Fishing	0,503	-0,071
Electricity, gas and water supply	-0,119	0,350
Construction	1,590	-1,268
Trade and Services	0,513	0,472
Transport and Communications	0,987	0,699
Finances	0,717	0,830
Investments	1,475	-3,388
Science and Information Technology	-0,209	0,062
Public Health Services, arts, culture and other social services	0,284	0,235
Other community, social and personal services	-0,412	-0,536
Mining and quarrying	0,342	0,275
Manufacturing	0,749	0,382
Hotels and restaurants	1,256	0,560
Public administration and defense; social insurance	0,170	0,091

Table 9. The Comparison of the results of the demand and supply factors on economic industries

Type of economic activity	R ² of the results which were obtained by demand factors	R ² of the results which were obtained by supply factors
Agriculture and Forestry	0,20	0,493
Fishing	0,20	0,639
Mining and quarrying	0,17	0,428
Manufacturing	0,61	0,915
Electricity, gas and water supply	0,49	0,620
Construction	0,61	0,845
Trade and Services	0,92	0,749
Transport and Communications	0,53	0,575
Finances	0,86	0,601
Investments	0,62	0,286
Science and Information Technology	0,76	0,197
Public Health Services, arts, culture and other social services	0,41	0,332
Other community, social and personal services	0,78	0,443

Conclusion

The Medium-term (supply side) factors have a greater impact on:

- Agriculture and Forestry
- Fishing
- Mining and quarrying
- Manufacturing
- Electricity, gas and water supply
- Construction

The short-term factors (demand side) have a significant impact on:

- Trade and Services
- Finances
- Investments
- Science and Information Technology
- Other community, social and personal services

Both (supply factors and demand factors) have equal impact on:

- Transport and Communications
- Public Health Services, arts, culture and other social services

Thank you for your
attention!