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### ANALYSIS OF CHANGES IN THE RUSSIAN ECONOMY

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#### *Abstract*

The aim of the paper is to identify active changes in the Russian economy, to determine causes and patterns of their occurrence as well as opportunities to eliminate the negative risks caused by these changes. The study is based on a systematic approach using statistical and cluster analysis. Analysis of changes in the Russian economy is associated with assessment of its indicators dynamics: GDP; growth rates of real and nominal GDP, gross formation of fixed capital and investments; total unemployment rates, of men and of women; net disposable household income; household financial transactions; household savings; household debt; financial assets; domestic research and development costs; number of researchers and government researches; family of triad patents. The analysis of changes in the Russian economy according to OECD and World Bank Group revealed: lack of growth rate of Russia's GDP as for a developing industrial country; large volume of losses of physical capital and transition of investments to the financial sector; exceeding of the General level of unemployment of men over women; reduction in the growth rate of net disposable income against the background of high debt load on households; minor changes in financial transactions of households are determined by low growth rates of savings; stable excess of expenditures growth rate over the financial assets of households; high dependence of R&D from public researches; low efficiency of public researches in times of economic crisis; consistently low values of internal expenditures on R&D, drop of private R&D rate and their transfer to public R&D.

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**Keywords:** Changes analysis, dynamics of indicators, patterns, cluster analysis, causes, statistical analysis.



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## 1. Introduction

Modern Russian economy shows signs of chronic disease with low growth rates and high real inflation. Long-lasting malignant state is more often replaced by exacerbations – periods of stagnation and recession the causes of which are the reduction of investments, capital outflow, underfunding, financial and import sanctions. Prerequisites for the recent sharp decline of the Russian economy and its transition first to a stage of stagnation in 2013 – 2014, and then to a recession in 2015 were accompanied by negative processes of stagflation. The reason for the prolonged chronic illness is the formed mixed transition system monopolized by state-and-oligarchic market system with extremely weak competitive development mechanism (Aganbegyan, 2017).

The process of treatment of exacerbations is complicated by the inspired mechanistic model of the theory of market equilibrium and by the inability of the neoclassical paradigm to explain an infinite number of economic phenomena including the periodic change of world economic structures as integral institutional systems that ensure reproduction of economy. Absence of an effective system of state regulation of the currency and financial market not only does not perform the function of financing productive investments, but also is a source of destabilization of the Russian economy, including due to manipulation by foreign financial institutions. The negative effects of sanctions have had a place and were able to increase in 2014 – 2016 not so much due to external shocks (fluctuations of oil prices, current trends and the state of the global financial system, etc.), but due to internal factors ("fails" of regulation of national economy) (Glazyev, 2016).

By the end of 2016 there were signs of the end of the crisis, and the 2017 seemed to give a reason to believe that the crisis had been overcome. But expectations of overcoming the crisis conflict with objective indicators of economic dynamics (Minakir, 2018).

According to the OECD (2019) data in Russia in the 2019 – 2020 there is forecast steady growth associated with an increase in private consumption due to increase of wages, loans and employment of households that would follow up the pension reform. Major infrastructure projects will stimulate both public and private investment. Increase of VAT in 2019 will temporarily slow down growth and reduce disposable income. Export growth will decline as external demand weakens, while imports will recover in 2020. Weaker ruble and higher VAT will temporarily lift inflation above the 4% target. Unemployment will rise as the demand for employment will only partially match the increase in labor supply after the retirement age is raised. Inconsistency of the development prospects of the Russian economy requires analysis, including in long-term perspective, using a wide database of OECD and World Bank Group.

## 2. Problem Statement

The problem of study of changes of structure and the dynamics of economic development is always relevant. It is most pronounced in the context of a cyclical recession caused by a drop in the growth rate of world trade and increased global competition.

The applied structural and evolutionary approaches to the analysis of economic changes do not go beyond the issues traditionally considered in the modeling of equilibrium growth (Scazzieri, 2018). For the analysis of changes in the economy there are used different indexes (Vu, 2017), (Erumban, 2019),

(Smirnov, Semenov, Kadyshev, Zakharova, & Perfilova, 2019), regression models (Bayramov, Breban, & Mukhtarov, 2019), ordered logit regression (Cutrini, 2019), Bayesian local likelihood methodology (Kapetanios, Masolo, Petrova, & Waldron, 2019) and other approaches that reflect, as a rule, only the dynamics of changes in economy.

To identify active changes in the Russian economy, to determine the causes and patterns of their occurrence as well as opportunities to eliminate the negative risks caused by these changes there will be used systematic approach applying statistical and cluster analysis according to OECD and World Bank Group data. This would allow to link changes in the dynamics of indicators and the structure of the Russian economy, and correctly identify the causes and patterns of their occurrence, the possibility of eliminating negative risks.

### **3. Research Questions**

The subject of the study is the economy of Russia. The study is based on a systematic approach using statistical and cluster analysis of OECD and World Bank Group data. Analysis of the Russian economy is associated with the assessment of the dynamics of key indicators: GDP; growth rates of real and nominal GDP, gross formation of fixed capital and investments; total unemployment rates, of men and of women; net disposable household income; household financial transactions; household savings; household debt; financial assets; domestic research and development costs; number of researchers and government researches; family of triad patents.

### **4. Purpose of the Study**

The aim of the paper is to identify active changes in the Russian economy, to determine the causes and patterns of their occurrence as well as opportunities to eliminate the negative risks caused by these changes. There is done analysis of dynamics of various sectors of the economy from households to finance, from the labor market to government research. Special attention is paid to the analysis of dependence of GDP and physical capital growth rates, unemployment and net disposable income, household debt burden and savings growth rates; the growth rate of spendings over household financial assets and the dependence of R&D on government research.

### **5. Research Methods**

Assessment of changes in the Russian economy is carried out using statistical and cluster analysis of the global database of key indicators of OECD and World Bank Group. The distinctive characteristic of statistical analysis as a method of collecting, studying and presenting large amounts of data to identify the main patterns and trends of a certain phenomenon are: statistical surveillance (systematic collection of data with subsequent mathematical processing); sampling (use of a particular piece of data according to certain criteria (stratified, cluster, quota, etc.)); correlation and regression analysis (identify data relationship and the reasons for which the data is independent from each other); dynamic analysis (allows to track effect, intensity and frequency of changes of objects and phenomena).

Cluster analysis is a multi-dimensional statistical procedure for collecting of data containing information on objects sampling and ordering of objects of study in relatively homogenous groups. The clustering problem belongs to statistical analysis.

Cluster analysis allows to establish a typology or classification of the studied objects or phenomena; identification of the major schemes of grouping objects (phenomena); to formulate hypotheses based on the research data; to test the hypothesis or research to determine the validity of existence of groups distinguished in one way or another from the available data, etc. Cluster analysis is performed using the software package "SPSS Statistics" (hierarchical cluster analysis, average distance between the clusters and the square Euclidean distance).

## 6. Findings

Analysis of changes in the Russian economy is associated with assessment of its indicators dynamics: GDP; growth rates of real and nominal GDP, gross formation of fixed capital and investments; total unemployment rates, of men and of women; net disposable household income; household financial transactions; household savings; household debt; financial assets; domestic research and development costs; number of researchers and government researches; family of triad patents.

Assessment of GDP dynamics, growth rates of real and nominal GDP, gross fixed capital formation, investment revealed the following changes (Table 01).

**Table 01.** GDP, growth rates of real and nominal GDP, gross fixed capital formation, investments, 1999-2020

Indicators	Average	Median	Deviation	Maximum	Minimum	Average / Median
GDP, US Dollars per capita (Y axis on the right)	2507708	2771418	1057094	3768772	936828	-9.52
Real GDP forecast, annual growth rate, %	3.61	4.32	4.07	10.05	-7.82	-16.43
Nominal GDP forecast, total, annual growth rate, %	19.56	20.09	18.72	83.42	-5.98	-2.64
Gross fixed capital formation, total, annual growth rate, %	6.50	8.66	9.40	21.07	-14.67	-24.99
Investment forecast, total, annual growth rate, %	2.91	2.43	1.19	4.73	1.68	19.80

Source: authors based on data of OECD (2019).

The results of assessment of Russia's GDP dynamics show insufficient growth rates for a developing industrial country. Meanwhile the negative value of ratio of average to median growth rates reflect its real decline. This trend is confirmed by the forecast ratio of the average to median real and nominal GDP growth rates.

Significant differences in the ratio of average to median growth rates of gross fixed capital formation and investment growth rates indicate large loss of physical capital and transition of investments to the financial sector.

Estimation of the dynamics of total unemployment rate, of unemployment rate of men and women revealed the following changes (Table 02).

**Table 02.** Unemployment rate, 1999 – 2018

Indicators	Average	Median	Deviation	Maximum	Minimum	Average / Median
Total, % of workforce	7.20	6.83	2.05	12.92	4.80	5.38
Men, % of labor force	7.42	7.12	2.04	13.17	4.89	4.19
Women, % of labor force	6.85	6.44	2.06	12.90	4.71	6.30
Men/women	1.09	1.08	0.04	1.15	1.02	0.45

Source: authors based on data of OECD (2019).

The above assessment results show excess of the overall unemployment rate of men over women which reached its maximum during the global financial and economic crisis in 2009-2011. In the subsequent years there is a tendency to equalize the unemployment rate within 6% - acceptable for developing countries (Smirnov, Semenov, Kadyshev, Zakharova, & Babaeva, 2019). The unemployment rate of women is volatile relative to that of men.

Assessment of the dynamics of net disposable income, financial transactions, savings and household debt revealed the following changes (Table 03).

**Table 03.** Net disposable income, financial transactions, savings and household debt, 1999 – 2022

Indicators	Average	Median	Deviation	Maximum	Minimum	Average / Median
Net household income, growth rate, %	3.03	3.23	3.65	7.45	-7.10	-5.96
Household financial transactions, net balance sheet, % of net disposable income	3.66	3.55	1.35	7.40	2.00	3.16
Household savings, total, % of disposable income	4.62	4.50	1.01	7.70	3.60	2.68
Household debt, total, % of net disposable income	27.64	27.29	2.48	30.67	22.75	1.29

Source: authors based on data of OECD (2019).

The results of the assessment reflect a decrease in the growth rate of net disposable income against the background of high values of household debt burden. Small changes in household financial transactions are driven by low savings growth. Taken together, these conditions show high risks of the Russian economy falling into recession.

Assessment of dynamics of financial assets and household expenditures revealed the following changes (Table 04).

**Table 04.** Financial assets and household expenditures, 2011 – 2022

Indicators	Average	Median	Deviation	Maximum	Minimum	Average / Median
Household financial assets, total, US Dollars per capita	13092.43	13030.24	2180.67	16421.12	7763.21	0.48
Household expenditure, total, US dollars	1876511.09	1866332.92	77464.74	1999351	1726058	0.55

Source: authors based on data of OECD (2019).

The above results show a steady increase in spendings over household financial assets. This phenomenon is positive for the fast-growing economy, but in the conditions of the Russian reality it is a catalyst for recession. Assessment of the dynamics of internal research and development costs, the number of researchers and government researches, the family of triad patents revealed the following changes (Table 05).

**Table 05.** Domestic expenditures on research and development, researchers, governmental researches, triad patents family, 1999 – 2022

Indicators	Average	Median	Deviation	Maximum	Minimum	Average / Median
Domestic research and development costs, total, % of GDP	1.05	1.04	0.06	1.19	0.93	0.74
Researchers, total, per 1,000 employed	6.91	6.95	0.62	7.90	5.92	-0.52
Government researches, total, % of nationwide	31.31	31.30	1.78	34.03	28.08	0.04
Family of triad patents, total number	79.97	78.77	8.04	90.87	56.90	1.53

Source: authors based on data of OECD (2019).

Assessment results reflect high dependence of R&D on government research. Low efficiency of state research during the economic crisis is revealed which is associated with a decrease in state funding. There are observed consistently low values of domestic R&D costs, as well as the loss of non-state research, or their transition to the state category.

To eliminate the negative effect on the economy Russia should identify clusters of factors influencing its changes. Let's use the procedure of hierarchical cluster analysis implemented in the SPSS Statistics package. To determine the distance between a pair of clusters we will use the average distance between clusters, with Euclidean metric (square of Euclidean distance) according to the data of World Bank Group, All Rights Reserved.

As a result of analysis of more than a thousand indicators of the Russian economy there have been identified the following clusters:

- 1) lending to commercial banks (tax credit) and: repayment of principal external debt (long-term), principal payments on foreign debt (private non-guaranteed); interest payments on foreign debt (private non-guaranteed); lending to commercial banks (official creditors, AMT and DIS); payments on foreign debt (long-term); lending (commercial banks);

2) male employers (% of male employment) and: employers, total (% of total employment); service employment, female (% of female employment); unemployment, youth male (% of male labor force ages 15-24); employers, female (% of female employment);

3) employment in services, female (% of female employment); employment in services, total (% of total employment); employment in services, male (% of male employment); employment rate of population, 15+, male (%); employment in industry, male (% of male employment); employment in industry, female (% of female employment); share of labor force aged 15-24, male (%); GDP per person employed; self-employed, male (% from the employment of men).

Based on the above results of cluster analysis the driving force of changes in the Russian economy is the interaction of financial sector (commercial banks) and labor market (employers and the unemployed). Activity of labor market changes significantly affects young people and women in the service sector, men and women in industry, and self-employed men.

## 7. Conclusion

As a result of assessment of changes in the Russian economy there were revealed low real GDP growth rates, a decrease in the growth rate of gross fixed capital formation and investment growth rates. A significant decline in physical capital does not affect the unemployment rate remaining at acceptable levels for developing countries.

Low rates of growth of GDP, gross fixed capital formation and investments against the background of a significant lag in the projected values of real GDP growth rates over the nominal together with a significant unemployment rate will lead to a guaranteed decrease in net disposable income and high household debt burden. This guarantee correlates with a low rate of savings growth and a significant excess of the growth rate of expenditures over the growth rate of household financial assets. The lack of correlation between decline in physical capital and unemployment rate is associated with higher shares of commodity production in the Russian economy that is confirmed by low values of internal costs on R&D and high proportion of inefficient public researches.

The modern economy of Russia is described by two contradictory positions. On one hand ("look from inside"), Russia's economy is characterized by a reduction of investments (Berezinskaya, 2017), by capital outflow, under-funding, financial and international sanctions caused by the formed mixed transition (Akindinova, Kuzminov, & Yasin, 2016) monopolized state-and-oligarchic market system with very low competitive mechanism of development and the lack of state regulation of monetary market. On the other hand ("look from outside") – steady growth (Zhao & Tang, 2018; Ito, 2017) associated with an increase in private consumption due to growth in household lending and stable employment.

Thus, the analysis of changes in the Russian economy revealed: acceptable level of unemployment for developing countries with a stable excess of the general level of unemployment of men over women; reduction in the growth rate of net disposable income against the background of high debt and low growth rate of savings; excess of expenditures growth over the financial assets; high dependence of R&D from public researches. In the Russian economy there can be identified clusters that significantly affect changes and cover activities of the financial sector (lending to commercial banks, repayment of principal foreign debt, interest payments on foreign debt, etc.) and the labor market (employers, employment, etc.).

Analysis of changes in the Russian economy revealed risks of rising unemployment and falling rates of lending by commercial banks to households caused by a decrease in net disposable income, high debt load and low savings growth. Opportunities to reduce these risks are associated with implementation of state funding programs for R&D focused on technological modernization and transition to digital economy.

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