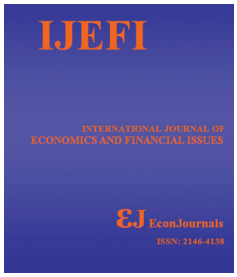

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Development of Domestic and Foreign Industrial Enterprises in Russia

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ABSTRACT

The paper analyzes the Russian industry ownership structure and its dynamics for enterprises in Russian (RO), foreign (FO) and joint (JO) ownership in stable periods 2005-2008, 2009-2014, and crisis ones 2008-2009 and 2014-2015. We apply the multivariate statistical analysis of time series, including factor analysis, cluster analysis, analysis of variance. We find that raw material and low-tech industries (CA, DF, DJ, DA) continue to be the leaders by the value of shipped products in Russia. The main group of high-tech and medium-tech industries with enterprises in RO (DL, DM, DK, DG) demonstrates the average growth rates and cannot close the gap on leaders. Industry sectors with enterprises in the FO and JO behave differently. Some industries demonstrate outstripping growth, but several sectors show a slowdown and instability in the development for 2009-2014. We also define the industries which negatively react to both crises periods and require state support.

Keywords: Domestic and Foreign and Joint Enterprises, Russian Manufacturing Development, Economic Crisis, Multivariate Statistical Analysis
JEL Classifications: C100, L600, O470

1. INTRODUCTION

The research aims are caused by several factors. The high-level development of enterprises in dependence of the ownership patterns is one of the most important problems not only for leading but also for developing countries. Foreign-owned (FO) enterprises and the domestic ones (RO) have some differences in their development, investments and labor indicators (Buckley et al., 2007; Chen et al., 2011; Basti et al., 2011; Gelübcke, 2012). The scientists identify the following main differences:

- Investment bring different productivity for enterprises under foreign and joint ownership (FO and JO = FJO) and domestic-owned (RO) ones. FJO have some advantages on the domestic markets caused by new technologies, advanced management and professional staff. The greater benefits are achieved by investments of foreign firms operating in monopolized sectors as well as high-tech industries. But the influence of FJO is negative for RO industries which cannot compete to them (Papalia and Calia, 2010).
- As for employment dynamics, the FJO enterprises are characterized by the fewer employees' number but higher qualification and higher salaries (Girma et al., 2009; Dachs and Peters, 2014).
- Researchers found no significant difference between domestic and foreign firms in terms of attitudes towards employment reduction during a crisis. But foreign ownership may affect positively on firms' sales turnover growth (Varum and Barros, 2011).

At the same time, the 2008 financial crisis was a serious challenge for the world economy. It has affected most countries. As for European countries, there was a significant decrease in

manufacturing in 2008 and the development in the post-crisis period was at a lower rate (Industrial Production (Volume) Index Overview, 2016).

The situation in Russian manufacturing was more difficult. The crisis of 2008 after a short-time stability of 2009-2014 turned to 2015 crisis. The features of two crises are the same: Oil prices fall, dollar exchange rate growth, and the effectual demand fall. The extra negative factor for Russian economy in 2014-2015 became the economic sanctions.

Russian economy at 2005-2012 was characterized with an intensive creation of FJO enterprises in main industry sectors. The Russian state economic projects and programs was oriented on imitation and adaptation of advanced foreign technologies by means of the establishing of FJO (Russian innovation development strategy for the period up to 2020, 2011). To solve this problem, Russian government established the preferential taxation in advanced special economic zones (the manufacturing ones - at Kaluga and Kaliningrad) where new FJO enterprises were located. That was the way how the foreign manufacturers avoided the customs duties and entered the Russian market. Russian authorities expected to involve innovative technologies in the domestic manufacturing. But since 2013-2015 these processes changed by the period of reducing intensity of the new foreign enterprises creation.

In the previous studies, the authors considered the economic and social results of the Russian, foreign and joint companies in selected subsections of manufacturing industry. We investigated manufacture of transport equipment (DM subsection) (Spitsin et al., 2015a; Spitsin et al., 2016a), electrical and optical equipment industry (DL subsection) (Spitsin et al., 2015b) and food industry (DA subsection) (Spitsin et al., 2016b) and found differences between RO and FJO companies in employment effects and investment intensity.

This paper investigates the industrial development in the Russian Federation by main industry sectors and ownership patterns during the period of 2005-2015.

The research objectives are, firstly, to identify trends and leaders and outsiders of the enterprises' development in the context of patterns of ownership and industry sectors in relatively stable periods of 2005-2008 and of 2008-2009 and, secondly, to cluster enterprises by patterns of ownership and industry sectors by their reaction on crisis conditions in 2008-2009 and 2014-2015.

2. RESEARCH METHODOLOGY

The growth dynamics of the main industry sectors with enterprises in Russian, foreign and joint ownership are investigated in the stable periods of 2005-2008, 2009-2014, and during crises 2008-2009 and 2014-2015. The main indicator is the value of shipped products (SP) on the net types of economic activities. The database includes statistical data on the main industry sectors (IS) split by the enterprises ownership forms (OF) (means IS*OF). Statistical data were obtained at the website of UIISS (Unified Interagency Informational Statistical System, 2016) and upon special requests to Rosstat (Federal Service of State Statistics, 2016). Database structured in such a manner was analyzed further in Statistica using multivariate statistical analysis according to Hill and Lewicki (2007), StatSoft (2013). The main industry sectors for the analysis includes 8 sectors (7 manufacturing industries and 1 mining industry) with the highest value of SP. These 8 sectors correspond to the following industry subsections according the Statistical Classification of Economic Activities in the European Community, NACE Rev. 1.1 (Eurostat, 2015; Classification of Economic Activities, 2016):

- Subsection CA mining and quarrying of energy producing materials
- Subsection DA manufacture of food products, beverages and tobacco
- Subsection DF manufacture of coke, refined petroleum products
- Subsection DG manufacture of chemicals, chemical products and manmade fibers
- Subsection DJ manufacture of basic metals and fabricated metal products
- Subsection DK manufacture of machinery and equipment n.e.c. (without Manufacture of weapons and ammunition)
- Subsection DL manufacture of electrical and optical equipment
- Subsection DM manufacture of transport equipment.

Each of these 8 sectors is investigated separately for the three forms of enterprise ownership (RO, FO, JO). Thus, we examine 24 objects: 8 industry sectors *3 ownership forms (IS*OF). Their SP values for the period 2005-2015 are shown in Figure 1.

Database created in such manner for 24 studied objects was analyzed further in "Statistica." We applied multivariate statistical analysis of dynamic series, including factor, cluster and variance analysis. Multivariate statistical analysis was carried out according the methodology described in Hill and Lewicki (2007), StatSoft (2013).

The research includes 2 main separate directions:

1. Dynamics of SP during the stable periods.
2. Dynamics of SP during the periods of crisis.

For each of these directions there are 3 stages of the research:

1. Creating the system of the initial indicators for the analysis, factor analysis of the system of initial indicators and receiving the aggregated factor indicators for further analysis.
2. Clustering of 24 objects (IS*OF) by factor indicators, estimation of statistical significance of the difference between the clusters for each factor indicator using the criteria variance analysis.
3. Economic interpretation of statistical results.

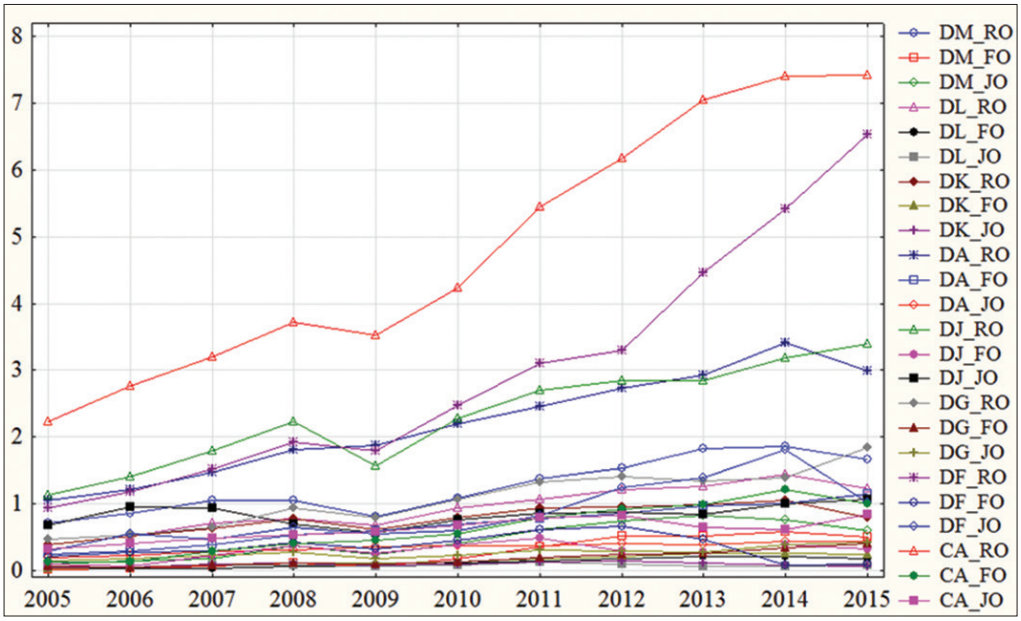
3. RESULTS OF MULTIVARIATE STATISTICAL ANALYSIS

3.1. Dynamics of Shipped Products during the Stable Periods

3.1.1. Construction of the factor indicators

Comparative statistical analysis of 24 IS*OF is made on an expanded set of numerical characteristics of the indicator SP. We examine the following numerical characteristics:

Figure 1: Dynamics of shipped products for 24 studied objects (IS*OF), trillion rubles



- The statistical indicators of the dynamic series, which include m, Me, D and SD (m - mean, Me - median, D - range and SD - standard deviation).
- The indicators, characterizing the linear trend (Pearson (r) and Spearman (R) criteria).
- The indicators, describing growth rates, which are calculated as the ratio of SP in the last year of the period to SP in the first year of the period (SP8/5 and SP14/9).

Each of these numerical characteristics is calculated for two relatively stable periods: 2005-2008 (4 years-m4, Me4 and so on) and 2009-2014 (6 years-m6, Me6, etc.). We receive the system of 12 numerical characteristics. Significance (different from zero) of paired correlation coefficients for a group of 24 observations at the level of P = 0.05 determines the critical value of the correlation Pearson coefficient rcr = 0.40. Based on the correlation analysis of the system of 14 numerical characteristics we constructed a dendrogram that allows to select different groups of related numeric correlation characteristics depending on the linkage distance d (Figure 2 and Table 1). d = 1−rcr = 0.6 (dash horizontal line in Figure 2) defines four groups of numerical characteristics that have significant correlation. As a measure of the proximity of two clusters the correlation distance (1−r) was selected. We applied Ward`s method as a rule of combining two clusters, which differs from all other methods by using the analysis of variance to evaluate the distances between clusters.

The correlation between initial indicators allows us to use the principal components analysis (Table 1), which could reproduce most variance of initial indicators using a relatively small number of new factor indices. The most significant (main) reversed factor loadings (partial correlation coefficients) of 14 numerical characteristics on factors are presented in bold in Table 1. Δ is the percentage of variance of initial indicators, explained by this factor. They (Δ-as) are shown in the bottom line. Accumulated variance of the first 4 factors is ≈96.4%.

Figure 2: Vertical tree diagram of 14 numerical characteristics of shipped products

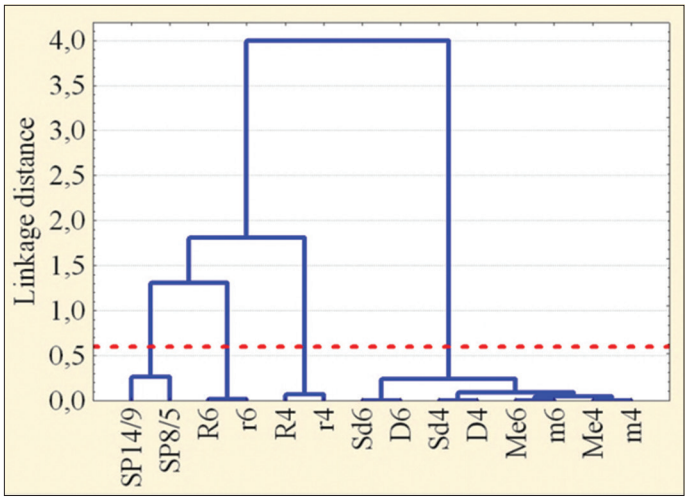


Table 1: Factor loadings (varimax method) of 14 numerical characteristics of SP

Initial indicators	F1	F2	F3	F4
m4	**0.964**	0.120	−0.021	−0.164
Me4	**0.961**	0.122	−0.025	−0.168
D4	**0.967**	0.105	0.093	−0.081
Sd4	**0.966**	0.114	0.058	−0.086
m6	**0.982**	0.140	0.078	−0.061
Me6	**0.980**	0.145	0.078	−0.060
D6	**0.949**	0.128	0.076	0.065
Sd6	**0.951**	0.125	0.081	0.075
r4	0.073	−0.071	**0.980**	0.074
r6	0.200	**0.971**	0.010	0.091
R4	0.096	0.115	**0.973**	0.076
R6	0.220	**0.958**	0.035	0.132
SP8/5	−0.200	−0.035	0.177	**0.930**
SP14/9	−0.028	0.444	−0.007	**0.861**
Δ	0.542	0.157	0.141	0.124

SP: Shipped products

According the Table 1, high factor loadings were distributed on the following factors:

F1 is the most significant factor (≈0.542), characterized by a positive correlation with the basic parametric (mean and SD) and nonparametric (median and range) characteristics of the set of values of the indicator "SP" for the periods 2005-2008 and 2009-2014. It is interpreted as the factor of statistical characteristics of the indicator "SP."

F2 is less significant factor (≈0.157), which characterized by a positive correlation with correlation coefficients (r and R) for the period 2009-2014. This factor is interpreted as the factor correlation between the indicator "SP" and the variable "Year" for the period 2009-2014.

F3 is still less significant factor (≈0.141), characterized by a positive correlation with correlation coefficients (r and R) for the period 2005-2008. This factor is interpreted as the factor of correlation between the indicator "SP" and the variable "Year" for the period 2005-2008.

Factors F2 and F3 describe the linear trend of growth of the indicator "SP" split by industry sectors and forms of ownership. In other words, these factors characterize the stability of linear growth during the period (in the case of high values of factor indicators) or the deviation from the linear growth or the linear growth instability (in the case of low values of factor indicators).

F4 is the least significant (≈0.124), characterized by a positive correlation with growth rates of SP for periods 2005-2008 (SP8/5) and 2009-20014 (SP14/9). F4 is interpreted as a factor of the growth rates of SP for periods 2005-2008 and 2009-2014.

3.1.2. Clustering of industry sectors by factor indices

According Figure 2 decrease the linkage distance (d) will cause the decomposition of factor F4 into two mono factors F41 (SP8/5) and F42 (SP14/9). With this in mind, as well as to a more visual interpretation of research results, 24 studied objects (IS*OF) were clustered in the factor space (F1, F2, F3, F41, F42). We applied the method of hierarchical clustering and constructed the dendrogram of 24 studied objects for factor indices F1, F2, F3, F41, F42 (Figure 3a). The number of clusters depends on the choice of linkage distance. Sustained decomposition (on the rules of association and proximity measures) of 24 studied objects in 9 clusters was obtained by using methods of K-means and hierarchical clustering (Figure 3a). Clustering results are illustrated in a scatter plots (Figure 3b-d).

Parametric F-test shows that the differences between the clusters are highly significant (at the level $p_F < 0.0005$) by a combination of factors due to highly significant ($p_F < 0.0005$) differences between the clusters for each of factors F1, F2, F3, F41, F42.

Due to the small number of clusters we control these results by rank Kruskal–Wallis test, which smooths out the differences for the set of clusters to statistically significant ($0.005 < p_{K\text{-}W} < 0.05$) for F1, F2, F41, F42, and to weakly significant ($p_{K\text{-}W} \approx 0.066$) for F3.

Using multiple comparison criteria, we evaluated the significance of the differences by each factor indicator for each pair of clusters. For example, parametric Tukey criterion estimates the differences between C4 and C8 by factors F1, F2, or between C8 and C2 by factors F41, F42 as strongly significant ($0.0005 < p_T < 0.005$), while the rank Kruskal–Wallis test smoothest out them to statistically significant ($0.005 < p_{K\text{-}W} < 0.05$).

3.1.3. Economic interpretation of the clustering results

Based on the clustering we have received a quality classification of clusters (and their members - IS*OF) in the nominal scale of measurement: "Leader," "Above the average," "Average," "Below the average" and "Outsider" by factor indicators F1, F2, F3, F41, F42 (Figure 3b and Table 2).

According Table 2, raw materials and low-tech industries (clusters C1, C4) continue to be the leading industries by the value of SP in Russia. They show the growth rate at the average level and does not intend to lose its leading position. The main group of high-tech and medium-tech industries with enterprises in RO (DL, DM, DK, DG) forms the cluster C9, and demonstrates average growth rates for both periods and sustainable development along a linear trend in the period 2009-2014. Clusters of industry sectors with enterprises in the FO and JO behave differently. In both periods cluster C3 (DM FO) shows advancing growth. Cluster C2 was developed faster in 2005-2008, and cluster C6 - in 2009-2014.

However, we found a statistically significant trend of slowing growth in industry sectors with enterprises in FO and JO (cluster C8) during the period 2009-2014. This cluster, and the cluster C7 are characterized by unsustainable development in the period of 2009-2014 (strong deviations from the linear trend). Thus, high-tech and medium-tech industries DL and DK with enterprises in JO become almost insignificant and will not encourage the import of modern technologies in Russia.

3.2. Dynamics of SP during the Periods of Crisis

3.2.1. Construction of the factor indices

Comparative statistical analysis of 23 IS*OF is made on an expanded set of numerical characteristics of the indicator "SP." We examine the following numerical characteristics:

- Statistical indicators, characterizing the value of SP in 2008, 2009, 2014, 2015: SP8, SP9, SP14; SP15.
- Indicators, describing the changes during periods of crisis 2008-2009 and 2014-2015: SP9-SP8, SP9/SP8, SP15-SP14, SP15/SP14.

We construct the system of 8 numerical characteristics. Significance (different from zero) of paired correlation coefficients for a group of 23 observations at the level of $p = 0.05$ determines the critical value of the correlation Pearson coefficient $rcr = 0.41$. Based on the correlation analysis of the system of 8 numerical characteristics we constructed a dendrogram that allows to select different groups of related numeric correlation characteristics depending on correlation distance d (Figure 4 and Table 3). $d = 1-0.59 = 1-rcr$ (dash horizontal line in Figure 4) defines three groups of numerical characteristics that have correlation association. Correlation distance (1−r) was selected as a measure of the proximity of two clusters and Ward`s method was applied as a rule of combining two clusters.

Figure 3: Clustering of 24 IS*OF in the factor space (F1, F2, F3, F41, F42). (a) Three diagram of 24 IS*OF for factors F1, F2, F3, F41, F42, (b) plot of means for each cluster, (c) 3D scatterplot of F1, F3, F41 (2005-2008), (d) 3D scatterplot of F1, F2, F42 (2009-2014)

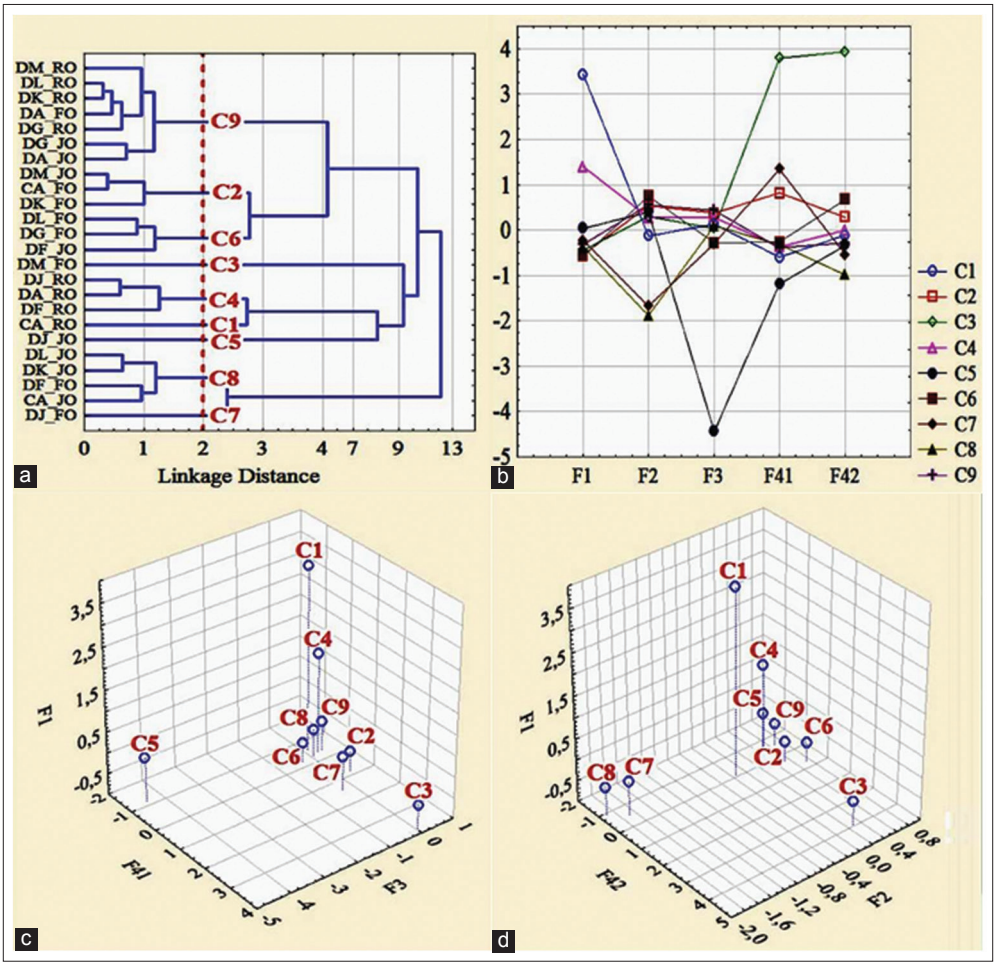


Table 2: Classification of clusters and their industry sectors in the nominal scale of measurement

Cluster	Members IS*OF	F1	F3 2005-2008	F2 2009-2014	F41 2005-2008	F42 2009-2014
C1	1 - CA RO	Leader	Average	Average	Below the average	Average
C2	3 - DM JO, CA FO, DK FO	Below the average	Average	Above the average	Above the average	Average
C3	1 - DM FO	Average	Average	Average	Leader	Leader
C4	3 - DJ RO, DA RO, DF RO	Above the average	Average	Average	Average	Average
C5	1 - DJ JO	Average	Outsider	Average	Below the average	Average
C6	3 - DL FO, DG FO, DF JO	Below the average	Average	Above the average	Average	Above the average
C7	1 - DJ FO	Average	Average	Below the average	Above the average	Below the average
C8	4 - DL JO, DK JO, DF FO, CA JO	Average	Average	Below the average	Average	Below the average
C9	7 - DM RO, DL RO, DK RO, DA FO, DG RO, DG JO, DA JO	Average	Average	Above the average	Average	Average

Using the principal components analysis, we built high-quality 3-factor model of initial indicators (Table 3). The bottom line shows the share of explained variance of initial numerical characteristics by each factor. The accumulated explained variance by first 3 factors is approximately 92.64%.

According Table 3, high factor loadings of initial indicators were distributed by the following factors:

F1 - The most significant factor (≈0.504), which is characterized by a positive correlation with the absolute values of SP for 2008, 2009 and 2014, 2015 and interpreted as a factor of the absolute values of SP.

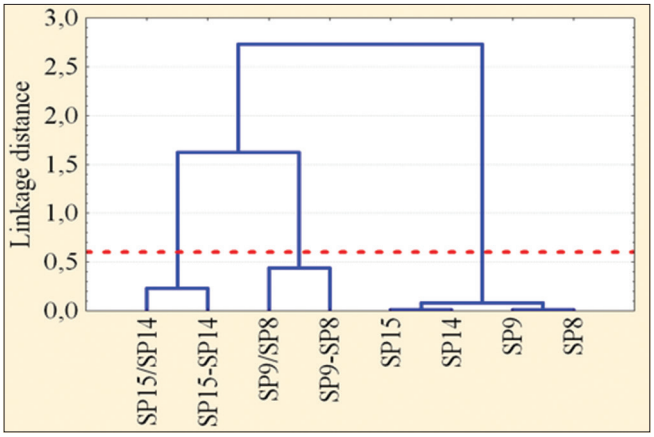
F2 - Less significant factor (≈0.227), which is characterized by a positive correlation with numerical characteristics, describing change the values of SP at crisis period 2014-2015

Table 3: Factor loadings (varimax raw) of 8 numerical characteristics of SP of crisis

Initial indicators	F1	F2	F3
SP8	0.978	0.061	0.146
SP9	0.988	0.053	0.004
SP14	0.987	0.067	0.037
SP15	0.958	0.229	0.043
SP9-SP8	−0.394	−0.070	0.822
SP9/SP8	0.123	0.099	0.921
SP15-SP14	0.192	0.927	0.049
SP15/SP14	0.045	0.937	−0.097
Δ	0.504	0.227	0.195

SP: Shipped products

Figure 4: Vertical tree diagram of 8 numerical characteristics of SP of crisis



and interpreted as a factor of changing the values of SP at crisis period 2014-2015.

F3 - The less significant factor (≈0.195), which is characterized by a positive correlation with describing change the values of SP at crisis period 2008-2009 and interpreted as a factor of changing the values of SP at crisis period 2008-2009.

3.2.2. Clustering of industry sectors by factor indicators

The 23 studied objects (IS*OF) were clustered in two factor space (F3 [SP9/SP8]; F2 [SP15/SP14]) and in three factor space (F1 [mSP/E9], F3 [SP9/SP8]; F2 [SP15/SP14]). We applied the method of hierarchical clustering, constructed the dendrogram of 23 studied objects for factor indicators F2, F3, and received the sustained decomposition of 23 studied objects in 7 clusters (Figure 5a). Clustering results are illustrated in the scattering diagrams for two (Figure 5a and b) and three (Figure 5c and d) factors.

Parametric F-test shows that the differences between the clusters are highly significant (at the level $p_F < 0.0005$) by a combination of factors due to highly significant ($p_F < 0.0005$) differences between the clusters for each of factors F2 (SP15/SP14), F3 (SP9/SP8).

Using multiple comparison criteria, we evaluated the significance of the differences for each pair of clusters by each factor index. Due to the small number of clusters we control these results by rank Kruskal-Wallis test, which smooths out the differences for the set of clusters to strongly significant on F3 ($p_{K-W} \approx 0.0041$) and F2 ($p_{K-W} \approx 0.0048$). In case of F3 the differences between C1 and C2 ($p_{K-W} \approx 0.025$) and between C1 and C7 ($p_{K-W} \approx 0.030$) are amplified (compared with the Tukey criterion) to statistically significant. In case of F2 the differences between C4 and C1 ($p_{K-W} \approx 0.0495$) and between C4 and C7 ($p_{K-W} \approx 0.0167$) increase (compared with the Tukey criterion) to statistically significant.

3.2.3. Economic interpretation of the clustering results

Distribution of industry sectors by clusters is shown in Table 4. The inclusion of the factor F1 leads to the fragmentation of clusters C1-C4 and C7 and increase the number of clusters from 7 in case of F2-F3 factors to 12 in case of F1-F3 factors (Table 4).

Based on the clustering (Figure 5a and b, Table 4) we have received a quality classification of clusters (and their members - IS*OF) in the nominal scale of measurement by factor indicators F2-F3.

1. The value of SP increased in Cluster C6 in both crisis periods.
2. The value of SP grew up in Cluster C2 in 2008-2009, but reduces it in 2014-2015.
3. Clusters C4, C3, C1 demonstrate the falling of SP in 2008-2009, but its growth in 2014-2015. The growth of C1 is significantly higher than the growth of C4, and the falling of C3 was significantly stronger than the falling of C4.
4. The value of SP declined Clusters C5, C7 in both crisis periods and the falling of C5 in 2014-2015, the decline was significantly stronger than the falling of C7.

The study revealed that the nominal values of SP (without adjusting on price index) in 2014-2015 showed significantly better dynamics than in 2008-2009. The strong decline (more than 25%) in 2014-2015 was only in one industry sector (DF JO with the recession more than on 40%), while in 2008-2009 the falling of more than 25% occurred in 6 industry sectors (DM FO, DM JO, DK JO, DJ FO, DJ RO, DG JO), including one of the most important industries - subsection DJ. Similar differences were observed with the increase of SP. In 2014-2015, SP growth in some industry sectors exceeded 30% (CA JO, DG RO), while in 2008-2009, the maximum growth rates were only 12% (DA FO, DL FO).

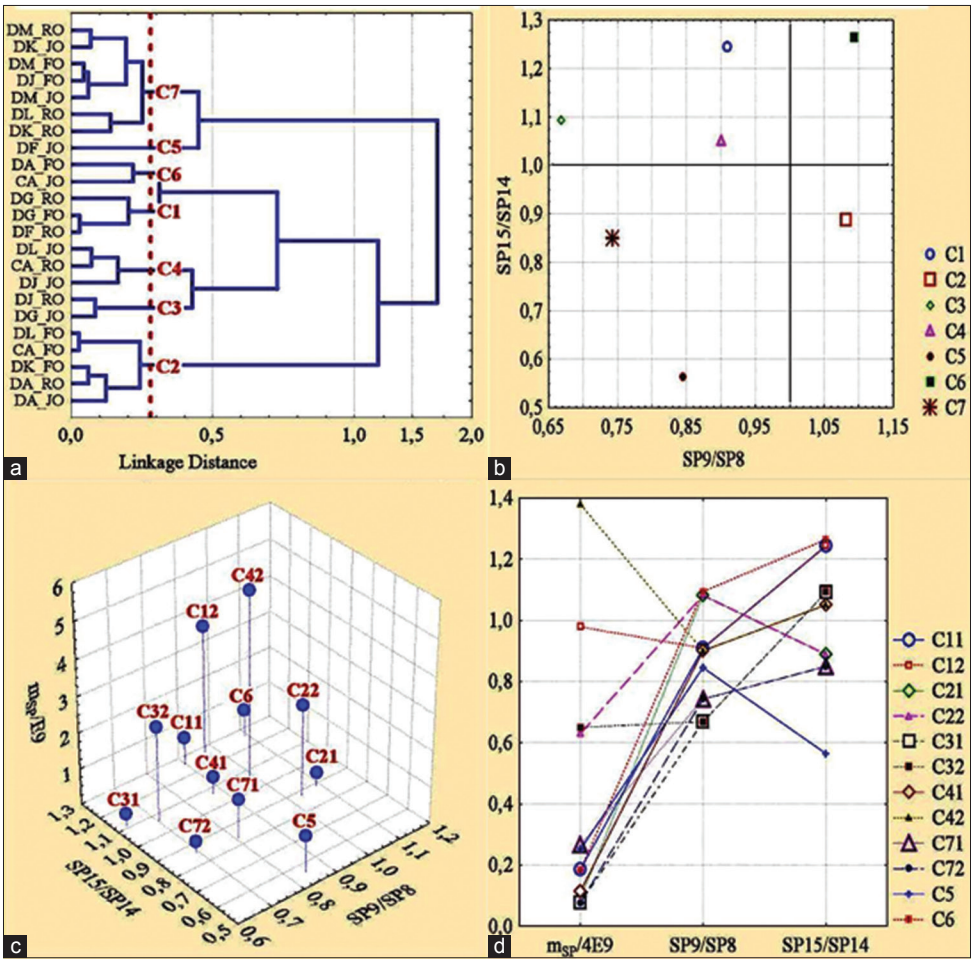
We also define the industry sectors including ownership forms, which negatively react to both crisis periods (sectors, included in the clusters C5 and C7). High-tech and medium-tech machine-building enterprises (DM, DK) of almost all forms of ownership as well as enterprises of DL RO (electronics) were experiencing serious problems in both crisis periods. These industry sectors required state support to overcome the crises.

4. CONCLUSION

Our analysis revealed certain patterns and trends of the main branches of Russian industry in the context of ownership in the 2005-2015 period.

1. Raw materials and low-tech industries (CA, DF, DJ, DA) continue to be the leading industries by the value of SP in Russia. They showed the growth rate at the average level and does not intend to lose its leading position. The main group of high-tech and medium-tech industries with enterprises in RO

Figure 5: Clustering of 23 IS*OF in the factor space (F1, F2, F3). (a) Three diagram of 23 IS*OF for factors F2 and F3, (b) 2D scatterplot of 7 clusters for factors F2 and F3, (c) 3D scatterplot of clusters for factors F1, F2, F3, (d) plot of means for each cluster



(DL, DM, DK, DG) demonstrates only the average growth rates for both periods (2005-2008 and 2009-2014) they cannot close the gap to the leaders.

2. Industry sectors with enterprises in the FO and JO behave differently. Both periods cluster C3 (DM FO) shows advancing growth. Cluster C2 was developed faster in 2005-2008, and cluster C6 - in 2009-2014. However, we found the trend of slowing and unsustainable growth in industry sectors with enterprises in FO and JO (cluster C8) during the period 2009-2014 (among them high-tech and medium-tech industries DL and DK with enterprises in JO).
3. Stable deep recession in the crisis of 2008-2009 and 2014-2015 years responded DM RO, DM FO, DM JO, DL RO, DK RO, DK JO, DJ FO, DF JO.

At the same time in the interpretation of the results we must consider the features and differences between the crises of 2008-2009 and 2014-2015. Differences of these crises lie primarily in inflation in the context of the growth rates of industries (Figure 6). Figure 7 shows the dynamics of the SP in main industries adjusted by price index growth.

Two differences should be noted. In the period before the first crisis (2008) prices have risen strongly (by 129% in the manufacturing industry), but in the crisis year (2009) prices declined (89% in the manufacturing industry). In 2014 prices, by contrast, rose slightly (to 107%), but in 2015 there was a crisis and they grew further rapidly (115%). It seems that the crisis of 2008-2009 was deeper. It was accompanied by a sharp reduction in employment in the industry, the decline in demand and a fall in prices as a reaction of enterprises at these negative factors. The crisis of 2014-2015 was less acute. There was no sharp decline in employment, companies could raise prices for their products and thus offset some of the problems related the growth of the dollar and rise in price of imported raw materials. Value of SP adjusted for price increases are shown in Figure 7. It is indicating the presence of problems in many industries in 2014-2015. But the crisis passed less sharply in nominal values. At the same time, the crisis 2014-2015 did not end in 2015 and continued in the next year. This is the reason why the crisis is so dangerous: Despite the good dynamics of nominal indicators (SP, earnings, payroll, average salary), the value of similar real indicators calculated with respect to price indexes, are comparable to the depth of the fall with those of 2008-2009.

In this paper, we analyzed the nominal "values of SP by pure activity groups" in the context of industry sectors and forms of ownership. The corresponding real indicator cannot be calculated since there are no official statistics data on price increases in the context of industry sectors and forms of ownership. However, the study can draw conclusions about trends in the development

of industry sectors in the context of ownership in stable periods and periods of crisis.

The raw materials and low-tech sectors continues to lead on the volume of SP. Rapid growth in the number of branches with FO and JO enterprises took place in 2005-2012. But has slowed down since 2013.

At the same time, during the period 2009-2014 the slowdown in the development of enterprises in the FO and JO was revealed in some sectors in which they become insignificant and will not contribute to the technology transfer into Russia, in particular the joint firms are not significant in the sections DL and DK. This fact requires adjustment of Innovative Development Strategy of Russia, which was supposed to support this transfer through joint ventures.

The study revealed the industries in the context of ownership, which negatively react to crises and require state support. First, it is machine-building complex and electronics (DM, DL, DK). These industries require state support in crisis situations, which normally accompanied by a decline in oil prices, the growth of the dollar, the decline in effective demand and income. At the same time, the crisis creates conditions for reduction of raw material import and advanced growth of enterprises in the RO in these industries. These circumstances should be considered while the state regulation and stimulation of positive trends in the economy.

Table 4: Distribution of industry sectors by clusters

IS*OF	m_{SP}/E9	F1	F2	F3	SP9/SP8	SP15/SP14	CL7	CL7k
DM_RO	1.34	0.209	−0.532	−0.920	0.770	0.894	C7	71
DM_FO	0.31	−0.731	−0.369	−0.735	0.668	0.859	C7	72
DM_JO	0.49	−0.508	−0.655	−0.979	0.673	0.799	C7	72
DL_RO	1.03	0.031	−0.668	−0.050	0.877	0.855	C7	71
DK_RO	0.80	−0.102	−0.979	−0.694	0.781	0.756	C7	71
DK_JO	0.09	−0.856	−0.006	−0.544	0.724	0.945	C7	72
DJ_FO	0.34	−0.593	−0.412	−0.843	0.707	0.837	C7	72
DA_FO	0.82	−0.191	0.728	1.370	1.120	1.158	C6	6
CA_JO	0.64	−0.411	1.441	1.061	1.067	1.370	C6	6
DF_JO	1.01	0.145	−2.370	−0.109	0.845	0.563	C5	5
DL_JO	0.07	−0.799	0.361	0.387	0.941	1.073	C4	41
DJ_JO	0.83	−0.273	0.427	−0.456	0.813	1.077	C4	41
CA_RO	5.52	3.369	−0.374	0.340	0.948	1.003	C4	42
DJ_RO	2.60	1.128	0.554	−2.554	0.703	1.068	C3	32
DG_JO	0.31	−0.812	0.547	−1.079	0.633	1.117	C3	31
DL_FO	0.12	−0.560	−0.468	1.082	1.118	0.803	C2	21
DK_FO	0.18	−0.621	−0.058	0.765	1.033	0.939	C2	21
DA_RO	2.52	1.280	−1.152	1.333	1.038	0.879	C2	22
DA_JO	0.38	−0.418	0.048	1.171	1.106	0.987	C2	21
CA_FO	0.76	−0.095	−0.721	1.300	1.113	0.831	C2	21
DG_RO	1.24	−0.099	1.673	−0.414	0.842	1.327	C1	11
DG_FO	0.23	−0.750	0.795	0.462	0.956	1.198	C1	11
DF_RO	3.92	1.658	2.190	0.104	0.930	1.209	C1	12

SP: Shipped products

Figure 6: Price growth rates for the products of basic industries (August of the reporting year to August of the previous year)

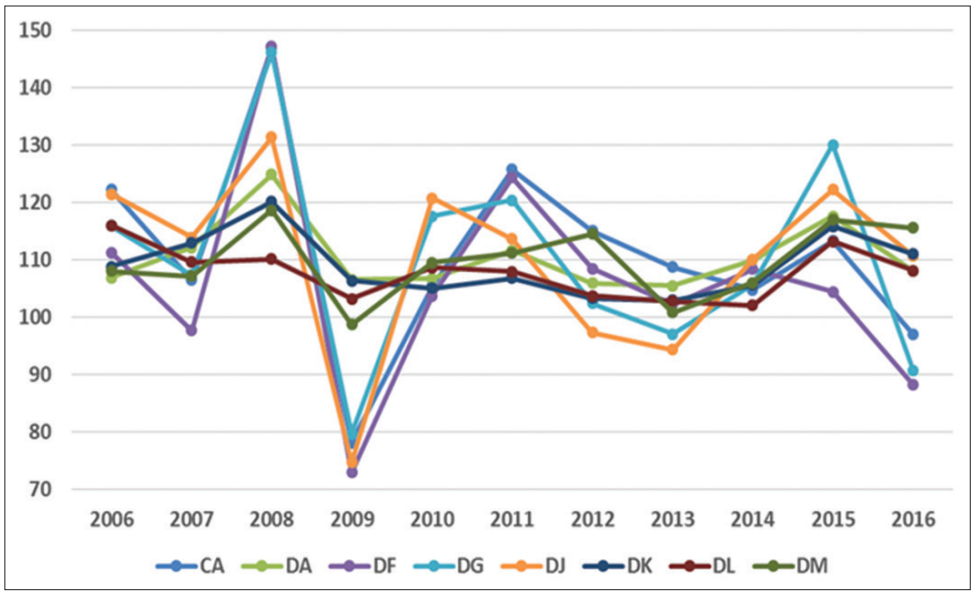
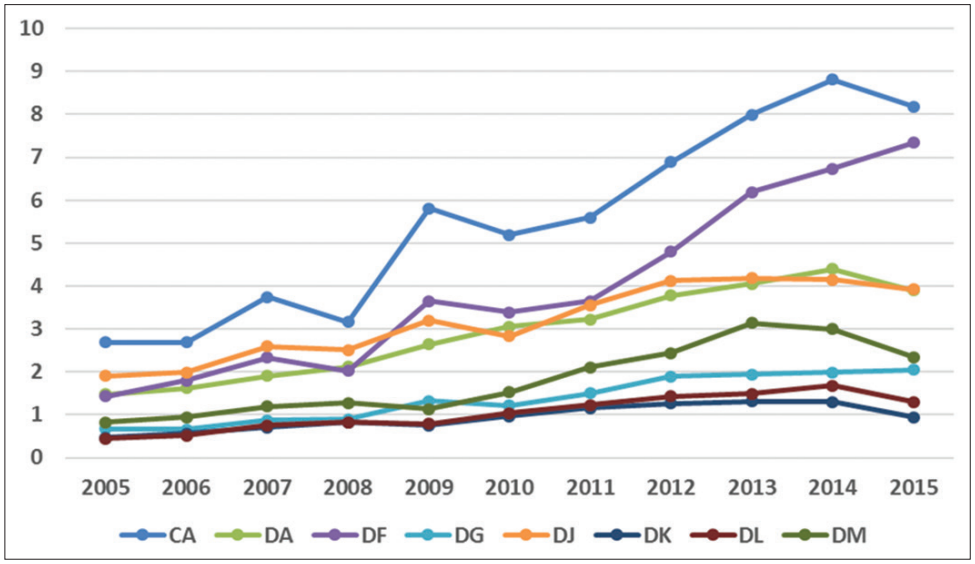


Figure 7: Shipped products in main industries adjusted by price index growth, trillion rubles



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