Development of the mechanical engineering complex on the basis of the improvement of large and small businesses relations

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Abstract. Condition, pace and character of the development of the mechanical engineering complex is in many aspects a crucial factor for the social and economic situation of any country. The development of market relations, changes of the conditions of doing business encourage the enterprises to search new managerial methods and to improve the interaction forms. In this respect the display of the peculiarities of the interaction of large machine engineering enterprises and small business in this sphere and also the assessment of the relationship of their development is an important and crucial issue under modern conditions. The most widely spread forms of the cooperation of large scale mechanical engineering enterprises and small businesses of the industry are: outsourcing, franchising, leasing, subcontracting, venture financing, creation of regional forms of the cooperation of large and small firms. However cooperation processes of large scale and small entrepreneurship in Russia are not properly developed. The authors determine the factors hindering the growth of the machine building industry, suggest the recommendations for the development of the large scale enterprises and small business in the industry, substantiate the role of the government in this process. Besides the mechanism of the state support of the development of small business is described.

1 Introduction

In the modern context the level of the social and economic development of a country in many respects depends on the condition of such an important industrial complex as mechanical engineering and machine manufacturing industry. At different times the problems of the development of machine manufacturing were studied by Borodachev N.A., Dvigubskiy I.A., Dyachenko P.E., Kashirina A.I., Linnik Yu.V., Matalin A.A., Mitrofanov S.P., Sokolovskiy A.P., Teame I.A., Yukhin A.I. and others. At present moment in Russia different levels of government pay attention to the development of the machine engineering complex. In the frame of the current governmental program “Development of the industry and the increase its competitiveness” the largest part of subordinate programs (heavy machine construction, energy machine building, agricultural machine construction, transport machine construction, machine construction on specialized industries and so on) in any way are directed on the development of the machine construction industry. In compliance with this program the main directions of the support and the development of the mechanical engineering complex are the modernization of the capital funds used in the technological process; encouragement of scientific research and developments directed on the creation of new technologies and materials; competitiveness growth and so on. However despite the measures taken by the Russian government more recently the decrease of the index of machine and equipment production [1, p. 43-45], the reduction of the dynamics of the investments into the fixed capital are observed [1, p. 133-134]. The stagnation in this sector of economy encourages the search of new methods and forms of the support and the development of machine manufacturing [2-21].

In the authors’ point of view the reserves of the efficiency growth of the machine engineering complex can be connected with the cooperation of the machine manufacturing firms with relatively smaller enterprises. Such cooperation can be both advantageous for both large scale and small enterprises. In the modern context the level of the development of small entrepreneurship is one of the key indicators characterizing the stability and maturity of a society. In economically developed countries of the world in the structure of the GDP the share of small enterprises exceeds the percent of the large scale enterprises and makes up 70% or more. In our country this index equals only 20%. In this respect the encouragement of the small entrepreneurship, the detection of the interaction of large scale machine construction enterprises and small firms, the

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improvement of their cooperation is especially important and vibrant problem today.

The goal of the research is the study of the peculiarities of the cooperation and the possibilities of the improvement of the interaction of large scale enterprises of machine construction industry and small enterprises.

2 Peculiarities of the cooperation of large scale mechanical construction enterprises and small entrepreneurship

The practical experience of the industrial development in the world confirms the expediency of the cooperation of large scale and small enterprises. Today this process has the fastest tempo in the countries of the East. Large mechanical construction enterprises often place orders of details and components at small enterprises located as a rule not far from the large one. This fact contributes to an increase of sustainability and stability of small business and also allows the large scale machine construction enterprises solving more complicated, serious and responsible problems. As a result the synergetic effect arises. The character and the intensity of the cooperation depends first of all on the industry where the enterprise functions, level of the development and the structure of the regional economy and the country as a whole.

The need of cooperation of small enterprises with large scale businesses depends considerably on the sphere of their activity. The largest share of small firms provides different services. Today in Russia the most widely spread spheres of work of small enterprises are car and consumer equipment repair (39,7 %), gross sales (24,7 %), real estate transactions, rent and services provision (20,4 %), construction (11,0 %), retail sales (10,6 %), manufacturing (9,5 %).

The analysis showed that at the present time the quantity of small enterprises in our country is several times lower than the number of large scale enterprises and this fact contradicts the international practice. This tendency is typical of all the territory of the Russian Federation. The calculated indices of the ratio of small firms to large scale enterprises and also indices of industrial production in the Southern federal district are given in the tables 1, 2.

Under modern economic conditions in Russia often arise situations when small enterprises can provide the load of industrial capacities of large machine construction enterprises. Small firms usually have intellectual property, innovative technologies but do not have necessary equipment and other fixed assets helping make money on the use of the innovations. Such a redistribution of resources allows improving the financial situation of large machine construction enterprises which get the order. But at the same time such a “reverse” interaction can lead to an increase of costs and the appreciation of the production due to singular contracts and refusal from serial production. If in large scale machine engineering enterprises there isn’t well timed technical modernization in long term period, they will lose competitive advantages and even can become bankrupts.

Today the main forms of the cooperation of large scale and small enterprises in Russia are outsourcing, franchising, leasing, sub contracts, venture financing,

| Table 1. Index of ratio of small firms to large scale enterprises in the Southern federal district of Russia. |
|-----------------|-------|-------|-------|-------|--------|
| Index           | 2012  | 2013  | 2014  | 2015  | 2016   |
| The republic of Adygeya | 0,51  | 0,51  | 0,53  | 0,53  | 0,54   |
| The republic of Kalmykiya | 0,12  | 0,18  | 0,20  | 0,25  | 0,33   |
| Krasnodar kray     | 0,40  | 0,44  | 0,44  | 0,46  | 0,48   |
| Astrakhan oblast (region) | 0,51  | 0,50  | 0,53  | 0,55  | 0,56   |
| Volgograd oblast (region) | 0,51  | 0,51  | 0,52  | 0,52  | 0,52   |
| Rostov oblast (region) | 0,64  | 0,62  | 0,61  | 0,59  | 0,57   |

| Table 2. Index of machine manufacturing in the Southern federal district of Russia. |
|-----------------|-------|-------|-------|-------|--------|
| Index           | 2012  | 2013  | 2014  | 2015  | 2016   |
| The republic of Adygeya | 108,4 | 100,2 | 121,5 | 103,8 | 111,7  |
| The republic of Kalmykiya | 99,8  | 116,9 | 85,0  | 109,1 | 102,5  |
| Krasnodar kray     | 107,6 | 102,6 | 105,3 | 102,5 | 104,3  |
| Astrakhan oblast (region) | 109,4 | 103,0 | 92,6  | 100,3 | 98,6   |
| Volgograd oblast (region) | 106,8 | 101,7 | 104,5 | 102,2 | 103,3  |
| Rostov oblast (region) | 110,5 | 106,8 | 106,1 | 161,4 | 113,6  |
creation of regional forms of cooperation of large scale and small enterprises. An efficient implementation of the forms of the interaction of enterprises mentioned above is possible only at an active participation from the part of the state as a regulator providing the creation of necessary institutional conditions.

### 3 Assessment of cooperation of large scale enterprises and small business (using the statistics of the Southern federal district of Russia)

The condition of large scale and small enterprises at the level of a region can be assessed on the basis of qualitative and quantitative criteria. The authors supposed that there exists the interaction of the condition of large scale enterprises and small businesses. The correlation and regression analysis was used for the calculation of this relation. At the same time the condition of the industry of the Southern federal district for ten years (2006–2015) was studied. The analysis of the following indices characterizing the small entrepreneurship were taken:

- quantity of small firms per 1000 of working age population;
- turnover of small firms per 1000 of regional inhabitants;
- share of the working population at small firms in the total number of the employed population of a region and others.

In order to assess the condition of large scale industrial business the following parameters were used:

- volume of industrial production per 1000 of regional population;
- number of on going large scale industrial enterprises per 1000 of working age population;
- volume of investments into the fixed capital per 1000 inhabitants of a region;
- share of population working at large industrial enterprises in the total number of employed population of a region and so on.

In the result of the analysis the correlation between various indices was established. It was determined that the largest correlation is observed between the volume of industrial production per 1000 inhabitants of a region and the quantity of objects of small entrepreneurship per 1000 of working age population. The results of the correlation and regression analysis of these indices are presented in the table 3.

Thus, between the indices characterizing the large scale and small business there exists a correlation that can be ranged from an obvious one to a strong one. The authors suppose that a very strong relation between the indices in the Adygeya republic is explained first of all by a large number of small enterprises in the sphere of services and client treatment that assure the needs of large scale business. The reason for a weak correlation in some regions (Krasnodar kray, Astrakhan region) is the structure of regional economy, big share of small enterprises working independently and which are self sufficient and which do not need active cooperation with large scale business at the modern stage of their development.

### Table 3. Assessment of proximity of the relation of indices of large scale enterprises and small business in the Southern federal district of Russia.

<table>
<thead>
<tr>
<th>Index</th>
<th>Coefficient of correlation</th>
<th>Regression equation</th>
<th>Standard error of regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern federal district of Russia</td>
<td>0,97</td>
<td>$y = 0.02x + 98095$</td>
<td>2637,52</td>
</tr>
<tr>
<td>The republic of Adygeya</td>
<td>0,95</td>
<td>$y = 0.01x + 2846$</td>
<td>56,98</td>
</tr>
<tr>
<td>The republic of Kalmykiya</td>
<td>0,63</td>
<td>$y = -0.03x + 2097$</td>
<td>336,38</td>
</tr>
<tr>
<td>Krasnodar kray</td>
<td>0,43</td>
<td>$y = 0.003x + 2097$</td>
<td>2220,14</td>
</tr>
<tr>
<td>Astrakhan oblast (region)</td>
<td>-0,23</td>
<td>$y = -0.002x + 9494$</td>
<td>460,53</td>
</tr>
<tr>
<td>Volgograd oblast (region)</td>
<td>0,52</td>
<td>$y = 0.01x + 21872$</td>
<td>1373,35</td>
</tr>
<tr>
<td>Rostov oblast (region)</td>
<td>0,82</td>
<td>$y = 0.07x - 1364$</td>
<td>6278,31</td>
</tr>
</tbody>
</table>

For a qualitative assessment of the correlation proximity the Cheddock scale was used. The systematic estimation of the coefficient of paired correlation by means of the comparison of its absolute value with a critical index at the importance level $\alpha$ corresponds to 0,05, degree of freedom $f$, equal to 8. If $r_{pocc} \geq r_{krit}$ so with the given degree of possibility (95%) it can be said that between the analyzed numerous aggregates there exists a linear relation. The importance of the coefficient of paired correlation was also studied on the basis the Student’s t-test for a large volume of selection.

### 4 Foundations of the development of large scale enterprises and small business

The analysis of the scientific literature and materials presented in the mass media allowed showing factors limiting the growth of machine construction industry in Russia and the development of the cooperation between the large scale and small enterprises showed the following:

- insufficient demand for the production of the enterprises in the domestic market;
- insufficient demand for the production of the enterprises in the foreign market;
- competitive imports;
- high taxation level;
- wear and absence of equipment;
- uncertainty of the economic situation;
- high interest rates for commercial credit;
- insufficiency of finance;
- insufficiency of qualified workers;
The analysis made showed that the biggest problems in the modern context are connected with a high level of taxation (54%), insufficient demand for the production of an enterprise in the domestic market (53%) and the uncertainty of the economic situation (39%).

Under such conditions it is important to implement the governmental support of industrial enterprises and especially of small firms. When the authorities are inert the stagnation can make serious problems for the economy. The governmental support of small enterprises has a serious importance for the development of the interaction of large scale enterprises and small business. The program of the development of the small entrepreneurship is expected to set goals, tasks and ways of their achievement, basic indices, to foresee a complex state support of the given sector of the economy. The mechanism of the state support of small entrepreneurship is shown in figure 1.

It is worth mentioning that in the present context large scale machine construction industry is becoming more and more automated and less labour intensive what leads to the release of people. They need to have the opportunity of doing the business that gives profit. Unfortunately the culture of individual entrepreneurship is not developed considerably and its increase allows forming a civilized cooperation of large scale enterprises and small business and allows augmenting considerably the resource potential of a country.

5 Conclusion

The contemporary cooperation of large scale machine construction enterprises and small business has its peculiarities and problems. Most often the cooperation is realized in the form of an outsourcing, franchising, leasing, sub contracting, venture financing and others. There exists a stable relation between the condition of large scale enterprises and small business.

For the intensification of the production of Russia the state is expected to implement a reasonable and efficient support of large scale enterprises and small firms. A special attention should be paid to the mechanism of the state support of the small business including the organizational, financial, informational and consulting components.
In the authors’ opinion the development of the cooperation between large scale enterprises and small firms is especially important under modern economic conditions as it provides absolutely new level for the use of resources based on the efficiency and thrift.

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