

The importance of innovations and their impact on labor productivity in small and medium enterprises of Kazakhstan - in the framework of the industrialization

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Abstract – The article considers the results of the econometric analysis, creating models and evaluation identified positive effects for innovation, investment, property asset and research and development (R & d) productivity of small and medium enterprises in regions of Kazakhstan for 2014-2016 carried out the economic analysis. The most important feature of a new type of industrialization, unlike a number of other concepts, is that, recognizing the importance of the industrial factor in the economy, orients the country's economy on the innovative development of high-tech renewal and the highest level of efficiency. To increase the productivity of the company, one first needs to determine the role of innovation strategy, then consider ways of introducing it into the enterprise. Based on this, it is proposed to improve the innovation policy in Kazakhstan, get acquainted with the practice of implementing innovation in foreign countries and its realization. In conclusion, in order to increase the level of innovation activity of enterprises, the innovative activity of the enterprise should be aimed at expanding the production of new or significantly improved products, be competitive in the market through the use of new technologies and the production of high-quality products.

Keywords: *innovation, new industrialization, productivity, capital, R&D, investment, small and medium-sized enterprises*

I. INTRODUCTION

In developed countries, innovation plays the special role in increasing the productivity of an enterprise. First of all, the development of the economy of any country, the increase of spiritual and material wealth of the people are connected with the innovative development of science, education and the production of that country. In this regard, within the framework of the new industrialization, the priority task of the

state should be the creation of an innovatively active and modern industry in Kazakhstan. It will provide real demand for innovation and will become the basis for the innovative development of the economy. The new industrialization means not only the replacement of the obsolete and fixed assets in traditional industries, but also the construction of new industries with high labor productivity and high added value based on the modern technologies that are competitive in the world market. It is necessary, first of all, to ensure the implementation of technological and organizational and managerial innovations that have proven effective in other countries, which will take our economy to a new level.

In Kazakhstan, to increase the productivity of an enterprise, it is necessary to determine the role of the innovation strategy and then consider ways of introducing it into the enterprise.

After looking at the innovative potential of Kazakhstan, we came to the conclusion that the use of advanced, new technologies by scientists and engineers in production, as well as patents, university and business ties, the introduction of improved technologies in production, the conduct of research work in small and medium-sized enterprises in Kazakhstan correspond to the goals [1].

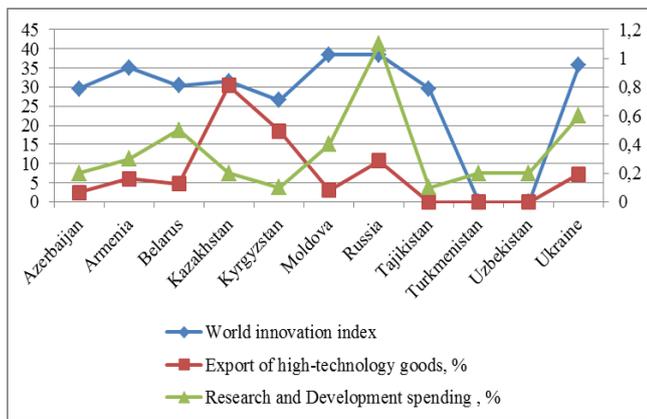


Fig. 1 – Schedule of innovation activity indicators of the countries of independent states (CIS) in 2017

As can be seen from Figure 1 - 2017, from the schedule of innovation performance indicators of the CIS countries, Russia showed 38.5% on the results of world innovation indices, Kazakhstan got 30.4% on exports of high-tech goods, Russia spends on Research and Development (R&D) 1.1%, and it is very high results [2]. But according to the results of innovation, it is obvious that it is much lower than in the leading countries. Therefore, for the CIS countries, it is proposed to improve innovation policy, familiarize with the practice of innovation in foreign countries and its implementation.

The study of influence and interrelation of innovation and enterprise productivity over the past few years has been one of the most important problems of foreign scientists' research. Despite the fact that many empirical studies have been carried out in connection with this problem, they have not paid much attention to measuring the impact of innovation on productivity in small and medium-sized enterprises. In Kazakhstan, too, the problems of interconnection of innovation and enterprise productivity in small and medium-sized enterprises, and measurement of their interrelationships are not given special attention.

Between small and medium-sized enterprises, R&D, technology and innovation (productive and process), there is a mutual influence (Hoffman et al., 1998), that is, it was already proposed in the late 90's and is still being investigated [3].

For enterprises (firms) in the processing industry (for example, food or textile), the result of innovative products is particularly important [4]. The results of the company's research and the intensity of R&D showed that investment in equipment increases the productivity and innovation implementation process. These innovations have a positive effect on the performance of the company as a whole [5]. It has also been determined that innovation has a significant impact on enterprise productivity [6].

For politics, one of the most important criteria for supporting innovation is the involvement of the largest companies in various sectors of the economy, through the creation of scientific centers and institutions that can provide assistance to developing companies [7].

For enterprises (firms) in the processing industry (for example, food or textile), the result of innovative products is particularly important (Mairesse, Mohnen, Kremp, 2005). Therefore, an increase in productivity is suggested after the release of new products. A comprehensive assessment model was developed and presented by Shyman (Sustainable Hydrothermal Manufacturing of Nanomaterials), which studied and introduced new technologies in the production and application of nanomaterials. The experience gained in this research is easily applicable to other cases of cost analysis related to innovation [8].

However, some facts point out that innovative SMEs (Small and Medium Enterprises) are not considered as risky investments in the portfolio of banks in the countries of the Visegrad Group (the Czech Republic, the Slovak Republic, Hungary and Poland), seeking external funding through R & D and innovation [9].

Theoretical and methodological foundations of the research are reviews of the literature on the problem of studying the works of Kazakhstan and foreign scientists and economists. The article uses modern analytical methods of research, including econometric methods, the methods of generalization and comparison, and comparison of the obtained results.

Definition and study of the probability of influence of innovation (productive or process, organizational, marketing) on the productivity of small and medium-sized enterprises in Kazakhstan is the hypothesis of this research work.

II. RESULTS AND DISCUSSION

The main part of the research

Many works devoted to the measurement of innovation are based on questionnaires. In innovative questionnaires, the measurement of innovation is usually carried out in two ways: the first one is based what kind of innovation the enterprise has introduced over the last 3 years (productive, process, organizational, marketing). The second way is based on the share of an innovative product in the market calculated through the definition of the volume of sales of products. Many authors believe that measuring the second way is the better solution, as it specifically shows the importance of innovation for the enterprise [10]. The quantitative analysis of the influence of an innovative trend in the firm on reducing costs has been carried out [11]. The main work in this direction passes through several periods. In the first period, the production function of Kobb-Douglas is applied to the basic model. The productivity of enterprises is measured through the production function of Cobb-Douglas production function, that is, the dependence of volume of production (Q) on the components of its production factors, labor force (L) and capital (C):

$$Q=AL^{\alpha}C^{\beta} \quad (1)$$

where A is an indicator of overall productivity. If $\alpha+\beta=1$, then the recurrence is constant; if $\alpha+\beta>1$, then the

recurrence is extended; if $\alpha+\beta < 1$, then the recurrence is regressive.

The model of the second period considers the relationship between the production function and innovation:

$$\text{Innovation}_i = 1 [\text{Innovation}_i^* > 0]$$

$$\text{where } \text{Innovation}_i^* = x_{i1}\alpha_1 + \beta R\&D_i^* + \varepsilon_{i1} \quad (2)$$

where $R\&D_i$ is the intensity of R&D in innovation, $PROD_i$ and $PROCi$ - innovation (productive and process), ε - model error.

The equation of productivity is determined by the following formula:

$$\text{Productivity}_i = x_{i2}\beta_2 + \xi \text{Innovation}_i^* + \varepsilon_{i2} \quad (3)$$

where y_i – productivity, ξ – coefficient of innovation affecting productivity.

The importance of models consists in obtaining conclusions and assessments based on econometric models related to innovation trends and profitability.

The results of the research

The set of data the authors used for the analysis was obtained from the official website of the Agency for Statistics of the Republic of Kazakhstan. In particular, in the analysis used the main indicators that influence the innovative activity of enterprises in the regions of Kazakhstan during 2014-2016 years. The method used to collect information is based on statistics, and the data source is the annual reports of enterprises, which are used to create an econometric model. At small and medium-sized enterprises in Kazakhstan, the authors performed correlation-regression analysis to determine the probability of innovation impact on the enterprise's productivity (Table 1). The simulation was carried out using the Gretl program [12].

The results of the simulation are given in the table below (Table 1).

TABLE I. MODEL SUMMARY TABLE

#	Type of model	R ²	Se
1	$Y_{m1} = 34,55 + 0,0003X1 + 0,0001X2 - 7,369 X3 + \varepsilon$	0,07	18,2
2	$Y_{m2} = 34,57 + 0,0001X1 + \varepsilon$	0,03	18,4

In general, as it can be seen from Table 1, the capital and investment has a positive impact of the productivity of the enterprise, while the internal costs of doing research and development (R & D) are negative, ($R = 0.26$).

$$Y_{m1} = 34,55 + 0,0003X1 + 0,0001X2 - 7,369 X3 + \varepsilon \quad (4)$$

where ε is the model error.

If one considers a probability of 95%, then an increase in one unit of capital and investment means an increase in productivity of SMEs, on average, by one unit, and lowering R & D internal expenditures.

In (1) of the model $R^2 = 0.07$, one can see that the enterprise's productivity is 7% associated with the enterprise's fixed capital and investments, internal R&D expenditures, and the rest - on the shares of unaccounted factors. According to the Fisher criterion, $F=21,9 > F_{табл}=2,81$, this means that the factor randomness hypothesis is not accepted. The White test $LM=9.93$ $p\text{-value} = P(\text{Chi-square}(14) > 9.93) = 0.77$ indicates the absence of heteroscedasticity, and the Ramsey test ($RESET$ $p\text{-value} = P(F(2, 41) > 0.33) = 0.73$) shows that equation (1) is adequate.

$$Y_{m2} = 34,57 + 0,0001X1 + \varepsilon \quad (5)$$

In the second model $R^2 = 0.03$, one can see that the enterprise's productivity is 3% associated with the enterprise's fixed capital, and the remaining 97% are related to other factors. According to the Fisher criterion, $F=11,41 > F_{табл}=2,81$, this means that the factor randomness hypothesis is not accepted. The White test $LM=8,32$ $p\text{-value} = P(\text{Chi-square}(9) > 8,32) = 0,50$ indicates the absence of heteroscedasticity, and the Ramsey test ($RESET$ $P(F(2, 42) > 0,40) = 0,67$) shows that equation (2) is adequate [13].

Based on the results of the econometric analysis, the authors can say that among the models, the most statistically significant is the first model.

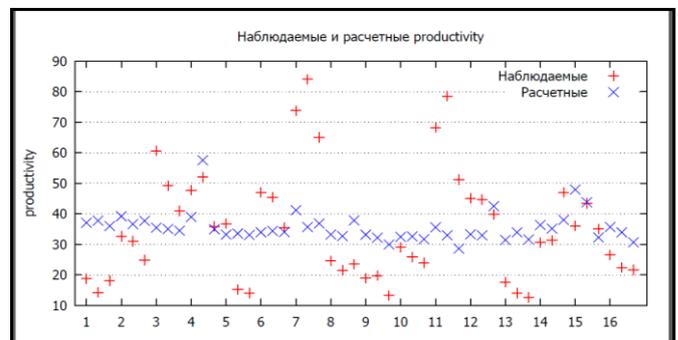


Fig. 2 - Graphs of observed and calculated values of enterprise performance

It can be seen from Figure 2 that from the observed and calculated values calculated by the equations of predicted values of enterprise productivity, the predicted values of recent years have greatly increased.

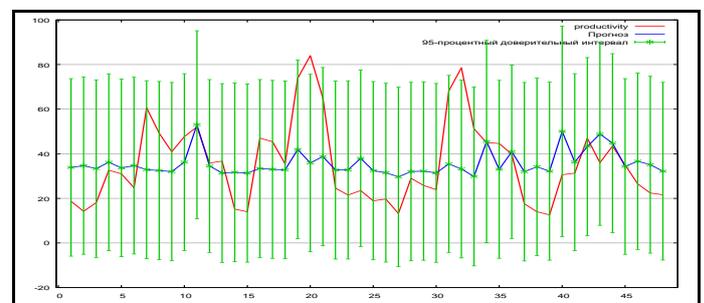


Fig. 3 - Graphs of predicted enterprise productivity values

It can be seen from Figure 3 that from the predicted values calculated by the equations of predicted values of

enterprise productivity, the predicted values of recent years have greatly increased. The regression model derived from this can be used in the future in economic processes for analysis and forecasting.

According to the results of the research and econometric analysis, it is possible to notice, that innovations have a positive influence on the productivity of small and medium-sized enterprises in the regions of Kazakhstan, for a period of time (2014-2016). That is, enterprises increase productivity by raising subsidies, attracting investments, conducting R&D, applying new technologies, producing high-quality new or improved products. Investments allow providing the production with new devices and technological innovations.

III. CONCLUSION

In the article, based on the results of the assessment of models, positive influences and significance of innovation, R & D, capital and investments on the productivity of small and medium-sized enterprises in the regions of Kazakhstan over recent years were determined. Thus, in the implementation of innovative programs in Kazakhstan, the level of innovative activity of domestic enterprises has had a particular influence of its own.

The development of innovative processes, especially the organizational and economic aspects of the conditions of state support in the development of innovation shows that it is necessary to conduct research on the development and formation of a national innovation system and innovative infrastructure. Having considered the innovative potential of Kazakhstan, we came to the conclusion that the implementation of innovative programs, in other words, consideration of the state of innovation development, also the circumstances and opportunities for implementing innovative projects in the regions are corresponding to planned targets.

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