

# Evolution of the Venture Investment Market in the Information Economy of Russia



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**Abstract** The urgency of the issue under research is determined by the key role of innovations in the development of the modern Russian economy, especially in the context of import substitution and the development of digital technologies. In the scientific literature, there is a certain lack of research on a comprehensive statistical description of the venture investment market in the Russian Federation. The objective of this contribution is to study the venture investment market in the economy of the Russian Federation. Hypothesis is changing innovation and invention activity in the information economy is directly correlated with the business activity in the venture capital market (VC funds). The leading method to the study of this issue is statistical, which allows performing a comparative analysis to identify factors that influence the business activity on the venture investment market of the Russian Federation. The database is a time series of Rosstat statistical indicators and the Ministry of Economic Development of the Russian Federation for 2008–2016. The tendencies of the venture capital market in Russia were reflected in the crisis of 2014–2015. The volumetric performance VC funds began to decline after a previous successful period, with both the total volume of venture capital investments, and their average size. In the structure of the innovation activity of the Russian economy, technological innovations predominate, although their share is gradually declining since 2012. The previous trend toward the development of environmental innovations gave a way to organizational innovations.

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The indicator called “coefficient of the invention activity” in our country is very stable over time; however, the situation is negative when compared with the major world powers. In general, the hypothesis of the relationship between the change in the innovation and invention activity in the economy and the business activity in the venture capital market was confirmed. The materials of this work can be useful for government bodies when developing programs for regulating the economy and developing a national development strategy.

## **1 Introduction**

### ***1.1 Introduce the Problem***

Scientific and technological progress makes states pursue an active innovation policy, as without it the probability of a scientific and technical backlog sharply increases. There is a risk that the country will become an outsider in the military sphere, the field of information and communication technologies, mechanical engineering, and also in the sphere of consumer goods for technical purposes.

However, any innovation is born not from scratch. It is preceded by scientific developments, bold technical solutions, patents, risky projects, and this activity requires certain financial costs, with no guarantee of return. This is the sphere of venture business and corresponding venture investments. Not every third-party investor is willing to risk his capital, which means that an important role in this sphere belongs to the state.

In the Russian Federation, there is an understanding of the importance of this task at the state level. The result was the development of the state program “Economic Development and Innovation Economy” (2014). Its structure includes priority projects in the areas of strategic development, which include the project “Small Business and Support for an Individual Business Initiative,” as well as a number of subprograms, in particular, “investment climate,” “development of small and medium enterprises,” “stimulation of innovations,” “creation and development of the innovation center Skolkovo,” and others.

The objective of the study is a statistical study of the venture and innovative activity. The object of the study is the Russian Federation. The subject of the study is a quantitative description of venture and innovation activity indicators.

### ***1.2 Literature Review***

Venture investments traditionally occupy a special place in economic science. However, the questions of quantitative and statistical evaluation of this economic branch (including in the Russian Federation) were considered by a limited number of scientists.

From the point of view of the theoretical study of venture investment issues, we note the works of Berger and Udell (1998), Gompers et al. (2008).

The issues of development prospects for the innovation activity in certain economic spheres were researched in the works of Yangirova (2015), Baranov and Muzyko (2015), Egorova and Pokholkov (2015), and other scientists. The subjects of their research became such economic branches as pharmaceuticals, agro-industrial complex, construction, education, medicine, and a number of others.

Regional and country aspects of the innovative development have been the subject of research by such authors as Dezhkina (2009), Kinnear and Ogden (2014), Šoltés and Gavurová (2014), Nikitin and Yuan (2015), Pece et al. (2015), and others. The most interesting is the innovative development in countries that have been following the socialist way of development for a long time, following the planned methods of the economy—the People's Republic of China, Poland, Slovakia, and others, as well as the countries of the “second echelon”—India, Australia, Canada, and others.

In the scientific literature, the issues of financing innovations, including from the positions of quantitative analysis, have received sufficient coverage. We can single out the works of Maslov (2015), Domnina et al. (2016), Chirkunova et al. (2016), Kosyakova et al. (2016), and other researchers. The research of venture capital investments in Russia can be found in works of Berkowitz and DeJong (2002), Glebova and Kotenkova (2014), Fazekas and Becsky-Nagy (2015), Nazarova (2016).

From the point of view of applying statistical methods, we can mention the works of Love et al. (2014), in which the authors applied the methodology of tobit and probit modeling in the study of dynamic interdependencies in innovation strategies; Glebova and Kotenkova (2014), where the authors proposed a methodology for calculating multidimensional estimation of the regional innovation potential; Vértesy (2014), who comprehensively analyzed the dynamics and structure of innovation in the aviation industry.

Another important subject of research was the venture capital and venture capital market. In this area, we note the works of Savaneviciene et al. (2015), Teker et al. (2016), and others. The relationship between the innovation and knowledge economy is shown in the work of Mehta et al. (2014).

In our opinion, there is a certain lack of research on a comprehensive statistical description of the venture investment market in the Russian Federation. This study is to partially eliminate this gap. Interest in this topic stimulates the deepening of the subject of research and the expansion of statistical methods.

## 2 Materials and Methods

The methodological basis of the study combines methods of trend, structural (vertical) and dynamic (horizontal) analysis, graphical, tabular, and other general scientific methods.

The study is based on official statistics. Their sources are the Unified Interdepartmental Information and Statistical System (EMISS), the Federal State Statistics Service (Rosstat), and the Ministry of Economic Development of the Russian Federation. Some of the data are drawn from Internet sources (for example, from ratings of independent agencies). The time series of the study is the period from 2008 to 2016.

To estimate structural shifts in the dynamics, the Ryabtsev index was calculated by the formula:

$$IR = \sqrt{\frac{\sum (d2 - d1)^2}{\sum (d2 + d1)^2}},$$

where  $d1$ —the fraction of the side of the population in the base period;  $d2$ —the fraction of the side of the population in the current period.

### 3 Results

The general background of the venture investment market is determined by the innovation activity of the economy. It is characterized by the activity of business entities to invest in new projects. If such activity is low, then it is less likely that investors will be interested in this market.

For a more accurate quantitative estimation of the innovation market, we will draw on the state statistics that Rosstat provides us. As key indicators, we select statistical indicators—“innovation activity of organizations” and “coefficient of the invention activity”.

The innovation activity is calculated as the share of organizations that carried out marketing, technological, and other innovations in the total number of organizations surveyed.

According to Table 1, the peak of the innovation activity of Russian organizations was in 2011–2012, when on average every tenth enterprise invested in innovations of various types. In general, until 2015, this figure did not undergo significant fluctuations in dynamics, which, given the sampling error, does not allow making reliable conclusions about the tendency to increase or decrease.

At the same time, according to data for 2016, we can already talk about the current trend toward a decrease in the innovation activity. And it happens on all structural elements of innovation. In the field of ecology, there is a situation when no business entity has reported on relevant innovations.

In Russia, a non-standard situation has developed—the sphere of IT technologies, which had to be at the forefront of the venture economy and technological progress, is considerably inferior to average Russian indicators of the innovation activity of organizations. This means that there are sectors of the economy in which the level of activity is higher. Such branch is, in particular, “extraction of minerals;

**Table 1** Dynamics of the innovation activity of organizations in the Russian Federation

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016
Innovation activity of organizations (%)	9.4	9.3	9.5	10.4	10.3	10.1	9.9	9.3	8.4
<i>Including</i>									
Organizational innovation	No data	No data	3.2	3.3	3.0	2.9	2.8	2.7	2.4
Marketing innovation	No data	No data	2.2	2.3	1.9	1.9	1.7	1.8	1.4
Environmental innovation	No data	No data	4.7	5.7	2.7	1.5	1.6	1.6	...
Technological innovation	No data	No data	7.9	8.9	9.1	8.9	8.8	8.3	7.3

Source Rosstat. Science and innovation. URL: [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/science\\_and\\_innovations/science/#](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/science_and_innovations/science/#). Accessed 24 April, 2018

manufacturing industries; production and distribution of electricity, gas, and water.” In it, the level of the innovation activity of organizations in the period under study exceeds 10% and in some years 11%.

At the same time, on the total costs for new technologies, the IT sphere confirms its right to be a leader in the venture market. If in 2010 it accounted for only 12.7% of the total costs for the country, then in 2011 there was a sharp jump—the share increased to 36.0%. This level is maintained even now, although the impact of the crisis in recent years is very tangible.

In addition, the IT sphere is still being kept afloat, annually increasing the volume of innovation costs. This has not been achieved in most other industries, including in the sphere of extractive and processing industries.

In the structure of the innovation activity, technological innovations predominate, although their share is gradually declining since 2012. The previous trend toward the development of environmental innovations gave way to organizational innovations. Note that the amount of shares does not lead to a total number of innovation-active organizations, since each surveyed enterprise can implement several types of innovations.

It makes sense to conduct research on the venture market when a large number of start-ups are supported by the corresponding invention activity of the population (Table 2). Let us consider the statistical indicator “factor of invention activity,” which is calculated by Rosstat as the number of domestic patent applications for inventions filed in Russia, counting on 10,000 people.

This indicator in our country is highly stable in dynamics, but when compared with the leading world powers, the situation turns out to be negative. Thus, according to the WIPI in 2010 and the coefficient of the invention activity

**Table 2** Dynamics of the coefficient of the invention activity in the Russian Federation

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016
Coefficient of the invention activity	1.95	1.8	2.01	1.85	2.00	2.00	1.65	2.00	1.83
Rates of growth (% to the previous year)	–	–7.7	11.7	–8.0	8.1	0.0	–17.5	21.2	–8.5
Rates of growth (% to 2008)	–	–7.7	3.1	–5.1	2.6	2.6	–15.4	2.6	–6.2

Source Rosstat. Science and innovation. URL: [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/science\\_and\\_innovations/science/#](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/science_and_innovations/science/#). Accessed 24 April, 2018

**Table 3** Dynamics of volumetric performance indicators of VC funds in the Russian Federation

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Amount of VC funds, mln. dollars (at the beginning of the year)	2474	2623	2898	3449	3721	4635	4361	3849	3637	3837
Number of VC funds (at the beginning of the year)	104	108	114	116	137	166	177	185	181	187
Amount of VC-investments, mln. dollars	162	124	153	272	376	285	150	150	125	...
Number of VC-investments	67	48	81	105	138	188	229	190	202	...

Source Analytical collections of RAWI (2004–2017). URL: <http://www.rvca.ru/rus/resource/library/rvca-yearbook/>. Accessed 24 April, 2018

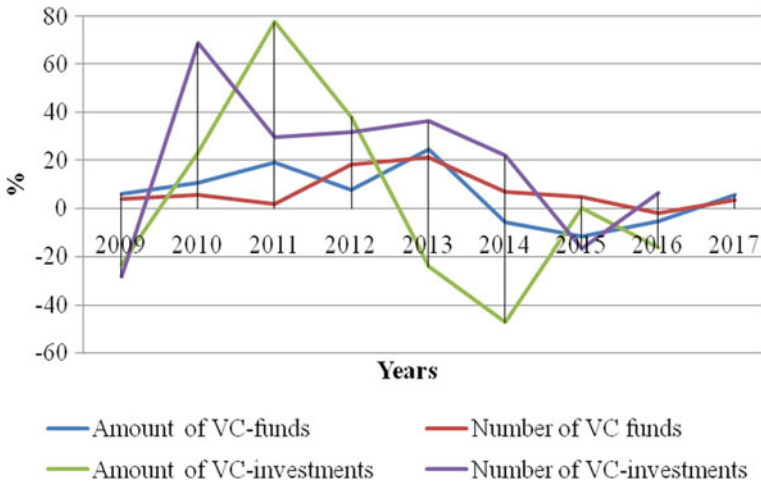
(the number of international patent applications filed), Germany is the leader, which exceeds Russia by almost 50 times, and then, the USA come—they exceed Russia by more than 30 times and China by 2 times.

The authors' hypothesis is the following: The change in the innovation and invention activity in the economy correlates with the business activity in the market of venture funds (VC funds).

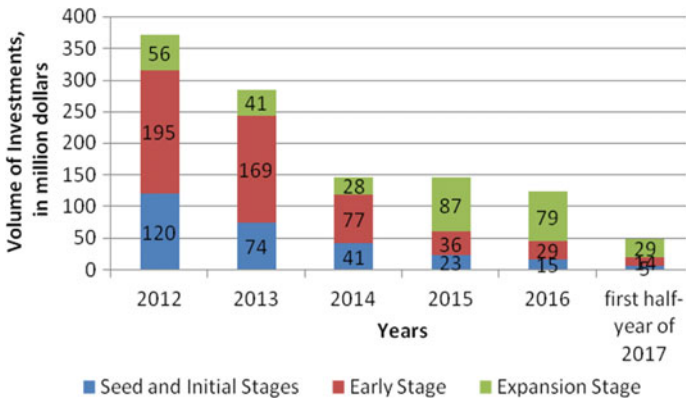
Table 3 shows the dynamics of volumetric performance indicators of VC funds in Russia for the period from 2008 to 2016. The starting point here is the year of the past financial crisis.

The booming of the VC Fund's activity was in a fairly prosperous period of 2010–2013. This is well illustrated by the chain (annual) rate of growth (Fig. 1). After 2013, a short-term decline in all volumetric indicators began. Statistics for 2016–2017 years gives hope for the emergence of the increasing trend.

The structure of the investment amount of VC funds in Russia is very heterogeneous in dynamics (Fig. 2). This heterogeneity is most noticeable in comparing



**Fig. 1** Annual growth in the performance of VC funds in the Russian Federation. *Source* «Additional data to the Survey of the Direct and Venture Investment Market in Russia for the First Half of 2017»/ <http://www.rvca.ru/upload/files/lib/RVCA-yearbook-I-2017-Russian-PE-and-VC-market-review-ru.pdf>. Accessed 24 April, 2018



**Fig. 2** Distribution of the investment amount of VC funds in the Russian Federation in 2012–2017. *Source* «Additional data to the Survey of the Direct and Venture Investment Market in Russia for the First Half of 2017»/ <http://www.rvca.ru/upload/files/lib/RVCA-yearbook-I-2017-Russian-PE-and-VC-market-review-ru.pdf>. Accessed 24 April, 2018

the structure of 2017 (first half) with data for 2012–2014. The values of the Ryabtsev index were more than 0.47, which indicates a significant level of structural differences. In 2015, the structure took the form that we see in later periods (the Ryabtsev index was about 0.05—this is a very low level of structural differences).

**Table 4** Dynamics of the average amount of investments of VC funds in the Russian Federation

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016
Average amount of investments, mln. dollars	2.418	2.583	1.889	2.590	2.725	1.516	0.655	0.789	0.619
Rates of growth (% to the previous year)	–	6.8	–26.9	37.1	5.2	–44.4	–56.8	20.5	–21.6
Rates of growth (% to 2008)	–	6.8	–21.9	7.1	12.7	–37.3	–72.9	–67.3	–74.4

Source «Additional data to the Survey of the Direct and Venture Investment Market in Russia for the First Half of 2017» <http://www.rvca.ru/upload/files/lib/RVCA-yearbook-I-2017-Russian-PE-and-VC-market-review-ru.pdf>. Accessed 24 April, 2018

Changes in the structure affected all types of investments. We note a decrease in features of all venture investments in the seed (seed) and initial (start-up) stages. In 2012, the share of this type of investment reached almost one-third—32.4%, and in 2017 dropped to 10.5%. Also, investments in projects at the early stage (early) decreased significantly, from 52.5 to 29.1%. On the contrary, venture investors have become much more involved in projects during the expansion stage for these 5 years. In 2012, their share was very small—only 15.1%, but already in the current year, it reached 60.4%.

However, a more accurate performance indicator of participants in the venture investment market is the “average amount of investments” (Table 4). Its value for the decade ranged from 2.725 million dollars in 2012 to a minimum of 0.619 in 2016. The decrease was 74.4% by 2008.

As a result of the decrease in the average amount of investments attracted by the company, investors should, starting from 2013, more accurately assess projects, correctly draw up business plans and learn from Western partners.

To test the authors’ hypothesis, we conducted a statistical analysis of the relationship. The indicator of the average amount of venture investments has the value of the pair correlation coefficient with the innovation activity  $r = 0.714$ , and with the coefficient of the invention activity  $r = 0.426$ .

The regression model demonstrated a direct dependence of the average amount of venture investments in the innovation and invention activity of economic entities:

$$Y = -11.64 + 2.45 X_1 + 0.88 X_2.$$

We will interpret the model parameters. With an increase in the innovation activity of enterprises ( $X_1$ ) by 1 percentage point, the average investment amount increases by an average of \$2.45 million per year with the average effect of other factors.



The increase in the coefficient of the invention activity ( $X_2$ ) contributes to the growth of the level of venture investments by an average of 0.88 million dollars.

The coefficient of determination was 64.8%. This indicates a high quality of the model built.

Thus, the authors' hypothesis about the relationship between the change in the innovation and invention activity in the digital economy and business activity in the venture capital market has generally been confirmed.

## 4 Discussion

The development of the economy is closely connected with innovations and investments, including venture capital. The problem of venture business in Russia started in the eighties of the twentieth century, when the hope in this direction was entrusted to commercial banks. However, in the end, the situation developed in such a way that these expectations did not bring positive results. Only large-scale privatization in 1992 attracted the attention of foreign investors working in the field of venture capital.

In 1993, 11 regional venture funds were established in the Russian Federation, at the initiative of the European Bank for Reconstruction and Development. In March 1997, the Russian Venture Investment Association was established in Russia. In 2007, the first venture fund of 3 billion rubles was formed. The purpose of its creation is to attract investments in developing the company "Russian Venture Company" and the Bank "VTB 24" (Krayevsky 2011).

Venture investment is a kind of highly risky form of investing in new high-tech companies that do not have an access to the stock market yet to ensure their establishment, growth, and development in order to obtain profit in the event of a successful project. Venture fund is formed by introducing means to shareholders; then, the management company is selected, which will implement the operational management fund. Venture capital plays a special role in the sphere of small business—the most mobile segment of the economy (Berger and Udell 1998).

According to the Russian Venture Capital Association (RVCA), in recent years, the market illustrated a positive dynamics of new venture capital funds, which is associated with the activity of different initiators in creating venture capital funds (Genezis Capital, Flint Capital) (Nikkonen and Rodionov 2011).

Based on development trends of the Russian venture market in the period under review, it can be concluded that during this period skills of market participants improved, investors chose more reliable companies for investment and at each stage of financing they invested less, thereby reducing their risks. The venture industry in the Russian Federation has been gaining momentum.

The political situation in the country affected the market of venture investments in 2014–2015. Some decline in the business activity was replaced by a different

trend: Venture funds with Russian founders began to focus on foreign markets. As the reasons, it is possible to name rather low capacity of the Russian venture market and uncertainty of prospects for the economic development.

The analysis of industrial preferences of venture funds shows that it is premature to predict significant changes in the overall picture of the market in this aspect. About 55% of venture capital funds operating on the Russian market are funds investing only in the ICT sector, while only 13% are focused on the sector of real technologies (health, electronics, and chemistry).

In general, we can say that the Russian venture capital market is still quite young. Amounts of accumulated funds, amounts and number of transactions do not allow making long-term forecasts about the presence or lack of well-formed trends (Mohnacheva 2012).

The youth of this market attracts the attention of the state, which should not regulate and monitor its condition, shouldn't make development forecasts (Cydenova 2012). The estimation of the venture market indicates its gradual development, despite the crisis in the economy (Aliev 2015). For example, in 2016, Russian venture funds made 53 exits. This is more than 2 times higher than the level of 2015. The statistics confirm the growth of the Russian and global innovation market (Fazekas and Becsky-Nagy 2015). In our opinion, these facts illustrate a high innovation potential of the modern economy.

The innovation potential must be used to find ways to break the Russian economy out of the crisis. The situation with import substitution in the Russian economy is very acute. At this stage of the development, domestic industry and agriculture cannot fully meet the needs of the Russian population. In our opinion, it is not possible to achieve full import substitution, and it happens not because of limited capabilities of producers, but because there is a lack of new technologies.

The positive moment that was revealed in the course of this research was the growth of the companies' innovation activity in the Russian Federation, in particular—fundamentally new developed advanced production technologies. This suggests that the coming era of the information economy stimulates Russian business to increase the innovation activity, including in the sphere of risky projects. Extrapolation showed the continuation of this trend in coming years. The negative point is the slowdown in the pace of the innovation activity development due to the economic crisis of recent years. In addition, there is a gap between the development and implementation of innovations in practice.

## 5 Conclusions

This research has practical significance, because the analysis carried out can be used by the relevant government bodies when developing and adjusting the programs of the social and economic development of the Russian Federation.

This study can be continued in a spatial aspect, involving the expansion of geography. In each federal district and region of Russia, there can be features of the innovative development that require detailed study.

Thus, with due attention of the state to domestic scientists and their development, as well as with large-scale support of small business, it will be possible to say that the Russian economy will become truly innovative. This will attract additional investments (including venture capital projects), create new jobs, and improve the living standards of the population.

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