Prospects for the development of the entrepreneurial potential of the regions of the Russian Federation

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Abstract. This article analyzes the business environment of regions on the example of the Russian Federation through a system of indicators that characterize the level of its development within the 8 selected groups of factors (general economic, social, demographical, innovative, natural and geographical, factors of living standards, financial, infrastructural). The main research methods are correlation analysis, regression analysis, and modeling. Based on the results of the research, the authors come to the conclusion about the key role of socio-demographic, general economic and innovative infrastructure conditions for the development of the business environment of the regions.
Keywords: economy of Russia, regions of Russia, entrepreneurial environment, entrepreneurial potential, regional economy.

1 Introduction

The business environment of the region is a complex category that is influenced by many factors of different nature. Statistical science is designed to systematize this variety of determinants, to make a logical element in their structure. To solve this problem, the authors divided the factor indicators into several enlarged groups and performed a correlation analysis with the indicators of the business environment of the region. The business environment of the region is a complex economic phenomenon that characterizes the degree of business development (primarily small) and its activity. The business environment of the region is determined by the socio-economic, natural-geographical, demographic, legal and other conditions of the region's development. Due to its complexity and versatility, the business environment of the region can only be evaluated by a comprehensive system of indicators [5]. The source of information for our research was data from the All-Russian center for public opinion research of the Russian Federation (VCIOM)[18].

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2 Literature review

Modernization of the Russian economy is a priority task for the country that means first of all strengthening the market infrastructure and creating innovative and investment capacity of companies [1, 2]. The main focus of contemporary publications today is on technological and economic issues in the context of digitalization: efficiency increase, reduction of costs, strengthening the competitiveness, improving the quality of products and services, etc. [3, 7, 8]. However, the issue of creating and transforming business models in the context of the VUCA world is still not sufficiently developed. The integration in the intellectual economy requires more attention to the issues of knowledge-based, innovative activities of regional business.

Prospects and some specific features of entrepreneurship development in Russia under digital conditions are considered by Rybakova & Nazarov [4]. Yakovlev, Streltsov, & Nikulina see consequences of digital economy in effective platforms that are being formed, where production capacities of organizations with high scientific and technical potential play a special role [7]. Issues of reorienting entrepreneurial support infrastructure are analyzed by Muñoz, et al. [12]. Based on the analysis of indicators characterizing the innovative development of the Russian regions, some researchers distinguish between leading and lagging regions depending on the effectiveness of socio-economic and scientific-technical potential implementation [11, 13].

The literature review shows that the entrepreneurial potential of regions is determined by a number of macro and mezo-economic factors that create favorable or unfavorable conditions for the birth, functioning and development of entrepreneurship [6, 9, 10, 14-17]. The study and analysis of these factors, systematization and generalization of theoretical research and experience in the practical implementation of business projects are valuable for the creation of strategic programs of regional development.

3 Methodology

The main research methods used in this study include correlation analysis, regression analysis, and modeling. These methods allowed the authors to consider the main factors influencing the entrepreneurial potential of regions, to measure the closeness of the relationship between variables and quantify factors that have the greatest impact on the performance indicator.

The group "General economic factors» includes the following indicators: gross regional product (GRP) per capita, rub/person $X_{1.1}$; GRP volume index, %, $X_{1.2}$; actual final consumption of households per capita, rub/person, $X_{1.3}$; share of agriculture, hunting and forestry in the gross value added of the region, %, $X_{1.4}$; share of mineral extraction in the gross value added of the region, %, $X_{1.5}$; share of manufacturing in the region's gross value added, %, $X_{1.6}$; share of education in the region's gross value added, %, $X_{1.7}$; industrial production index, %, $X_{1.8}$; consumer prices index, %, $X_{1.9}$; real income index of the population, %, $X_{1.10}$; unemployment level, %, $X_{1.1}$.

These indicators characterize the state of the region's economy as a whole, as well as its most important segments – the industry structure of the economy, the labor market, and the price level. Hypothetically, they can be linked to the business environment of the region both directly and vice versa. On the one hand, the high level of economic development, growth in the physical volume of production of goods and services is an incentive for creating new businesses and active growth of existing ones. On the other hand, in economically developed regions, there is a high probability of high competition in the market, which is an obstacle to entering the market (Table 1).

Table 1. Matrix of paired correlation coefficients for the group "General economic factors"[†]

r	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
$X_{1.1}$	-0.228	0.835	0.026	0.023	-0.014	0.217	0.021	-0.078	-0.098	0.126	0.044	0.354
$X_{1.2}$	-0.066	0.271	0.005	0.089	0.108	-0.081	-0.019	-0.144	-0.004	0.137	-0.033	0.160
$X_{1.3}$	0.149	0.457	0.462	0.382	0.016	0.400	-0.065	-0.045	-0.001	0.232	0.012	0.660
$X_{1.4}$	-0.319	-0.416	-0.511	0.114	0.065	-0.092	-0.133	-0.205	-0.227	-0.280	-0.023	-0.498
$X_{1.5}$	-0.124	0.776	-0.076	-0.059	0.003	0.160	0.152	0.097	-0.077	0.041	-0.024	0.219
$X_{1.6}$	0.507	-0.253	0.290	-0.091	0.001	-0.222	-0.043	0.268	0.319	0.296	0.227	0.114
$X_{1.7}$	-0.455	-0.394	-0.424	0.180	-0.117	-0.079	0.004	-0.213	-0.207	-0.376	-0.301	-0.629
$X_{1.8}$	-0.003	-0.118	-0.085	0.037	-0.035	0.005	0.168	0.111	0.304	0.134	0.183	0.060
$X_{1.9}$	0.017	-0.075	0.217	-0.042	-0.076	-0.093	-0.126	0.042	0.037	-0.001	-0.025	-0.047
$X_{1.10}$	-0.180	0.167	-0.015	0.223	0.133	-0.051	-0.081	-0.309	-0.123	-0.006	-0.067	0.140
$X_{1.11}$	-0.415	-0.203	-0.513	-0.317	-0.264	0.075	0.172	-0.138	-0.153	-0.387	-0.283	-0.605

Source: Own processing.

The data in Table 2 largely confirm the first part of our hypothesis. Thus, the high positive value of the correlation coefficient of the Multidimensional assessment of the business environment of the region (Y_{12}) and the turnover of private organizations (Y_2) with the level of GRP ($X_{1.1}$) and actual final consumption ($X_{1.3}$) is noteworthy. This suggests that the economically developed regions of the Russian Federation are still creating favorable ground for business development. The most successful business environment is formed in industrially developed territories (both in the field of mining and processing - $X_{1.5}$ и $X_{1.6}$), but agricultural regions and large educational centers are not successful in terms of private enterprise development. At the same time, the high share of education in GRP ($X_{1.4}$ и $X_{1.7}$) negatively affects the indicators of entrepreneurial activity of enterprises, that is, the qualitative growth of the business sector. In addition, businesses need workers and personnel, but the unemployed population is not the main reserve of the private sector's labor force: regions with high unemployment ($X_{1.11}$) have low values of the business environment of the region indicators, such as a multidimensional assessment and many private indicators (the

[†] Correlation coefficients that are significant at the level p <0.05 are highlighted in red

number of private and small enterprises, entrepreneurial activity). People who have lost their jobs tend to trust more to the work in the municipal and public sector, seeing it as a stable source of their life resources, and even more so are not always willing to risk starting their own business. We also note that the factor of inflation ($X_{1.9}$) was insignificant for the development of business initiatives in the region.

"Demographic factors" group contains the following indicators: $X_{2.1}$ – proportion of urban population, %; $X_{2.2}$ – gender of the population (number of women per 1000 men); $X_{2.3}$ – birth rate, ‰; $X_{2.4}$ – death rate, ‰; $X_{2.5}$ – infant mortality rate, ‰; $X_{2.6}$ – migration balance rate, ‰; $X_{2.7}$ – the ratio of divorces to marriages (there are divorces per 1000 marriages); $X_{2.8}$ – life expectancy at birth, years; $X_{2.9}$ – share of the working age population, %.

Since business is primarily focused on meeting the needs of various segments of the population, its features of settlement can serve as important factors for the state of the business environment of the region. This influence may be mediated by the volume and specialization of regional production (for example, a high share of manufacturing or agriculture). The main factor in this group, in our opinion, is the urbanization of the territory (Table 2).

Table 2. Matrix of paired correlation coefficients for the "Demographic factors" group

r	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
$X_{2.1}$	0.481	0.256	0.652	0.067	-0.031	0.060	-0.090	0.090	0.003	0.057	-0.011	0.365
$X_{2.2}$	0.503	-0.395	0.292	-0.156	-0.029	-0.297	-0.151	0.200	0.148	0.088	0.119	-0.070
$X_{2.3}$	-0.364	0.152	-0.259	-0.027	-0.197	0.267	0.143	-0.075	-0.115	-0.195	-0.271	-0.195
$X_{2.4}$	0.315	-0.371	0.270	-0.119	0.200	-0.315	-0.159	0.053	0.123	0.171	0.237	0.058
$X_{2.5}$	-0.434	0.005	-0.344	0.075	-0.151	0.085	0.007	-0.136	-0.116	-0.134	-0.204	-0.266
$X_{2.6}$	0.460	-0.116	0.451	0.085	0.126	-0.067	0.025	-0.027	0.175	0.087	-0.031	0.305
$X_{2.7}$	0.214	0.146	0.171	-0.087	0.201	-0.162	-0.094	-0.026	-0.066	0.121	0.261	0.202
$X_{2.8}$	0.182	-0.006	0.004	0.213	-0.183	0.132	0.007	0.107	0.066	-0.067	-0.063	0.033
$X_{2.9}$	-0.128	0.529	0.002	0.328	-0.104	0.319	0.046	-0.090	-0.122	-0.026	-0.136	0.251

Source: Own processing.

Paired correlation analysis confirmed the validity of the last thesis: it is the urban environment ($X_{2.1}$) that accumulates the main sources of business activity and feeds the business environment. We consider the influence of the gender factor to be very interesting ($X_{2.2}$) – the greater the quantitative predominance of the female population in the region, the more there are private enterprises of different sizes, but the volume of their average turnover is smaller. Conversely, an increase in the working age population ($X_{2.9}$) has a positive impact on the financial results of the business. In terms of correlation coefficients, we note the positive impact of the migration balance ($X_{2.6}$) on the number of private organizations and on the business environment of the region as a whole. It is interesting that the indicators of business demography do not correlate with similar indicators of classical demography.

The "Social factors" group includes $X_{3.1}$ – provision of places for pre-school children in organizations that carry out educational activities under pre-school educational programs, supervision and care of children, places (per 1000 children); $X_{3.2}$ – number of students in general education organizations, people (per 1000 inhabitants); $X_{3.3}$ – number of students

enrolled in training programs for qualified workers, employees (per 10,000 inhabitants); $X_{3.4}$ – number of students enrolled in the programs of mid-level specialists, people (per 10,000 inhabitants); $X_{3.5}$ – number of educational institutions of higher education and scientific organizations, units (per 10,000 inhabitants); $X_{3.6}$ – number of students enrolled in bachelor's, specialist's, master's programs, people (per 10,000 inhabitants); $X_{3.7}$ – number of hospital beds, units (per 10,000 inhabitants); $X_{3.8}$ – capacity of outpatient organizations, visits per shift (per 10,000 residents); $X_{3.9}$ – number of doctors of all specialties, people (per 10,000 inhabitants); $X_{3.10}$ – morbidity rate (registered diseases of patients with a diagnosis established for the first time in life), units (per 1000 inhabitants); $X_{3.11}$ – number of theater audience, people (per 1000 inhabitants); $X_{3.12}$ – number of museum visits, units (per 1000 inhabitants); $X_{3.13}$ – number of gyms, units (per 10,000 inhabitants); $X_{3.14}$ - library fund, copies (per 1000 inhabitants); $X_{3.15}$ – number of collective accommodation facilities, units (per 10,000 inhabitants); $X_{3.16}$ – crime rate, units (per 100,000 inhabitants).

The state of the social sphere is characterized by very multifaceted indicators, which can be briefly described as "education", "health", "culture (including physical)" and "criminogenicity". Accordingly, the task is to study the impact of the educational and cultural level of the population, its health and law abidance on the ES of the region (Table 3).

Table 3. Matrix of paired correlation coefficients
by "Social factors" group

r	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
$X_{3.1}$	0.043	0.264	0.193	-0.132	0.177	-0.190	-0.137	-0.075	-0.109	0.088	0.149	0.133
$X_{3.2}$	-0.538	0.169	-0.439	-0.148	-0.090	0.133	0.098	-0.163	-0.171	-0.213	-0.242	-0.320
$X_{3.3}$	-0.179	0.002	-0.217	-0.346	0.196	0.050	0.075	-0.058	-0.057	-0.028	-0.028	-0.133
$X_{3.4}$	-0.103	-0.111	-0.097	-0.177	0.013	0.055	-0.010	0.017	-0.206	-0.236	-0.058	-0.243
$X_{3.5}$	0.286	-0.297	0.544	0.147	-0.068	0.085	-0.040	0.202	0.121	0.027	-0.008	0.157
$X_{3.6}$	0.399	-0.340	0.508	0.108	0.014	-0.075	0.008	0.233	0.105	-0.045	-0.060	0.084
$X_{3.7}$	-0.296	0.024	0.000	-0.079	0.134	0.024	0.007	-0.155	-0.082	0.031	0.052	0.027
$X_{3.8}$	-0.100	0.056	0.192	-0.065	0.128	-0.166	-0.099	-0.101	-0.155	-0.002	0.095	0.030
$X_{3.9}$	-0.061	0.174	0.283	-0.068	-0.001	0.159	0.149	0.103	0.050	0.064	0.025	0.196
$X_{3.10}$	-0.062	0.443	0.136	-0.147	-0.065	-0.020	-0.082	-0.032	-0.234	-0.133	-0.081	-0.030
$X_{3.11}$	0.486	-0.264	0.712	0.020	-0.061	-0.001	0.089	0.222	0.170	0.050	0.042	0.257
$X_{3.12}$	0.222	-0.072	0.511	-0.078	0.193	-0.126	0.129	0.034	0.226	0.157	0.043	0.303
$X_{3.13}$	-0.536	0.338	-0.222	-0.198	0.086	-0.038	-0.133	-0.207	-0.228	-0.081	0.033	-0.155
$X_{3.14}$	-0.383	-0.046	0.055	-0.142	0.168	-0.130	-0.168	-0.215	-0.117	0.000	0.133	-0.061
$X_{3.15}$	-0.115	0.000	0.008	-0.126	0.465	-0.163	0.280	0.020	0.198	0.163	0.050	0.184
$X_{3.16}$	-0.118	0.077	0.084	-0.375	0.060	0.058	0.075	-0.068	-0.092	0.033	-0.020	-0.031

Source: Own processing.

According to table 3, we can see that the values of paired coefficients are mostly small, and these factors should not play a decisive role in the territorial differentiation of the busi-

ness environment of the region. At the same time, the cultural level of the population matters, factors $X_{3.11}$ и $X_{3.12}$ have a positive relationship with almost all indicators of the business environment of the region. Development of higher education ($X_{3.5}$ и $X_{3.6}$) gives birth to new entrepreneurs, the number of private organizations is growing, but this business is rarely financially successful and active.

Group "Factors of living standards" contains $X_{4.1}$ – per capita monetary income of the population, rubles; $X_{4.2}$ – average consumer spendings per capita average consumer spendings per capita (per month), rubles; $X_{4.3}$ – retail trade turnover per capita, rubles; $X_{4.4}$ – volume of paid services per capita, rubles; $X_{4.5}$ – share of household expenditure on food, %; $X_{4.6}$ – share of household expenditures on housing and utilities, and fuel, %; $X_{4.7}$ – share of the population with monetary incomes below the subsistence minimum, %; $X_{4.8}$ – level of consumption of meat and meat products per capita, kg; $X_{4.9}$ – availability of cars (number of own cars), units (per 1000 inhabitants); $X_{4.10}$ – the total area of residential premises, on average per one inhabitant, m^2/ person; $X_{4.11}$ – the share of dilapidated housing stock in the total area of the entire housing stock, %. This group of factors is also very broad. It takes into account both the indicators of income of the population, and the provision of essential material goods (cars, housing), the consumption of basic food (in particular, meat and meat products). These indicators also correlate with each other. Thus, a high standard of living (in particular, a high income) implies appropriate housing conditions.

We note that this group contains factorial characteristics that are diametrically opposite to the standard of living. Thus, high values of features $X_{4.1} \ldots X_{4.4}$, $X_{4.8} \ldots X_{4.10}$ are indicators of a high standard of living, while other signs are the opposite (Table 4).

Table 4. Matrix of paired correlation coefficients
of the group "Factors of living standards"

r	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
$X_{4.1}$	0.083	0.426	0.435	0.461	-0.022	0.315	-0.151	-0.135	-0.093	0.035	-0.111	0.383
$X_{4.2}$	0.381	0.282	0.590	0.481	-0.041	0.411	-0.152	-0.070	-0.045	0.068	-0.062	0.523
$X_{4.3}$	0.410	0.259	0.528	0.488	-0.110	0.438	-0.210	-0.051	-0.052	0.068	-0.022	0.487
$X_{4.4}$	0.272	0.311	0.570	0.386	0.127	0.289	-0.026	-0.085	-0.020	0.083	-0.095	0.516
$X_{4.5}$	-0.287	-0.300	-0.323	-0.025	-0.052	0.152	0.126	-0.015	0.132	-0.075	-0.058	-0.138
$X_{4.6}$	-0.146	0.080	-0.117	-0.075	-0.135	-0.085	0.045	-0.086	-0.040	0.028	0.019	-0.102
$X_{4.7}$	-0.524	-0.352	-0.453	-0.497	0.010	-0.215	0.214	-0.082	-0.030	-0.086	-0.069	-0.466
$X_{4.8}$	0.233	0.174	0.218	0.047	0.193	-0.141	-0.136	-0.030	-0.089	-0.011	0.137	0.156
$X_{4.9}$	0.509	0.156	0.386	0.068	0.141	-0.130	-0.144	-0.037	-0.083	0.081	0.082	0.264
$X_{4.10}$	0.321	0.248	0.203	0.135	0.147	-0.179	-0.407	-0.107	-0.178	-0.039	0.154	0.107
$X_{4.11}$	-0.167	0.043	-0.067	-0.145	-0.033	0.245	0.015	-0.127	-0.122	-0.062	-0.017	-0.036

Source: Own processing.

The correlation analysis in this group showed the importance and closeness of the relationship between consumer activity ($X_{4.1} \ldots X_{4.4}$) and the business environment of the region.. This is quite logical, since the business is focused on the consumer market and, in turn, is financially dependent on the willingness of buyers to fulfill their demand. This logic also includes negative coefficients for the factor variables "the share of household expenditures on food" ($X_{4.5}$) and "the share of the population with monetary incomes below the subsistence minimum" ($X_{4.7}$). These indicators are a characteristic of the impoverished

population, its inability to fully finance its needs. In such regions, the private sector (especially in the service sector) has a low rate of return, and according to the laws of the economy, capital will not stay in it. "Natural and geographical factors" group consists of $X_{5.1}$ – population density, people/km^2; $X_{5.2}$ – woodiness area, %; $X_{5.3}$ – average annual air temperature, degree; $X_{5.4}$ – average annual precipitation, mm. The difference of these factors is that they are almost independent of humans (some exceptions are the factor of forest area). They mainly characterize the geographical area of the subject of the Federation. The population density factor adds an aspect of the nature of residents settlement across the territory, their concentration or deconcentration on a limited area of surface (Table 5).

Table 5. Matrix of paired correlation coefficients
of "Natural and geographical factors" group:

r	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
$X_{5.1}$	0.207	-0.022	0.626	0.216	-0.101	0.030	-0.048	0.021	0.074	0.065	-0.088	0.269
$X_{5.2}$	0.209	-0.090	0.181	-0.228	-0.129	0.140	-0.036	-0.041	-0.135	-0.086	-0.102	-0.069
$X_{5.3}$	0.095	-0.388	-0.068	0.196	0.078	-0.126	-0.037	0.060	0.167	0.034	0.091	-0.024
$X_{5.4}$	0.196	-0.147	0.332	-0.023	0.064	-0.123	-0.206	-0.099	-0.060	0.028	0.040	0.064

Source: Own processing.

Of all the natural and geographical facts, let's highlight the "population density" ($X_{5.1}$). It has a particularly strong impact on the quantitative indicators of small businesses (Y_3, Y_4) and on the business environment of the region as a whole (Y_{12}): the more concentrated the population, the more active the business is in this area. Under these conditions, logistics is simplified, business relationships become closer and simpler, and advertising and delivery work better and faster. "Financial factors" group includes $X_{6.1}$ – revenues of the consolidated budgets of the subjects of the Russian Federation per capita, thousand rubles; $X_{6.2}$ – expenditures of the consolidated budgets of the subjects of the Russian Federation per capita, thousand rubles; $X_{6.3}$ – fixed capital investment per capita, thousand rubles; $X_{6.4}$ – foreign direct investment in fixed assets per capita, dollar; USA; $X_{6.5}$ – balanced financial result (profit minus loss) of organizations' activities per capita, thousand rubles; $X_{6.6}$ – share of unprofitable organizations, %. This group contains factors that show the potential (theoretical) and real financial possibility of investing in the business sector – investment activity and financial condition of organizations and regions (Table 6).

Table 6. Matrix of paired correlation coefficients
of "Financial factors" group

r	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
$X_{6.1}$	-0.240	0.370	0.060	0.237	0.071	0.172	0.014	-0.109	-0.064	0.075	-0.039	0.247
$X_{6.2}$	-0.251	0.340	0.061	0.234	0.071	0.173	0.014	-0.118	-0.067	0.070	-0.044	0.235
$X_{6.3}$	-0.266	0.809	-0.078	-0.028	-0.029	0.201	0.009	-0.086	-0.068	0.051	0.051	0.235
$X_{6.4}$	0.062	0.095	0.235	0.178	-0.183	0.468	-0.046	-0.062	-0.016	0.145	0.069	0.316
$X_{6.5}$	0.009	0.655	0.150	0.160	-0.002	0.151	0.006	0.041	-0.015	0.096	-0.009	0.331
$X_{6.6}$	-0.175	0.156	-0.011	-0.259	0.180	0.021	0.187	0.049	0.195	0.156	0.206	0.161

Source: Own processing.

All paired correlation coefficients with a multidimensional assessment of the business environment of the region have positive values, that is, there is an influence of financial factors on the degree of regional business development. The coefficient $r_{y2x6.3} = 0,809$: should be especially noted: the level of investment significantly determines the volume of private enterprises turnover. This is a positive feature, as it highlights the importance and necessity of investment in the economy. At the same time, among the financial factors, there was not a single one that had a statistically significant relationship with the indicators of blocks 4 and 5.

The group of "Innovative factors" contains $X_{7.1}$ – innovative activity of organizations, %; $X_{7.2}$ – share of innovative goods, works, services, % of the total volume of shipped goods, performed works, services; $X_{7.3}$ – internal costs on research activities and developments per capita, thousand rubles; $X_{7.4}$ – expenditures on ICT (information and communication technologies) per capita, thousand rubles; $X_{7.5}$ – share of organizations that used special software tools, % of the total number of surveyed organizations; $X_{7.6}$ – number of active subscribers of fixed and mobile broadband Internet access, units (per 100 inhabitants); $X_{7.7}$ – digital TV coverage, %. This group includes indicators of the economy's readiness to transition to the era of digitalization and to an innovative development path. At the same time, statistical indicators consider this phenomenon both at the level of enterprises and at the level of households (Table 7).

Table 7. Matrix of paired correlation coefficients
of the "Innovative factors" group

r	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
$X_{7.1}$	0.314	0.000	0.333	0.161	0.058	-0.098	-0.151	0.019	-0.042	0.005	0.030	0.162
$X_{7.2}$	0.321	-0.145	0.203	0.140	-0.010	-0.024	-0.125	-0.048	-0.081	-0.101	-0.042	0.048
$X_{7.3}$	0.435	-0.037	0.672	0.203	-0.192	-0.017	-0.062	0.114	0.053	0.065	-0.101	0.241
$X_{7.4}$	0.013	0.498	0.421	0.204	-0.122	0.218	-0.076	-0.006	0.007	0.137	-0.026	0.379
$X_{7.5}$	0.212	0.063	0.270	-0.099	0.079	-0.159	-0.020	0.228	0.181	0.281	0.316	0.226
$X_{7.6}$	0.593	0.067	0.689	0.177	-0.036	-0.107	-0.172	0.140	-0.047	0.002	-0.009	0.270
$X_{7.7}$	0.128	-0.069	0.043	-0.003	-0.204	-0.161	-0.203	-0.021	-0.099	-0.085	-0.037	-0.182

Source: Own processing.

Scientific research, innovation and the active use of information and communication technologies are reliable factors for activating the business environment of the region. This is especially evident in factor $X_{7.6}$ – "The number of active subscribers of fixed and mobile broadband Internet access", which has a high positive pair correlation coefficients with the number of private sector enterprises and with a multidimensional assessment of the business environment of the region. Out of the entire list of factor variables in this block, only the digitalization factor of TV broadcasting (X7.7) has no statistically significant relationships ($X_{7.7}$). Perhaps, at present, this advanced technology of telematics services is more social in nature and is not related to the development of business, but to the activities of the state.

The group "Infrastructural factors» is presented through $X_{8.1}$ – number of personal computers, units (per 100 employees); $X_{8.2}$ – depreciation rate of fixed assets, %; $X_{8.3}$ – share of paved roads in the total length of public roads, %; $X_{8.4}$ – passenger turnover of

public buses per capita, thousand pass-km; $X_{8.5}$ – automobile transport cargo turnover per capita, thousand t-km; $X_{8.6}$ – commissioning of residential buildings, m^2 of total residential area (per 1000 inhabitants); $X_{8.7}$ – emissions of pollutants into the atmosphere from stationary sources, thousand tons (per 1000 inhabitants). This group covers a wide range of factors that take into account the environmental situation, the state of the basic segment of the economy – fixed assets, as well as the availability and use of elements of information, transport and social infrastructure (Table 8).

Table 8. Matrix of paired correlation coefficients for a group "Infrastructure factors»

r	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
$X_{8.1}$	0.262	-0.160	0.707	0.014	0.192	-0.085	-0.021	0.016	0.017	0.038	-0.082	0.243
$X_{8.2}$	0.079	0.151	-0.148	-0.027	-0.147	-0.122	0.227	0.391	0.267	0.195	0.225	0.041
$X_{8.3}$	0.289	0.182	0.242	0.164	0.219	-0.071	0.162	-0.005	0.092	0.114	-0.055	0.345
$X_{8.4}$	0.101	-0.069	-0.012	-0.234	0.029	-0.027	0.370	0.411	0.408	0.274	0.388	0.172
$X_{8.5}$	-0.103	0.293	0.022	0.113	0.013	-0.091	-0.189	-0.147	-0.122	0.057	0.078	0.091
$X_{8.6}$	0.218	0.016	0.045	0.181	-0.063	0.023	-0.177	-0.091	-0.028	-0.053	0.020	0.074
$X_{8.7}$	-0.214	0.842	-0.093	-0.081	-0.058	0.126	0.026	-0.043	-0.101	0.066	0.057	0.194

Source: Own processing.

For all indicators, there is a direct relationship with the business environment of the region. This connection is mostly noticeable in regions with a high level of computer technology use and good road quality ($X_{8.1}$, $X_{8.3}$). The importance of well-organized logistics is shown, in particular, in the relationship between the turnover of automobile transport and the volume of turnover of private enterprises ($r_{y2x8.5} = 0,293$). However, the state of the environment has a much more significant impact on the financial results of the business - an increase in emissions of harmful substances leads to an increase in the values of the Y_2indicator. This can be explained by the fact that the complex environmental situation is inherent in industrially developed territories, where there are likely to be conditions for business prosperity. Moreover, it is not the number of enterprises (with the performance indicators Y_1 и Y_3 there is an inverse correlation), but their turnover. This block of factors is one of the few where business demography indicators have significant correlations (with the state of fixed assets $X_{8.2}$ and with passenger transport turnover $X_{8.4}$).

4 Results

The next stage of the study is regression analysis. It is intended for an analytical form of expression of the indicators relationship. Preliminary performance indicators are checked for compliance with the normal distribution law. This is important for subsequent analysis and application of certain statistical methods. The instrument is the Kolmogorov-Smirnov criterion, which is justified in a relatively large population. The calculation results are shown in Table 9.

Table 9. Kolmogorov-Smirnov criteria for business environment of the region indicators in the Russian Federation in 2017 (significance level 5 %)

Indicators	The criterion value	P-value	Compliance with the normal distribution law
Y_1	0.994	0.277	Yes
Y_2	1.057	0, 214	Yes
Y_3	2.962	0.000	No

Indicators	The criterion value	P-value	Compliance with the normal distribution law
Y_4	0.784	0.571	Yes
Y_5	1.700	0.006	No
Y_6	1.274	0.078	Yes
Y_7	2.243	0.000	No
Y_8	1.285	0.073	Yes
Y_9	3.005	0.000	No
Y_{10}	1.935	0.001	No
Y_{11}	1.225	0.100	Yes
Y_{12}	1.790	0.003	No

Source: Own processing.

Thus, of the 12 indicators of the Russian business environment of the region, only 6 are in accordance with the normal distribution law ($Y_1, Y_2, Y_4, Y_6, Y_8, Y_{11}$). Regression models will be built based on them. The regression model for the Y_1 indicator - "The share of private organizations" will have the following form:

$$\widehat{Y}_1 = 70,107 + 0,127x_{2.1} - 1,374x_{2.5} + 0,024x_{2.7} - 2,853x_{3.13} - -0,001x_{3.14} - 0,004x_{3.16} - 0,436x_{5.3} + 0,157x_{7.5} + 0,260x_{8.1}, \qquad (2)$$

where: $X_{2.1}$ – share of the urban population, %; $X_{2.5}$ – infant mortality rate, ‰; $X_{2.7}$ – the ratio of divorces to marriages (there are divorces per 1000 marriages); $X_{3.13}$ – number of gyms, units (per 10,000 inhabitants); $X_{3.14}$ - library fund, copies (per 1000 inhabitants); $X_{3.16}$ – crime rate, units (per 100,000 inhabitants); $X_{5.3}$ – average annual air temperature, degree; $X_{7.5}$ – share of organizations that used special software tools, % of the total number of surveyed organizations; $X_{8.1}$ – number of personal computers, units (per 100 employees).

The multiple correlation coefficient in the model is 0.849. The variation in the share of private organizations in the region by 72.1 % is due to the variation of the factors considered in the model, and by 27.9 % is due to the variation of other factors not included in this model. According to the F-criterion, the model is significant (with a 95 % probability). The above indicates a good quality and adequacy of the built model.

An important element of multiple regression analysis is finding partial coefficients of determination:

$$d_i = \beta_i * r_{yxi}, \qquad (3)$$

where: β_i - coefficients of the regression equation on a standardized scale; r_{yxi} - paired correlation coefficients.

The need to calculate partial coefficients of determination is caused by the different scales of factors-arguments. They can be used to estimate the "net" contribution of a factor to the variation of the values of the dependent variable. Summarizing the results of calculations of private coefficients of determination, we can note that the main role in the territorial differences in the share of private organizations is played by social and demographic factors: the region's urbanization, crime rate, development of cultural infrastructure and sports, health status (which is indicated by the infant mortality rate) – in total, they account for 69.3% of the impact on the effective indicator. However, the nature of their influence is different.

Thus, the relative number of private institutions is higher in urban areas with a high level of ICT development, good health, low crime rate, geographically belonging to the North-West, central part of the European part and Western Siberia. In the Russian Federation, the

largest share of private organizations is in Saint Petersburg (92.7 % of all organizations), in the Tyumen region (91.5%), and in the Samara region (91.2%).

The regression model for the Y_2 indicator - "Turnover of private organizations" will have the following form:

$$\hat{Y}_2 = 64{,}714 + 0{,}592x_{1.5} + 0{,}008x_{5.1} + 0{,}086x_{6.1} - 0{,}579x_{6.6} - 1{,}113x_{8.1} + {} + 6{,}518x_{8.4} + 6{,}322x_{8.7}, \qquad (4)$$

where: $X_{1.5}$ – share of mineral extraction in the gross value added of the region, %; $X_{5.1}$ – population density, people/km²; $X_{6.1}$ – revenues of the consolidated budgets of the subjects of the Russian Federation per capita, thousand rubles; $X_{6.6}$ – share of unprofitable organizations,%; $X_{8.1}$ – number of personal computers, units (per 100 employees); $X_{8.4}$ – passenger turnover of public buses per capita, thousand pass-km; $X_{8.7}$ – emissions of pollutants into the atmosphere from stationary sources, thousand tons (per 1000 inhabitants).

The multiple correlation coefficient is 0.905. The variation in turnover of private organizations in the region by 82.0 % is due to the influence of factors included in the model. According to this performance indicator, priority belongs to infrastructure factors, which account for 54.6% of the impact. Thus, the turnover per 1 private organization is likely to be higher in a financially secure region with a predominance of extractive industries, a compact settlement system and a complex environmental situation. That is why we see Yamalo-Nenets, Nenets and Khanty-Mansiysk Autonomous okrugs, Kemerovo region, Komi, etc. among the leaders in this Y_2 indicator.

The dependence of small enterprises turnover (Y_4) on various factors is approximated by the multiple regression model:

$$\hat{Y}_4 = 35{,}302 - 0{,}113x_{1.6} - 0{,}014x_{2.7} - 0{,}599x_{4.7} - 0{,}345x_{8.7}, \qquad (5)$$

where: $X_{1.6}$ – share of mineral extraction in the gross value added of the region, %; $X_{2.7}$ – the ratio of divorces to marriages (there are divorces per 1000 marriages); $X_{4.7}$ – share of the population with monetary incomes below the subsistence minimum, %; $X_{8.7}$ – emissions of pollutants into the atmosphere from stationary sources, thousand tons (per 1000 inhabitants).

The multiple correlation coefficient is 0.674. All these factors account for 45.5 % of the variation in the birth rate coefficient of organizations by regions. According to the indicator "Turnover of small enterprises", the dominant influence belongs to the factor of living standards – the share of the population with incomes below the subsistence minimum, which causes more than 1/3 (more precisely, 36.5%) of the variation of the effective variable. Other indicators have an important, but significantly less impact. Therefore, we can say that the largest volume of turnover of small businesses is observed in regions that are not industrially developed and, consequently, do not have global environmental problems, and at the same time have a decent standard of living in combination with traditional family lifestyle.

The leaders among the regions in terms of turnover of small enterprises are the Crimea, Astrakhan and Volgograd regions, and Saint Petersburg. In particular, these subjects of the Federation have very low values for emissions of harmful substances (much lower than the arithmetic average).

The dependence of the IP revenue volume (Y_6) on factors is described by the following linear multi-factor model:

$$\hat{Y}_6 = -4090{,}7 + 189{,}1x_{1.4} + 279{,}4x_{2.9} + 27{,}4x_{3.4} - 427{,}2x_{3.15} - {} - 315{,}1x_{4.7} - 329{,}6x_{4.10} + 29{,}7x_{5.2} + 570{,}0x_{6.4}, \qquad (6)$$

where: $X_{1.4}$ – share of agriculture, hunting and forestry in the gross value added of the region, %; $X_{2.9}$ – share of the working age population, %; $X_{3.4}$ – number of students enrolled in the programs of mid-level specialists, people (per 10,000 inhabitants); $X_{3.15}$ – number of collective accommodation facilities, units (per 10,000 inhabitants); $X_{4.7}$ – share of the population with monetary incomes below the subsistence minimum, %; $X_{4.10}$ – the total area of residential premises, on average per one inhabitant, $m^2/$ person; $X_{5.2}$ – woodiness area, %; $X_{6.4}$ – foreign direct investment in fixed assets per capita, dollar; USA.

The factors collected in the models explain more than half (55.3 %) of the regional variation of IP revenue volume. The multiple correlation coefficient is 0.744. Among all the independent variables, the "foreign direct investment in fixed assets per capita" factor clearly stands out, explaining the 19.9 % of Y_6 variation. The second most important factor is "the share of the population with monetary incomes below the subsistence minimum" (14.4 %), followed by "the total area of residential premises per inhabitant on average" (7.9%).

The largest revenue of IP is achieved in regions of natural forest area with its agricultural specifics and a good level of training of middle managers that are non-tourist centers while providing its citizens with an acceptable standard of living and provide the economy with investment (including foreign). Private entrepreneurs in Dagestan, the Sakhalin region, the Khabarovsk territory and Buryatia have the largest volume of revenue. Thus, in the Republic of Dagestan, the share of agriculture, hunting and forestry in the region's GVA is 23.5 %, which is more than 2 times higher than the average value in Russia.

We built a multi-factor regression model of the dependence of the organization's mortality rate (Y_8) from several factors. General view of the resulting model:

$$\hat{Y}_8 = -139{,}204 - 3{,}557x_{1.11} + 656{,}389x_{3.5} - 0{,}007x_{3.14} - 0{,}200x_{4.9} - -2{,}173x_{7.2} + 2{,}139x_{7.5} + 2{,}825x_{8.2} + 37{,}423x_{8.4}, \qquad (7)$$

where: $X_{1.11}$ – unemployment level, %; $X_{3.5}$ – number of educational institutions of higher education and scientific organizations, units (per 10,000 inhabitants); $X_{3.14}$ – library fund, copies (per 1000 inhabitants); $X_{4.9}$ – availability of cars (number of own cars), units (per 1000 inhabitants); $X_{7.2}$ – share of innovative goods, works, services, % of the total volume of shipped goods, performed works, services; $X_{7.5}$ – share of organizations that used special software tools, % of the total number of surveyed organizations; $X_{8.2}$ – depreciation rate of fixed assets, %; $X_{8.4}$ – passenger turnover of public buses per capita, thousand pass-km.

This model has a good statistical quality, which is expressed by the values of the t-criterion and the F-criterion. Thus, the parameters of the model and the model as a whole can be considered statistically significant with a probability of 95 %. The variation of the factors collected in the model by 61.9 % causes a variation in the mortality rate coefficient of organizations. All other (random) factors account for 38.1 % of the variation. The value of the correlation coefficient is 0.787. In this model, there are 2 factors from the groups "Social factors" and "Innovative factors", but even in total, they caused only 1/5 of the effective feature variation (19.7 %). The other 2 factors, which we previously attributed to the "Infrastructure factors" group (31.8%), had a much greater impact.

Based on the results of the simulation, we can say that a high level of mortality is observed in regions with low unemployment, with a focus on higher education and science, which do not differ in the renewal of fixed assets and a good standard of living. Regions with high business mortality include the Crimea, Astrakhan and Vologda regions, and the Khanty-Mansiysk Autonomous Okrug – Yugra.

The following multiple regression equation was obtained based on the effective indicator Y_{11} – "Number of fast-growing enterprises (estimated growth by the turnover)":

$$\hat{Y}_{11} = -10{,}173 - 1{,}222x_{1.11} + 0{,}521x_{7.5} - 0{,}639x_{7.6} + 8{,}156x_{8.4}, \quad (8)$$

where: $X_{1.11}$ – unemployment level, %; $X_{7.5}$ – share of organizations that used special software tools, % of the total number of surveyed organizations; $X_{7.6}$ – number of active subscribers of fixed and mobile broadband Internet access, units (per 100 inhabitants); $X_{8.4}$ – passenger turnover of public buses per capita, thousand pass-km.

5 Discussion

The quality of this model was not very high – the correlation coefficient was 0.594, and the determination coefficient was 0.352 (factors explain only 35.2 % of the variation in effective breeding). In these conditions, it is difficult to distinguish the dominant factor (a group of factors); we only note that, according to the particular coefficients of determination, the main factor is the "passenger turnover" (14.8% of the influence). In general, the number of fast-growing enterprises (by turnover) increases in regions with high employment, a good level of ICT development and a large volume of passenger traffics. These regions include the Republic of Crimea, Astrakhan region, Krasnoyarsk territory, and Bryansk region. For example, in the Astrakhan region, the passenger turnover of public buses per capita is the largest (4.41 thousand pass-km) in the country. The distribution of 6 performance indicators does not follow the normal law (Y_3, Y_5, Y_7, Y_9, Y_{10}, Y_{12}). Thus, it is incorrect to apply parametric analysis methods to them. We will use nonparametric methods for analyzing relationships – rank correlation methods. The results of the analysis of factor relationships are briefly shown in table 10. We show only the highest values of Spearman's rank correlation coefficient (regardless of the sign in the coefficient).

Table 10. Spearman's rank correlation coefficients
(5% level of significance)

Name	Coefficients
Y_3	
$X_{2.1}$ – share of the urban population, %;	0.680
$X_{7.3}$ – internal costs on scientific research and developments per capita, thousand rubles;	0.649
$X_{7.6}$ – number of active subscribers of fixed and mobile broadband Internet access, units (per 100 inhabitants);	0.636
$X_{3.11}$ – number of theater audience, people (per 1000 inhabitants);	0.565
$X_{8.1}$ – number of personal computers, units (per 100 employees).	0.545
Y_5	
$X_{3.15}$ – number of collective accommodation facilities, units (per 10,000 inhabitants);	0.294
$X_{2.9}$ – share of the working age population, %.	-0.236
$X_{3.3}$ – number of students enrolled in training programs for qualified workers, employees (per 10,000 inhabitants);	0.214
The other coefficients are not statistically significant	
Y_7	
$X_{3.11}$ – number of theater audience, people (per 1000 inhabitants);	0.333
$X_{4.10}$ – the total area of residential premises, on average per one inhabitant, m^2/person;	-0.322
$X_{2.3}$ – birth rate, ‰	0.302
$X_{1.4}$ – share of agriculture, hunting and forestry in the gross value added of the region, %;	-0.297
$X_{3.14}$ - library fund, copies (per 1000 inhabitants);	-0.293
Y_9	
$X_{1.6}$ – share of manufacturing in the region's gross value added, %;	0.547

Name	Coefficients
$X_{2.6}$ – migration growth coefficient, ‰	0.490
$X_{3.11}$ – number of theater audience, people (per 1000 inhabitants);	0.469
$X_{7.3}$ – internal costs on scientific research and developments per capita, thousand rubles;	0.460
$X_{2.1}$ – share of the urban population, %;	0.447
Y_{10}	
$X_{1.11}$ – unemployment level, %.	-0.445
$X_{7.5}$ – share of organizations that used special software tools, % of the total number of surveyed organizations;	0.387
$X_{1.7}$ – share of education in the region's gross value added, %;	-0.346
$X_{4.9}$ – availability of cars (number of own cars), units (per 1000 inhabitants);	0.319
$X_{7.4}$ – expenditures on ICT per capita, thousand rubles;	0.307
Y_{12}	
$X_{6.3}$ – fixed capital investment per capita, thousand rubles;	0.648
$X_{4.4}$ – volume of paid services per capita, rubles;	0.629
$X_{4.2}$ – average consumer spendings per capita (per month), rubles.	0.600
$X_{1.2}$ – GRP physical volume index, %;	0.592
$X_{1.1}$ – gross regional product (GRP) per capita, rubles/person;	0.582

Source: Own processing.

According to the obtained results, it is difficult to single out any one enlarged group of factors that significantly affect the above-mentioned performance indicators of the business environment of the region. For example, the number of small businesses and IP (Y_3 и Y_5) is influenced primarily by social and demographic indicators, as well as factors related to the development of IT infrastructure. The birth rate of organizations (Y_7), is also related to the traditional demographic birth rate of the population, and the relationship between them is reversed.

To create and grow a business (Y_7, Y_9 и Y_{10}), the production specialization of the region is important – the birth rate of organizations and their entrepreneurial activity is higher in territories where agriculture and education take a small share in the GRP. Active business growth requires appropriate infrastructure support and investment in research and development.

The final indicator is a multidimensional assessment of the business environment of the region (Y_{12}) that synthesizes the key determinants of business development. Subjects of the Federation with a high level of investment, standard of living and level of economic development are preferred for creating and running a business. Thus, our key hypothesis of the study was generally confirmed.

6 Conclusion

In conclusion, we will bring together the factor relationships of the business environment of the region indicators and identify the most important groups of influence factors (Table 11). The "+" sign indicates the significance of the influence of this factors' group.

Table 11. Significance of the influence of enlarged groups of factors on the business environment of the region

Group of factors	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	Y_{10}	Y_{11}	Y_{12}
1. General economic							+		+	+		+
2. Demographical	+	+			+		+		+			
3. Social	+	+			+		+	+	+			
4. Factors of living standards				+		+	+			+		+
5. Natural and geographical												
6. Financial						+						+
7. Innovative		+						+	+	+		
8. Infrastructural		+	+					+			+	

Source: Own processing.

The summary data show the key role of socio-demographic, general economic, and innovative infrastructure regions' conditions in the development of the business environment. The financial condition of the regions plays a secondary role, and natural and geographical conditions are almost irrelevant. Thus, if the regional government adds adequate business support programs to the existing starting conditions (including at the municipal level), this will bring the business environment of the region to a qualitatively new level of development.

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