

Chapter 16

Diagnostics of the Educational Potential of Regions as a Way to Ensure the Economic Security of the Russian Federation in the Context of Digitalization



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16.1 Introduction

Investments in human capital and education are of great importance for the development of the economy in Russia. To compare social development, there is a human development index whose main components are longevity, education, and per capita GDP. Education determines a country with a high or no level of human development.

It is important to understand that a significant share of the growth in GDP gives an intellectual component. With the development of information technologies and the education system, digitalization is becoming an integral part of it. Very high demands are made by employers for the labor qualities of students, complex tasks are set for the field of education, and employment of young people. An important role is given to the modernization and development of the education system since the growth of specialists with higher education is characteristic of countries with developed markets and a high share of intangible products in GDP (Charles & Zegarra, 2014; Charnes et al., 1978; Domenech et al., 2016; Saisana et al., 2005; Schultz, 1961).

The methodology for assessing the educational potential of regions for the economic security of Russia is an actual issue on the condition of financial instability.

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The differentiation of human potential in different regions cannot but affect the quality, resource provision of the education system that influences the socioeconomic state of the regions and the possibility of effective economic growth (Chigarin, 2015; Porunov, 2017).

16.2 Methodology

The methodological basis of the study was made up of economic and static methods, a systematic approach, and a method of optimal solutions. The methodology was tested using official data from the Federal State Statistics Service and the Ministry of Finance of Russia for 2018–2019.

At the first stage, quantitative indicators were selected (Becker, 1994; Charnes et al., 1994; Chigarin, 2015; James, 2015; Kornilov et al., 2019; Porunov, 2017). Their analysis allowed us to draw some qualitative conclusions about the educational potential based on operational network indicators, indicators of regional digitalization, the financial and economic situation of the regions.

The second stage represents the analytical processing of the collected data and the formation of a system of indicators. The educational potential of the regions is assessed in terms of the following indicators: operational-network indicators of education; indicators of regional digitalization and the financial-economic situation of the regions. Tables 16.1, 16.2 and 16.3 describe in detail the indicated groups of indicators.

The group of operational-network indicators of the regional educational potential is united by the integral indicator of the presence of a developed education system for the country. This integral component is used in the preparation of the rating of educational potential as a guide. The presence of universities in the regions leads to an increase in the percentage of young people with higher education.

Indicators of the number of students enrolled in bachelor's, specialist's, master's programs (thousand people), admission to bachelor's, specialist's, master's programs (thousand people), graduation of bachelors, masters (thousand people), a material and technical provision in educational institutions, training of highly qualified personnel, their employment, involvement in the labor market, involvement in science (for inventions, for utility models) are important not only as a benchmark for the country's education but also its quality component.

Integral index of regional digitalization factors characterizes the development of technologies, the use of information technologies (PCs, servers), and utilization rates of network security (organizational use of the Internet, including broadband access).

A group of economic and financial indicators of the region includes the average monthly nominal wage of employees of organizations (RUR), the coefficients of production capacity, the cost of innovation, the scope of innovation, investment development, investment allocation, regional income, the ratio of the consolidated revenues and gross regional product, the ratio of costs of subjects of consolidated budgets Russia and the GRP, the ratio of costs and revenues of the consolidated

Table 16.1 Group of operational-network indicators of the educational potential in regions

Designation	Name of indicator	Interpretation and calculation
KOPR1	Number of students enrolled in bachelor's, specialist's, master's programs (thousand people)	The higher the index value, the better the quality of life in the region
KOPR2	Admission to study under bachelor's, specialist's, master's programs (thousand people)	The higher the index value, the better the quality of life and level of education in the region
KOPR3	Graduation of bachelors, masters (thousand people)	The higher the index value, the better the quality of life and level of education in the region
KOPR4	Coefficient of material and technical security in educational institutions	The higher the index value, the better the logistics and equipment in regional training institutions, which also contributes to the development of regional education Number of personal computers used for teaching purposes in public municipal organizations/1000 enrolled students
KOPR5	Higher qualification training factor	A high score reflects the development of the regional education system Number of organizations that train specialists/Number of organizations that train specialists in the Russian Federation
KOPR6	Employment rate	The higher the indicator, the better the education system and labor market in the region Composition of the employed population by education level in the region/Composition of the employed population by education level in the Russian Federation
KOPR7	Coefficient of involvement in the labor market	A high score reflects a large degree of involvement of the regional population in a labor market, which also affects the standard of living and economy of the region as a whole Average annual employment in the region/Average annual employment in the Russian Federation
KOPR 8, KOPR 9	Engagement rate in science (on inventions and utility models)	The higher the indicator, the higher level of population involvement in science and innovation Admission of patent applications in the region/Admission of patent applications in Russia

Source Compiled by the authors

Table 16.2 Group of indicators of regional digitalization

Designation	Name of indicator	Interpretation and calculation
PC1	Coefficient of technology development	The higher the indicator, the higher level of the development of the productive and innovative potential in the region Develop advanced manufacturing technologies in the region/developed advanced production technology in Russia
PC2	Technology utilization rate	The higher the indicator, the higher level of development of the productive and innovative potential in the region Used advanced production technologies in the region/Used advanced production technologies in the region in the Russian Federation
PC3, PC4	The coefficient of information technologies (PCs, servers)	The indicator reflects the level of information and communication technology in providing regional organizations
PC5, the PC6	The utilization rate of network security (Organization, use the Internet, including broadband access)	The value of this indicator characterizes the level of network usage and security in the region

Source Compiled by the authors

budgets of the RF subjects, the growth of industrial production, and production by economic activity. The regional economies are aimed at innovative development, so it is important for creating innovative products.

The third stage involves the calibration coefficients into groups.

To transform coefficients to a common measurement interval, it is necessary to make its calibration, based on the performance requirements (minimize or maximize) (Porunov, 2017). The following formulas are used for calibration while minimizing indicators (16.1) and calibration for maximizing indicators (16.2).

$$K_{ij}^* = \frac{K_{ij} - K_{imin}}{K_{imax} - K_{imin}}, \quad (16.1)$$

$$K_{ij}^* = \frac{K_{imax} - K_{ij}}{K_{imax} - K_{imin}}, \quad (16.2)$$

where K_{ij}^* —a calibrated indicator i th the proposed index for the diagnosis of the educational potential of the regions in j th region, K_{ij} —estimated value i th proposed educational potential diagnostic indicator regions j th region, K_{imax} —the highest calculated value i th index among the analyzed RF subjects, K_{imin} —the smallest calculated value i th index among the analyzed RF subjects. This method

Table 16.3 Group economic and financial indicators in the region

Designation	Name of indicator	Interpretation and calculation
PEF1	Average monthly nominal accrued wages of employees (rubles)	The higher the index, the higher level of population wealth in the Russian Federation and its regions
PEF2	The coefficient of production capacity	The higher the index, the higher level of production capacity in the region Fixed assets in the economy/GRP
PEF3	Innovation Cost Ratio	The higher the indicator, the higher the developed production and innovation potential The cost of technological innovation/GRP
PEF4	Innovation volume ratio	The higher the indicator, the higher the developed production and innovation potential The volume of innovative goods, works, services/GRP
PEF5	Investment development ratio	A large value of the index indicates a high level of economic development of the country and individual subjects of the Federation
PEF6	Investment distribution ratio	The value of this indicator characterizes the level of regional investment and reflects the share of funding sources in the Russian Federation and its regions
PEF7	Investment development ratio	The higher the value, the greater the share of costs for construction and technological renovation of the economy of Russia and its regions Investments in fixed capital by type of economic activity total (million)/GDP
PEF8	Factor of regional income	A high score reflects the level of development of the regional economy Consolidated budgets' incomes of the Russian regions/Consolidated budget incomes of Russia
PEF9	Coefficient of consolidated revenues in the GRP	The higher the index, the higher the level of development of the economy in Russia and its regions Revenues of the consolidated budgets of the Russian Federation/GRP

(continued)

Table 16.3 (continued)

Designation	Name of indicator	Interpretation and calculation
PEF10	The ratio of consolidated budgets' expenditures of the Russian regions to GRP	A high score reflects the large share of the implementation of national projects costs of government programs that contribute to stimulate economic growth and improve people's quality of life Consolidated budgets' expenditures of the Russian regions/GRP
PEF11	The ratio of consolidated budgets' expenditures of the Russian regions on the national economy to consolidated budget revenues	This indicator defines the ratio of costs and revenues of the consolidated budget of the Russian Federation, which also reflects the economic condition of Russia and its regions Consolidated budgets' expenditures of the Russian regions on the national economy/Consolidated budget revenues
PEF12	The coefficient of performance of budgets of the Russian Federation in relation to GRP	Indicator reflects the level of mobilization and use of budget funds Execution of the RF budget (pension fund, social security fund, the compulsory health insurance fund) /GRP)
PEF13	Industrial growth factor	The higher the index, the higher level of industrial growth in the region
PEF14	Production growth rate by type of economic activity (manufacturing activity)	The higher the index, the higher level of manufacturing activity in the region

Source Compiled by the authors

of calibration leads to a change in the values of the indicators in the range from 0 to 1.

In the fourth stage, the group summarizes the calibrated parameters in order to determine the cumulative coefficient of the calibrated complex (SKKK). The region with the minimum number of points is in the first place.

16.3 Results

The empirical results of the research are illustrated in Table 16.4.

All regions, based on the value of the calibrated indicator of the educational potential of the regions, were divided into three groups: first group—"leading regions"; second group—"mixed regions"; third group—"outsider regions".

Table 16.4 The regional educational potential system of indicators of the condition of digitalization, 2018 (fragment)

Region	Complex calibrated coefficients of the group of network operational performance of the educational potential of the regions		Complex calibrated coefficients of the regional digitalization group		Complex factors calibrated group of economic and financial indicators of the region		Aggregate complex calibrated coefficients		Place
	KKK KOPR	Rank	KKK PC	Rank	KKK PEF	Rank	SKKK	Rank	
Russian Federation	1.512	1	1.132	1	16.830	26	19.474	28	1
Moscow city	2.143	3	1.962	6	16.434	21	20.538	30	2
Leningrad Region	2.396	7	2.499	15	16.118	13	21.013	35	3
Altai Territory	2.771	21	1.923	5	16.125	14	20.819	40	4
Republic of Tatarstan	2.965	27	2.244	12	15.807	8	21.016	47	5
Magadan Region	3.019	28	1.993	7	16.227	18	21.239	53	6
St. Petersburg city	3.367	31	2.240	11	16.078	12	21.685	54	7
Amur Region	2.692	19	2.606	18	16.246	19	21.544	56	8
First level	2.813	24	2.868	32	13.462	1	19.143	57	9
Moscow Region	3.382	32	2.769	26	14.145	3	20.296	61	10
Nizhny Novgorod Region	3.437	41	2.683	20	14.921	4	21.042	65	11
Jewish Autonomous Region	2.285	4	3.395	68	15.816	9	21.495	81	12
Murmansk region	3.561	63	2.066	8	15.970	10	21.597	81	13
Republic of Adygeya	2.790	22	2.196	10	17.579	51	22.565	83	14
Komi Republic	2.471	9	3.228	61	16.151	15	21.850	85	15

(continued)

Table 16.4 (continued)

Region	Complex calibrated coefficients of the group of network operational performance of the educational potential of the regions		Complex calibrated coefficients of the regional digitalization group		Complex factors calibrated group of economic and financial indicators of the region		Aggregate complex calibrated coefficients		Place
	KKK KOPR	Rank	KKK PC	Rank	KKK PEF	Rank	SKKK	Rank	
Khabarovsk Territory	3.455	42	2.824	28	16.171	17	22.450	87	16
Republic of Ingushetia	3.942	85	1.687	3	13.838	2	19.467	90	17
...									
Second level	3.435	38	3.143	55	17.354	41	23.932	134	41
Kemerovo region	2.509	11	3.322	66	17.754	58	23.584	135	42
Pskov region	2.612	17	3.032	49	18.184	70	23.827	136	43
Tver region	3.414	36	3.382	67	17.054	33	23.850	136	44
Kurgan region	2.506	10	4.112	84	17.378	43	23.996	137	45
Sevastopol city	3.761	83	3.030	48	15.795	7	22.586	138	46
Tyumen region	2.361	6	3.117	52	19.887	83	25.364	141	47
Irkutsk region	2.600	14	3.626	78	17.554	50	23.780	142	48
...									
Chechen Republic	3.987	86	3.413	69	15.481	5	22.881	160	65
Tomsk Region	3.481	50	3.763	80	16.986	30	24.231	160	66
Orel Region	2.714	20	3.454	71	18.193	71	24.361	162	67
...									
Third level	3.621	70	3.276	63	20.551	86	27.448	219	82
Saratov Region	3.703	81	3.730	79	17.865	63	25.298	223	83

(continued)

Table 16.4 (continued)

Region	Complex calibrated coefficients of the group of network operational performance of the educational potential of the regions		Complex calibrated coefficients of the regional digitalization group		Complex factors calibrated group of economic and financial indicators of the region		Aggregate complex calibrated coefficients		Place
	KKK KOPR	Rank	KKK PC	Rank	KKK PEF	Rank	SKKK	Rank	
Republic of Mari El	3.699	80	3.609	76	18.230	74	25.537	230	84
Republic of Kalmykia	3.640	72	4.052	83	18.374	75	26.066	230	85
The Republic of Daghestan	3.769	84	5.994	86	18.825	79	28.587	249	86

Source Calculations of the authors based on data of the Ministry of Finance of the Russian Federation and the Federal Service of State Statistics

16.4 Conclusion

In general, the use of the methodology of evaluating the educational potential of the regions for the economic security of Russia on the condition of digitalization allowed:

- assess educational potential in individual areas and obtain a comprehensive comparative assessment by region;
- find a quantitative measure for assessing the educational potential of regions, taking into account the operational network indicators of education, regional digitalization, economic and financial indicators;
- to determine the effective boundaries for assessing the educational potential of the regions, taking into account the operational network indicators of education, regional digitalization, economic and financial indicators;
- to determine directions of changes in the operational network indicators of education, regional digitalization, economic and financial indicators to achieve the values of the best regions.

The results obtained will serve to meet the information needs of federal and regional management. Evaluation of the numerical value by the level of educational potential allows making effective financial decisions at the state level that contribute to improving the quality and accessibility of education. All decisions are focusing on the training of highly qualified personnel, which affects the development of human capital as the main value of the state.

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