

Psychological Predictors of Regional Innovativeness in the Russian Federation

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Abstract. The article presents the results of a study on the role of cognitive capacity, individualism, and assertiveness of the population in the regions of the Russian Federation as predictors of innovativeness (estimated as patent activity) in these regions. First, a comparison was made of the strength of the relationship between five measures of the cognitive capacity of regional populations and regional patent activity. The results of this comparison did not provide a basis for selecting a single “best” measure of cognitive capacity. Second, the role of regional individualism and assertiveness as predictors of patent activity was assessed through 20 regression analyses, in which the dependent variables were two indicators of regional patent activity and the predictors were indicators of cognitive capacity, individualism, and assertiveness. The results showed that, while the cognitive capacity of regional populations is an important predictor of regional patent activity, assertiveness also contributes to regional innovative achievements. However, individualism was either an insignificant predictor or entered the regression equation with a negative coefficient. This latter result is inconsistent with several studies that have found individualism to have a positive effect on innovativeness.

Keywords: Innovativeness, Patent Activity, Cognitive Capacity, Individualism, Assertiveness

1. Introduction

Innovations drive economic growth, as demonstrated at both the national (Squalli & Wilson, 2014) and regional levels (Lynn & Vanhanen, 2012), where more innovative countries and regions tend to be more prosperous. Given this strong link, significant efforts have been devoted to identifying the factors that contribute to innovation. One key area of research explores the relationship between average intelligence at the country or regional level and various indicators of innovativeness (Azam, 2017; Burhan et al., 2014; Carl, 2016; Fierst & Kirkegaard, 2016; Gelade, 2008; Grigoriev, 2016; Grigoriev & Karlin, 2019; Lynn & Vanhanen, 2012; Rindermann et al., 2009; Rus et al., 2021; Squalli & Wilson, 2014). Key findings from these studies are presented in Table 1.

Table 1 highlights the relationship between average intelligence and national or regional innovativeness. Lynn and Vanhanen (2012) were the first to demonstrate that this relationship is curvilinear. They noted that a national IQ of at least 90 appears to be necessary for significant research activity (p. 65). Further evidence of this

nonlinearity has been found in studies examining R&D, high-tech exports, and patent applications (Grigoriev, 2016). Due to this nonlinearity, linear correlations tend to be stronger when applied to log-transformed data.

Some authors assume that the cognitive capacity of the most intelligent portion of the population is a better predictor of its achievements than average intelligence. This was recently confirmed (Kirkegaard & Carl, 2022). There are two approaches to estimating the cognitive capacity of the most intelligent portion of the population: one measures the share of the population with intelligence above a certain threshold, and the other assesses the level of intelligence within the most intelligent segment of the population. The first approach was adopted by the pseudonymous blogger La Griffe du Lion (2002) and Gelade (2008); the second by Rindermann, Sailer, and Thompson (2009), among others. Rindermann and Thompson (2011) argue that the latter is preferable: “it is not the percentage of people in an upper stratum that is important; rather, its absolute cognitive level is what enables intellectual, cultural, institutional, political, and technological progress.”

Table 1. Results of studies on the relationship between average intelligence and indicators of innovativeness at

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the country or regional level				
Reference	Units of analysis	Indicator of innovativeness	Pearson correlation	Regression coefficient in multiple regression or change in adjusted R^2
Gelade, 2008	Countries	Patent index, US 2003-2005	.51	
Gelade, 2008	Countries	Patent index, US (log) 2003-2005	.75	
Gelade, 2008	Countries	Patent index, non-US 2003-2005	.42	
Gelade, 2008	Countries	Patent index, non-US (log) 2003-2005	.67	
Rindermann, Sailer, Thompson, 2009	Countries	Patent rate 1960-2007	.40	
Rindermann, Sailer, Thompson, 2009	Countries	Patent rate 1991-2007	.45	
Rindermann, Sailer, Thompson, 2009	Countries	Scientists 1985-1995	.61	
Rindermann, Sailer, Thompson, 2009	Countries	High technology 1997	.38	
Lynn, Vanhanen, 2012	Countries	R&D 1990-2003	.666	
Squalli, Wilson, 2014	US states	Ln (patents per million)		Significant
Burhan et al., 2014	Countries	Log (patents granted in the US) 2000-2009	.548	
Burhan et al., 2014	Countries	Log(R&D) 2013	.815	
Carl, 2015	UK regions	Patent applications per capita 2010	.83	
Carl, 2015	UK regions	R&D 2012	.60	
Fierst, Kirkegaard, 2016	Countries in the Americas	Log(scientific papers per capita) 2005-2014	.57	
Fierst, Kirkegaard, 2016	Countries in the Americas	Fraction of GDP spent on research and development (years not reported)	.21	
Azam, 2017	Countries	Economic Complexity Index 2010-2014	.76	
Григорьев, Карлин, 2019	Countries	Ln(patent applications) 2016	.682	
Григорьев, Карлин, 2019	Countries	Ln(Nature Index) 01.02.2018-31.01.2019	.824	
Григорьев, Сугоняев, Карлин, 2019	RF regions	Patents 2013-2017		Significant
Rus, Ilies, Achim, 2021	Countries	Global Innovation Index 2005-2020		Significant

This is a controversial statement. If the level of intelligence required to perform a certain activity is known, then the proportion of people in the population whose intelligence exceeds this level (hereinafter referred to as the smart fraction) will also be an informative indicator of how likely it is that the activity will be performed within the population.

Cultural values are also studied as factors in innovativeness. Hofstede's cultural dimensions and Schwartz's cultural values have often been used to examine the relationship between national innovativeness and cultural values. Shane (1992; 1993) was the first to examine the relationship between Hofstede's dimensions and national innovativeness. According to his results, the cultural dimensions associated with innovativeness are individualism, power distance (Shane, 1992), and uncertainty avoidance, but not masculinity (Shane, 1993). Gelade (2008) demonstrated that Schwartz's cultural dimensions—specifically, intellectual autonomy (a facet of the autonomy/embeddedness dimension) and hierarchy—are correlated with patenting activity at the national level. Furthermore, the study found that intellectual autonomy moderates the relationship between the proportion of individuals with very high IQ and national innovativeness.

Similarly, Karlin and Grigoriev (2019) examined the effect of Schwartz's cultural dimensions on a country's scientific productivity, using the Nature Index—a measure based on publications in 82 leading scientific journals—as the dependent variable. Their analysis considered intellectual autonomy, affective autonomy (another facet of the autonomy/embeddedness dimension), and hierarchy, along with four other predictors: IQ, IQ squared, a socialist system in the country in the past or present, and the interaction between IQ and the existence of a socialist system. Among the cultural dimensions, only affective autonomy significantly increased the explained variance of the dependent variable when added to IQ, IQ squared, the existence of a socialist system, and its interaction with IQ. Intellectual autonomy did not reach statistical significance, while the effect of hierarchy was also not significant. Additionally, introducing the interaction between IQ and affective autonomy led to a slight increase in explained variance.

Taylor and Wilson (2012) found a positive effect of individualism on national

innovativeness. At the same time, they found that a certain type of collectivism, “institutional collectivism,” also has a positive effect on national innovativeness. However, given that institutional collectivism positively correlates with Hofstede's individualism/collectivism dimension and Schwartz's affective autonomy (see Taylor & Wilson, 2012, p. 239), this construct (or its measure) may be questioned.

The results obtained by Efrat (2014) showed that not only investment in innovation but also cultural traits, namely, individualism, masculinity, and uncertainty avoidance, are factors in innovativeness.

Strychalska-Rudzewicz (2016) reported significant correlations between three of Hofstede's cultural dimensions, power distance, individualism/collectivism, and uncertainty avoidance, and the Summary Innovation Index for 28 countries. In addition, she presented correlations of these dimensions with three innovation indicators: high-tech exports, R&D investment, and the number of patents. These correlations were reported both for the sample of countries in which fast-developing Asian countries were present and for the sample from which they were excluded. When fast-developing Asian countries were excluded, all correlations were significant. But if fast-developing Asian countries were included, only the correlation of power distance with R&D investment and the correlation of uncertainty avoidance with all three innovation indicators remained significant.

Jang, Ko, and Kim (2016) estimated the effect of six of Hofstede's cultural dimensions (power distance, individualism/collectivism, masculinity, tolerance for uncertainty, long-term orientation, and indulgence) on the patenting activity of 34 OECD member states. When six economic indicators were used as control variables, only power distance, individualism/collectivism, and long-term orientation had significant effects on the patenting activity of OECD members.

The positive relationship between individualism and patenting activity at the national level was also demonstrated by Gorodnichenko and Roland (2011; 2017).

Bukowski and Rudnicki (2018) showed that not only individualism/collectivism but also two other dimensions, long-term orientation and Minkov's flexibility (see Minkov et al., 2017), are predictors of national innovativeness.

The most important cultural dimension is individualism/collectivism (Gallyamova & Grigoryev, 2023). Schwartz's autonomy/embeddedness dimension, used in Gelade (2008) and Karlin & Grigoriev (2019) is similar to individualism/collectivism in Gorodnichenko & Roland (2011). Moreover, there is evidence that another of Hofstede's dimensions, power distance, is more accurately understood as a facet of individualism/collectivism rather than a separate dimension (see Bukowski & Rudnicki, 2018). Therefore, the individualism/collectivism scores of countries or regions, together with IQ scores, can be used as effective predictors of various socioeconomic outcomes, particularly innovative activity.

The present study has three objectives. First, we aim to determine which measure of cognitive capacity in the population of the regions of the Russian Federation serves as the most effective predictor of regional innovative activity. To our knowledge, comparisons of the predictive value of different measures of cognitive capacity have so far been conducted only at the national level; here, we extend this comparison to the regional level. Second, we aim to determine whether the level of individualism in the regions of the Russian Federation predicts regional innovativeness beyond the effect of cognitive capacity. Two indices of individualism will be considered: one based on survey data (Minkov et al., 2023), and another derived from a combination of demographic indicators and regional Internet activity data (Gallyamova et al., 2025). Third, we examine whether the average assertiveness of the population in the regions of the Russian Federation predicts regional innovativeness over and above cognitive capacity. This analysis is based on the assumption of a conceptual intersection between the constructs of individualism and assertiveness.

2. Method

As an indicator of regional innovativeness in the regions of the Russian Federation, this study uses regional data on submitted patent applications for utility models and granted patents for utility models from 2013 to 2017, obtained from the website of the Russian Federal State Statistics Service. These data, along with data on submitted patent applications for inventions and granted patents for inventions, have already been used by Grigoriev et al. (2019).

The results of that study indicate that data on patents for utility models are preferable to data on patents for inventions as an index of innovativeness; therefore, the latter will not be used in this study. Unlike the study by Grigoriev et al. (2019), the number of applications or patents was expressed in relation to the economically active population rather than the total population.

The indicators of cognitive capacity and assertiveness of the population in the regions of the Russian Federation were assessed based on data from voluntary Internet testing. The results of this online testing have previously been published (Sugonyaev et al., 2018; Sugonyaev et al., 2019), but the data have since been supplemented and corrected. All calculations in this study were carried out using the most recent version of the dataset ($n = 267026$ for cognitive capacity and 213121 for assertiveness).

The following indicators of cognitive capacity in the regions of the Russian Federation were considered. First, the average intelligence of the regional population (measured in raw scores). Second, the smart fraction, defined, following La Griffe du Lion (2002), as the percentage of individuals in a region with an IQ greater than or equal to 108, which corresponds to 24 or more raw score points. Third, the average intelligence level of the top 5% of respondents in the region. Fourth, the percentage of respondents in a region with a raw score below 10 ($IQ \leq 75$, which approximately corresponds to the 5th percentile). Fifth, the ratio of the percentage of respondents with a raw score above 28 ($IQ \geq 125$, which approximately corresponds to the 95th percentile) to the percentage of those with a raw score below 10.

Two sets of estimates of individualism in the populations of the regions of the Russian Federation were used. The first set (IND1) was obtained by combining demographic indicators and data on the Internet activity of regional residents (Gallyamova et al., 2025). The IND1 index was based on demographic indicators (e.g., household composition, divorce rates), adjusted for housing affordability using regression analysis, and Google Trends data ("People" and "We" queries). Data sources included the 2010 Census and Rosstat statistics. The second set (IND2), obtained via survey, was adopted from (Minkov et al., 2023).

Table 2. Estimates of cognitive capacity, individualism, assertiveness, and patent activity in Russian regions

Region	IQave	SF1	IQhi5	DF	SF2/DF	IND1	IND2	Ass	UMA	UMO
Altay territory	19.57	30.90	29.03	6.42	0.604	22	-15	8.24	92.91	73.64
Amur region	19.31	29.68	28.99	6.78	0.564	45	42	8.08	84.38	70.82
Arkhangelsk region	20.34	36.04	29.30	5.52	0.925	47	75	8.18	79.55	63.49
Astrakhan region	19.42	30.22	28.90	6.84	0.523	-55	6	8.09	80.25	60.71
Belgorod region	20.02	33.73	29.22	5.05	0.964	-26	-51	8.10	140.79	119.77
Bryansk region	20.02	34.03	29.27	6.17	0.749	7		8.13	185.16	141.15
Chechen R.	16.69	18.89	28.85	16.44	0.189	-398	-435	7.81	21.99	17.42
Chelyabinsk region	19.97	34.69	29.27	5.26	0.917	46	9	8.15	170.41	154.55
Chuvash R.	20.84	38.06	29.37	3.86	1.525	-50	-54	7.81	131.69	113.65
Irkutsk region	19.60	31.85	29.11	6.35	0.695	6	33	8.23	78.03	66.96
Ivanovo region	20.17	34.90	29.09	5.35	0.842	67		8.14	110.67	95.68
Kabardino-Balkaria R.	18.11	20.88	28.44	8.93	0.235	-254	-229	8.05	45.12	30.63
Kaliningrad region	20.12	33.37	28.95	4.43	0.840	70	58	8.05	59.08	44.83
Kaluga region	20.29	34.06	29.15	3.51	1.250	45		8.00	93.36	79.29
Kamchatka territory	19.58	29.81	28.93	5.05	0.712	72		7.90	46.18	49.73
Karachay-Cherkessia R.	18.03	21.78	28.21	8.71	0.214	-227		7.94	38.04	27.67
Kemerovo region	19.70	31.33	28.99	5.82	0.688	46	70	8.20	81.04	65.95
Khabarovsk territory	19.81	32.20	29.18	5.39	0.878	48	27	8.07	113.60	100.37
Khanty-Mansi AD	19.40	29.18	29.03	5.91	0.627	6	16	8.14	31.79	25.08
Kirov region	21.00	38.48	29.32	3.28	1.662	64		8.03	134.13	114.01
Kostroma region	20.58	37.66	29.17	4.53	1.396	40		8.06	80.01	66.78
Krasnodar territory	19.70	30.76	28.95	5.01	0.754	-47	14	8.32	87.33	74.98
Krasnoyarsk territory	20.04	33.89	29.22	5.12	0.930	36	24	8.14	103.53	83.36
Kurgan region	20.01	33.31	29.15	5.55	0.792	45	-21	8.17	139.86	125.87
Kursk region	20.24	34.55	29.12	4.54	0.927	9	9	8.20	164.43	149.97
Leningrad region	20.02	33.96	29.29	5.71	0.848	38	-35	8.01	65.40	49.95
Lipetsk region	20.03	32.04	29.06	4.52	0.906	42		8.11	52.03	37.46
Magadan region	20.20	36.08	28.95	5.10	0.692	127	66	8.24	52.82	42.26
Moscow City	21.18	41.86	29.45	4.23	1.732	64	139	8.09	326.97	279.28
Moscow region	20.37	36.17	29.29	4.62	1.162	42	8	8.09	230.22	192.39
Murmansk region	20.06	33.62	29.25	5.28	0.928	129	97	7.92	48.66	40.89
Nizhniy Novgorod region	20.17	34.71	29.21	4.62	1.056	41	40	8.14	148.54	126.95
Novgorod region	20.66	37.15	29.31	4.04	1.361	83		8.03	99.04	79.63
Novosibirsk region	20.28	36.33	29.32	5.04	1.149	43	46	8.17	178.08	148.89
Omsk region	19.62	30.25	28.99	4.94	0.787	22	24	8.30	171.95	152.41
Orenburg region	19.38	28.97	28.85	5.61	0.617	-13	-20	8.20	35.05	24.92
Oryol region	20.48	35.52	29.22	3.54	1.404	-1		8.11	111.21	103.44
Penza region	20.37	35.36	29.15	5.02	0.930	31	-22	8.22	95.20	76.73
Perm territory	20.86	38.97	29.42	3.72	1.770	65	65	8.18	145.11	127.49
Primorsky territory	19.15	27.06	28.89	5.78	0.612	27	22	8.03	73.34	65.12
Pskov region	19.77	30.97	28.88	4.92	0.722	66		7.90	95.24	77.80
R. of Adygea	19.69	31.82	29.03	6.42	0.650	-35		8.13	54.56	31.18

R. of Altay	19.01	30.40	29.14	9.41	0.501	-23		8.05	35.38	25.94
R. of Bashkortostan	20.12	34.02	29.22	4.90	0.930	-61	-7	8.21	126.52	107.54
R. of Buryatia	18.50	25.56	28.96	8.12	0.474	-47	12	8.04	34.57	22.55
R. of Dagestan	16.44	16.72	28.10	14.53	0.104	-303	-403	7.93	18.51	13.84
R. of Ingushetia	16.11	16.19	28.19	18.10	0.053	-400		7.35	3.81	9.52
R. of Kalmykia	18.94	28.61	28.63	9.13	0.316	-159		7.85	33.88	23.18
R. of Karelia	20.64	37.74	29.22	4.73	1.047	71		7.99	163.80	130.20
R. of Khakassia	19.17	27.69	29.02	5.82	0.708	10		8.24	28.51	23.48
R. of Komi	20.59	36.32	29.36	4.18	1.413	62	61	7.94	29.38	21.12
R. of Mari El	20.55	36.46	29.33	3.96	1.364	-14		7.98	171.52	144.58
R. of Mordovia	20.04	31.35	29.27	4.39	1.190	-16	-39	8.06	90.03	87.50
R. of N. Ossetia-Alania	18.16	24.05	28.40	10.09	0.175	-157	-145	7.96	144.16	133.28
R. of Sakha (Yakutia)	19.77	31.79	28.66	4.63	0.722	-69	14	8.07	75.50	56.94
R. of Tatarstan	20.44	37.07	29.36	4.79	1.120	-28	-18	8.04	279.61	257.93
R. of Tyva	15.75	12.15	27.88	15.26	0.102	-166	-87	7.81	4.00	6.00
Rostov region	20.04	33.17	29.10	4.88	0.869	-10	23	8.22	111.56	88.88
Ryazan region	20.68	37.59	29.19	3.65	1.258	57		8.24	209.26	162.41
Sakhalin region	18.95	28.21	29.16	7.58	0.573	83	59	7.94	13.92	6.96
Samara region	20.47	36.17	29.25	4.22	1.309	49	38	8.26	221.15	195.29
Saratov region	19.95	32.42	29.24	5.36	0.895	30	27	8.27	164.34	135.38
Smolensk region	19.98	32.44	28.85	5.00	0.664	81		8.15	50.96	36.15
St. Petersburg City	21.49	44.26	29.39	3.43	2.146	91	136	8.16	384.37	303.50
Stavropol territory	19.25	29.21	28.91	6.19	0.592	-102	-83	8.17	53.27	45.29
Sverdlovsk region	20.21	34.25	29.23	4.27	1.103	68	76	8.17	179.64	152.56
Tambov region	19.77	32.63	28.95	6.16	0.619	3	-50	8.03	59.66	49.18
Tomsk region	20.87	39.66	29.41	4.48	1.461	54	83	8.28	320.12	293.03
Tula region	20.26	35.01	29.17	5.24	0.883	37	34	8.20	98.24	84.20
Tver region	20.32	34.63	28.93	4.07	0.945	80	37	8.07	143.55	128.88
Tyumen region	20.41	34.41	29.39	4.01	1.395	43	31	8.22	150.95	127.71
Udmurt R.	20.76	38.20	29.44	3.62	1.746	7	59	8.09	169.03	123.30
Ulyanovsk region	20.10	33.53	29.14	4.52	1.000	17	-31	8.10	320.17	280.06
Vladimir region	20.30	35.56	29.28	5.11	0.979	45	-26	8.11	106.02	85.06
Volgograd region	19.78	32.16	29.06	5.46	0.776	24	49	8.18	161.12	148.17
Vologda region	20.93	40.23	29.36	4.54	1.241	55	49	8.10	75.22	56.05
Voronezh region	20.20	34.54	29.27	5.13	1.045	21	-41	8.07	132.15	116.65
Yamalo-Nenets AD	19.93	30.58	29.28	5.07	0.926	35		8.18	40.32	36.34
Yaroslavl region	21.19	41.21	29.25	3.54	1.746	97	145	8.19	189.42	152.68
Zabaykalsky territory	18.72	25.27	28.82	7.03	0.453	-52	-10	8.14	14.69	11.33

Note. *IQ ave* = average regional intelligence (in raw scores); *SFI* = percentage of respondents in a region with more than 23 raw score points ($IQ \geq 108$); *IQhi5* = average intelligence of the top 5% of respondents in a region; *DF (dumb fraction)* = percentage of respondents with a raw score below 10 ($IQ \leq 75$); *SF2/DF* = ratio of the percentage of respondents with a raw score above 28 ($IQ \geq 125$) to those with a raw score below 10; *Ind1* = regional individualism estimate based on demographic indicators and Internet activity; *Ind2* = regional individualism estimate based on survey data; *Ass* = assertiveness; *UMA* (utility model applications) = average number of patent applications per 1 million economically active population for 2013–2017; *UMO* (utility model certifications obtained) = average number of granted patents per 1 million economically active population for 2013–2017.

3. Results

Table 2 presents indicators of cognitive capacity, individualism, and assertiveness, along with patent activity data for the regions of the Russian Federation.

The first objective of this study is to determine which measure of cognitive capacity is most closely associated with innovative (patent) activity. To this end, Pearson product-moment correlations and Spearman rank correlations between five cognitive capacity indicators and patent activity indicators were computed. Pearson correlations were calculated using both non-logarithmic and logarithmic forms of the patent activity indicators. These results are presented in Table 3.

The results of the correlation analysis presented in Table 3 do not allow for a confident conclusion that the smart fraction is a better predictor than average intelligence. However, they do indicate that the smart fraction has greater predictive power than the average intelligence level of the top 5% of respondents in a region. This may be due to the low variability of the latter measure (its standard deviation is 0.31, compared to 1.07 for *IQave*: see the explanation of abbreviations in the note to table 2). This low variation may be explained by the nature of the test used in the voluntary Internet assessment, which was designed primarily to screen out individuals with low intelligence and was less effective at differentiating among high-IQ respondents

Table 3. Correlations of cognitive capacity indicators with patent activity indicators

Cognitive capacity indicator	Pearson correlations				Spearman correlations	
	UMA	UMO	ln(UMA)	ln(UMO)	UMA	UMO
IQave	.584	.561	.782	.730	.666	.647
SF1	.638	.612	.782	.740	.685	.662
IQhi5	.529	.514	.678	.632	.604	.587
DF	-.475	-.459	-.726	-.662	-.615	-.611
SF2/DF	.659	.637	.680	.673	.687	.679

SF2/DF was found to be relatively strongly associated with patent activity. This may be explained as follows: productive creative work requires not only the presence of individuals capable of such work but also a generally higher baseline level of intelligence in the broader population. A lower percentage of *DF* may provide a greater sense of security for members of the smart fraction and improve conditions for investing their intellectual resources in solving creative problems.

Overall, the results of the correlation analysis

do not support the selection of a single best predictor. Therefore, the second objective—clarifying the role of individualism and assertiveness—was pursued using all five cognitive capacity measures.

The roles of individualism and assertiveness were examined through twenty stepwise regression analyses, with the dependent variables being the logarithms of *UMA* and *UMO*. Each analysis included one cognitive capacity measure and one individualism index. The results are presented in Tables 4–7

Table 4. The results of regression analyses of ln(UMA) on cognitive capacity indicators, IND1 and assertiveness

Cognitive capacity indicator	β and p for cognitive capacity indicators		β and p for IND1		β and p for assertiveness		R ² adj.
	β	p	β	p	β	p	
IQave	.982	<.000001	-.405	.000792	.244	.002657	.673
SF1	.879	<.000001	-.313	.004790	.304	.000193	.674
IQhi5	.538	<.000001	non-significant		.301	.001024	.519
DF	-.864	<.000001	-.292	.043746	.174	.075662	.550
SF2/DF	.562	<.000001	non-significant		.372	.000007	.576

Table 5. The results of regression analyses of ln(UMA) on cognitive capacity indicators, IND2 and assertiveness

Cognitive capacity indicator	β and p for cognitive capacity indicators		β and p for IND2		β and p for assertiveness		R ² adj.
	β	p	B	p	β	P	
IQave	.929	< .000001	-.384	.003099	.229	.017534	.629
SF1	.874	< .000001	-.336	.006443	.278	.003698	.634
IQhi5	.541	.000002	non-significant		.307	.003463	.486
DF	-.855	.000002	-.346	.027561	.189	.094362	.507
SF2/DF	.675	< .000001	non-significant		.412	.00013	.554

Table 6. The results of regression analyses of ln(UMO) on cognitive capacity indicators, IND1 and assertiveness

Cognitive capacity indicator	β and p for cognitive capacity indicators		β and p for IND1		β and p for assertiveness		R ² adj.
	β	p	B	p	β	p	
IQave	.972	< .000001	-.411	.002514	.176	.051972	.578
SF1	.883	< .000001	-.329	.008044	.234	.008768	.589
IQhi5	.525	.000001	non-significant		.230	.019046	.427
DF	-.827	.000005	-.278	.081882	non-significant		.446
SF2/DF	.580	< .000001	non-significant		.289	.000787	.515

Table 7. The results of regression analyses of ln(UMO) on cognitive capacity indicators, IND2 and assertiveness

Cognitive capacity indicator	β and p for cognitive capacity indicators		β and p for IND2		β and p for assertiveness		R ² adj.
	β	p	B	p	β	p	
IQave	.863	< .000001	-.350	.012525	.228	.029562	.557
SF1	.819	< .000001	-.311	.019608	.273	.008324	.567
IQhi5	.494	.000021	non-significant		.307	.005503	.425
DF	-.784	.000027	-.307	.063447	non-significant		.445
SF2/DF	.659	< .000001	non-significant		.400	.000314	.519

4. Discussion

The results of the regression analyses reveal the following.

First, the indicators of cognitive capacity in the regions of the Russian Federation are the strongest predictors of patent activity. This provides further evidence that population intelligence is a key factor in societal achievements, particularly in innovation.

Second, the results indicate that regional

assertiveness also contributes positively to innovative outcomes. However, the same cannot be said for individualism. In 40% of the models, individualism was an insignificant predictor; in the remaining cases, it entered the regression equation with a negative coefficient. This finding is inconsistent with the literature reviewed in the Introduction, which generally supports a positive relationship between individualism and innovativeness. Notably, most of those studies did not control for intelligence and were conducted at

the national level. Further research is needed to clarify the role of individualism as a predictor of innovation at the regional level.

Third, the comparison between average intelligence and the smart fraction as predictors of innovation supports the earlier correlation analysis: there is no strong evidence favoring the superiority of the smart fraction (defined here as the percentage of individuals with $IQ \geq 108$). In models using *SF1*, adjusted R^2 values were only marginally higher than those using *IQ ave*. It is possible that a higher threshold (e.g., $IQ \geq 130$) would yield different results. However, as previously noted, the test used in the voluntary Internet assessment does not effectively differentiate high-IQ respondents, limiting the ability to test this hypothesis.

Finally, *UMO* is consistently predicted more accurately than *UMA*. One possible explanation is that assertiveness, which includes self-confidence, may influence the number of applications more than the number of granted patents. It is also possible that patent-granting authorities show more leniency toward "weaker" regions in the issuance process.

A limitation of this study is that it used only one indicator of innovativeness in the regions of the Russian Federation: data on patent activity provided by the Russian Federal State Statistics Service. The task for further research is to verify the obtained results using various indicators of innovativeness.

5. Conclusion

The results of this study indicate that cognitive capacity is a key predictor of patent activity—used here as an indicator of innovativeness—in the regions of the Russian Federation. Assertiveness also contributes to regional innovation, though to a lesser extent. The findings highlight the need for further research into the role of individualism in predicting regional innovativeness, particularly given its inconsistent predictive value when cognitive capacity is controlled for. Another task for further research is to verify the obtained results using various indicators of innovativeness.

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CRedit author statement:

Sugonyaev K.V.: methodology, data curation,

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Grigoriev A.A.: conceptualization, preparation of original draft.

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Highlights:

- Among psychological variables considered cognitive capacity of region's population is the strongest predictor of patent activity.
- There is only marginal superiority of smart fraction index La Griffe du Lion over average ability scores.
- Aggregated assertiveness contributes positively to innovation outcomes.
- Positive relationship between regional scores of innovativeness and individualism was not confirmed.

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Психологические предикторы региональной инновационности в Российской Федерации

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Абстракт: В статье представлены результаты исследования роли когнитивных способностей, индивидуализма и настойчивости населения в регионах Российской Федерации как предикторов инновационности (оцениваемой как патентная активность) в этих регионах. Во-первых, было проведено сравнение силы взаимосвязи между пятью показателями когнитивных способностей населения региона и региональной патентной активностью. Результаты этого сравнения не послужили основой для выбора единственного “наилучшего” показателя когнитивных способностей. Во-вторых, роль регионального индивидуализма и самоутверждения как факторов, влияющих на патентную активность, была оценена с помощью 20 регрессионных анализов, в которых зависимыми переменными были два показателя региональной патентной активности, а предикторами - показатели когнитивных способностей, индивидуализма и самоутверждения. Результаты показали, что, хотя когнитивные способности населения региона являются важным фактором, определяющим региональную патентную активность, настойчивость также способствует региональным инновационным достижениям. Однако индивидуализм был либо незначимым предиктором, либо вошел в уравнение регрессии с отрицательным коэффициентом. Этот последний результат не согласуется с результатами нескольких исследований, которые показали, что индивидуализм положительно влияет на инновационность.

Ключевые слова: инновационность, патентная активность, когнитивные способности, индивидуализм, настойчивость

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