

Financial Policy of Innovation Development Providing: The Impact Formalization

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Anastasiia Samoilikova, ORCID: <https://orcid.org/0000-0001-8639-5282>

Assistant, Junior Researcher, Department of Finance and Entrepreneurship, Sumy State University, Sumy, Ukraine

Abstract

This paper deals with the study of world and European rankings for innovative development. It is emphasized that Ukraine ranks quite low compared to other countries and even its own last year's results. The dynamics of Ukraine's position in the Global Innovation Index, is presented for the period from 2009 to 2019. The paper focuses on the tendency that innovation activity and the high level of its financial support are concentrated mainly in individual countries and regions. In this regard, the relevance of the determining factors / indicators of the greatest influence and the reasons for the unsatisfactory state of innovation development in Ukraine is substantiated. The purpose of the study is to substantiate and formalize the impact of financial policy indicators to ensure innovative development on the overall level of innovative development. In addition, attention is paid to the functional relationship between the level of competitiveness and innovation capacity, a significant positive relationship between the indicators of the country's innovation capacity and the dynamism of business and financial system, and so on. Methodical tools are methods of correlation and regression analysis. As a result, some hypotheses have been confirmed, not confirmed or partially confirmed. The study empirically confirms and theoretically proves that the percentage of Gross Domestic Expenditure on Research and Development (GERD) in GDP, the share of Gross Domestic Expenditure on Research and Development (GERD) represented by the business sector and the share of Gross Domestic Expenditure on Research and Development (GERD) financed by business, the volume of domestic credit to the private sector and ease of regulation / resolution of insolvency - these indicators have a direct (positive), strong dependence and significance of correlation with the general level of innovative development.

Keywords: methods of correlation and regression analysis, financial policy, financial support, financial support, functional dependence, innovative development, innovation index, level of innovation, innovation rating.

JEL Classification: G18, G32, H50, O31, O32.

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Introduction

Innovation is the driving force behind economic growth and sustainable development in the context of growing uncertainty in the global economy (declining economic growth; increasing protectionism; increasing barriers for international trade, investing and mobility of labor; falling productivity growth, etc.) and political and legal instability. Ukraine's positions in world innovation rankings and its dynamic aren't satisfactory. Obviously financial policy plays a key role in innovation development. So, the aim of the research is to justify the impact of financial policy indicators of innovation development providing on the general innovation level. And the main task of research is formalizing the impact of financial policy indicators of innovation development providing on the general innovation level in different countries.

Literature Review

A number of Ukrainian and foreign scientists have studied theoretical and methodological approaches to research innovation activity, innovation development and other aspects of innovations, in particular, international innovation

development rankings and its indicators. The most innovative economies in the world were generalized by I. Ghosh (Ghosh, I., 2020). L. Smolij, A. Revutska and I. Novak investigated the influence of innovation factor in economic dynamics in Europe. They believe that the level of development of science, technology determines the position of countries in the global economy and determines the size of the gap between the levels of economic development (Smolij, L. et al., 2018). Development of the system of indicators for monitoring of innovative activity was studied by A.V. Gorin (Gorin, A.V., 2016). N.F. Crespob and C. Crespob applied a fuzzy-set qualitative comparative analysis to data from the Global Innovation Index. They defined two subsamples of countries (high-income and low-income) and found several causal combinations of conditions lead to high innovation (Crespob, N.F. and Crespob, C., 2016). R. Salahodjaev investigated factors and reasons, why Uzbekistan improved its position in the Global Innovation Index. It is important cause of Uzbekistan, as well, as Ukraine, is actively working to enter and improve its positions in international innovation rankings (Salahodjaev, R. 2019). L. Mamatova reviewed development of innovation activity of Ukraine in the international context. The author analyzed the current state and dynamics of innovation activity development in Ukraine according to international indices (Mamatova, L.Sh., 2018). Analysis of Ukraine's position in international innovation development rankings was conducted by S.M. Ilyashenko, Yu.S. Shipulina and N.S. Ilyashenko (Ilyashenko, S.M. et al., 2018). The EU Innovation Scoreboard and the definition of Ukraine's place in it were investigated by I.Yu. Yegorov (Yegorov, I.Yu., 2016). A. Halchuk determined a place of innovative potential of Ukraine in international economic rankings, too (Halchuk, A., 2016). But the issue of formalizing the impact of financial policy indicators of innovation development providing on general innovation level in different countries isn't investigated enough. There aren't such researches, connected with Ukraine, too.

Results

However, Ukraine occupies rather low places in comparison with other countries and even its own last year's results in ratings of the world and European economies in the sphere of innovation activity and innovation development (Table 1).

Table 1. Ukraine's place in the world and European rankings in the field of innovation activity and innovation development in 2019 (made by the author according to the data (Hollanders et al., 2019, Schwab, 2019, Schwab, 2018, Miller, 2019, Miller, 2018, The Global Innovation Index, 2018, The Global Innovation Index, 2019, Bloomberg Innovation Index, European Innovation Scoreboard))

Rating	Segmented countries	Ukraine's place/ total number of countries	Ranking gap (2019 compared to 2018)
The Global Innovation Index	World countries	47 / 129	↓ 4
The Bloomberg Innovation Index	World countries	56 / 60	↓ 3
European Innovation Scoreboard	EU members and selected third countries	36 / 36	–
The Global Competitiveness Index	World countries	85 / 141	↓ 2
The Index of Economic Freedom	World countries	147 / 180	↑ 3

Source: Compiled by the author.

Obviously, innovation activity and high level of its financial support are concentrated mainly in individual countries and regions (Table 2). Thus, it is quite difficult to reach innovation leaders, developed high-income countries for those countries that have medium (or generally low) level of income, in spite of innovative potential. Nowadays Ukraine applies to the lower middle-income countries according to the Global Innovation Index.

Table 2. Innovation leaders by income level and region in 2019 (made by the author according to the data (The Global Innovation Index, 2019))

Group of countries by income level	Innovation leaders	Region	Innovation leaders
High-income countries	Switzerland Sweden USA	Europe	Switzerland Sweden Netherlands
		North America	USA Canada
		Latin America and the Caribbean	Chile Costa Rica Mexico
The upper segment of middle-income countries	China Malaysia Bulgaria	Southeast Asia, East Asia and Oceania	Singapore Republic of Korea Cheap hotels in Hong Kong, China

Table 2 (cont.). Innovation leaders by income level and region in 2019 (made by the author according to the data (The Global Innovation Index, 2019))

The lower segment of middle-income countries	Vietnam Ukraine Georgia	Central and South Asia	India Iran Kazakhstan
		North Africa and West Asia	Israel Cyprus UAE
Low-income countries	Rwanda Senegal Tanzania	Sub-Saharan Africa	South Africa Kenya Mauritius

Source: Compiled by the author.

This situation actualizes the need for dynamic and structural-functional analysis of innovation rating indicators in order to substantiate global and national trends in this field, identify the factors of greatest impact and the causes of unsatisfactory state of innovation in Ukraine, based on world and European approaches and standards. It should be said that Ukraine ranks 85th among the 141 countries in the Global Competitiveness Index-2019. This place varies significantly in terms of individual indicators groups: institutions – 104; infrastructure – 57; macroeconomic stability – 133; health - 101; skills - 44; product market – 57; labor market – 59; financial system – 136; market size – 47; business dynamism – 85; innovative capability – 60 (Schwab, 2019). Suppose that the indicator of innovation capability has a significant impact on general competitiveness. According to the results of the study of the Global Competitiveness Index (Table 3), the hypothesis is confirmed by the obtained values of the correlation indicator (0.9131), which characterizes the high relationship between the innovative capability and competitiveness (direct, positive), determination factor (0,9038) and the Fisher coefficient (140,4843), confirming the significance of the established polynomial dependence, and the quality of the results of correlation and regression analysis (Table 4), carried out using the tools of Excel data analysis.

Table 3. Selected indicators of the Global Competitiveness Index-2019 (made by the author according to the data (The Global Competitiveness Report, 2019))

Ranking place	Country	Indicators according to the method of the Global Competitiveness Index, points					
		Summary score	Innovative capability	Business dynamism	Financial system	Market capitalization	Venture capital availability
1	Singapore	84,80	75,20	75,60	91,30	100,00	63,50
2	USA	83,70	84,10	84,20	91,00	100,00	70,60
3	Hong Kong	83,10	63,40	75,40	91,40	100,00	62,00
4	Netherlands	82,40	76,30	80,60	84,60	100,00	56,40
5	Switzerland	82,30	81,20	71,50	89,70	100,00	56,00
6	Japan	82,30	78,30	75,00	85,90	100,00	55,70
7	Germany	81,80	86,80	79,50	79,10	53,90	63,40
8	Sweden	81,20	79,10	79,40	88,00	100,00	56,40
9	United Kingdom	81,20	78,20	77,00	88,10	100,00	57,90
10	Denmark	81,20	76,20	80,00	86,80	100,00	45,60
11	Finland	80,20	75,80	78,10	89,70	95,20	68,80
12	Taiwan	80,20	80,20	73,10	88,40	100,00	51,40
13	Korea	79,60	79,10	70,50	84,40	97,80	40,50
14	Canada	79,60	74,00	76,50	87,10	100,00	50,10
15	France	78,80	77,20	71,40	85,90	93,20	53,70
16	Australia	78,70	69,50	75,30	85,90	100,00	42,30
17	Norway	78,10	68,00	76,90	82,00	61,50	48,40
18	Luxembourg	77,00	68,40	65,80	87,00	98,50	57,70
19	New Zealand	76,70	60,60	75,80	76,70	43,40	54,80
20	Israel	76,70	74,20	79,60	80,60	71,60	69,80
31	Estonia	70,90	52,10	69,90	65,20	10,20	47,10
32	Czech Republic	70,90	56,90	68,70	67,60	23,60	46,60
37	Poland	68,90	49,70	62,00	64,10	32,20	31,70
43	Russian Federation	66,70	52,90	63,10	55,70	38,90	29,30
47	Hungary	65,10	47,40	58,10	61,50	18,30	42,10
55	Kazakhstan	62,90	32,00	66,60	53,10	25,40	32,00
74	Georgia	60,60	32,70	62,20	56,20	1,10	26,30
85	Ukraine	57,00	40,00	57,00	42,00	4,00	39,20
140	Yemen	35,50	25,30	37,40	29,00	0,00	19,40
141	Chad	35,10	22,70	29,70	37,30	0,00	19,70

Source: Compiled by the author.

Table 4. Functional dependency between competitiveness level and innovation ability (calculated by the author)

Indicator	Correlation coefficient	Functional dependency	Determination factor (R ²)	Fisher coefficient (fact)	Fisher coefficient (table), α=0,05
Innovative capability	0,9131	$y = 0,0252x^2 - 1,78x + 54,783$	0,9038	140,4843	4,2

Source: Compiled by the author.

A number of indicators influence on the innovative capability level, too. We believe that there is a significant positive relationship between country's innovative capability and business dynamism and financial system (the input is shown in Table 3). The results of the hypothesis test are presented in Table 5.

Table 5. Functional dependency between country's innovation capability and business dynamism and financial system (calculated by the author)

Indicator	Correlation coefficient	Functional dependency	Determination factor (R ²)	Fisher coefficient (fact)	Fisher coefficient (table), α=0,05
Business dynamism	0,8453	$y = -0,104x^2 + 1,7171x + 6,1684$	0,7813	70,0747	4,2
Financial system	0,9268	$y = -0,0087x^2 + 1,8634x - 5,278$	0,8810	170,6198	4,2
-market capitalization	0,8831	$y = 0,0036x^2 + 1,4949x - 45,688$	0,7805	99,1592	4,2
- venture capital availability	0,8286	$y = -0,0042x^2 + 1,1069x - 3,3935$	0,6947	61,3548	4,2

Source: Compiled by the author.

So, business dynamism and financial system affect for the innovation capability significantly and positively. The high correlation coefficients characterize a close direct relationship. The regression analysis establishes a polynomial relationship between the studied parameters. Determined determination factor and F-statistics check the significant relationship and substantiate the quality of made calculations. Within the European countries Ukraine ranks last 36th according to the European Innovation Scoreboard. One of the key indicators, which are taken into account in the European Innovation Scoreboard, is the evaluation of financial support, the assessment of venture financing and the estimation of public expenditures for research and development (Table 6).

Table 6. Selected rating indicators of the European Innovation Scoreboard (made by the author according to the data (European Innovation Scoreboard, 2019))

Country	Summary Innovation Index	Finance and support	Venture capital	Public R&D expenditure
Switzerland	0,82	0,84	0,82	0,86
Sweden	0,71	0,68	0,46	0,91
Finland	0,70	0,71	0,54	0,87
Denmark	0,68	0,67	0,33	1,00
Netherlands	0,65	0,74	0,74	0,73
United Kingdom	0,62	0,64	0,92	0,36
Norway	0,62	0,72	0,51	0,94
Luxembourg	0,62	0,73	1,00	0,46
Belgium	0,62	0,68	0,60	0,75
Germany	0,61	0,63	0,39	0,86
Austria	0,60	0,53	0,20	0,85
Israel	0,57	0,45	0,00	0,45
Ireland	0,57	0,45	0,75	0,14
Iceland	0,57	0,65	0,00	0,65
France	0,54	0,80	0,96	0,63
Estonia	0,50	0,55	0,55	0,55
Portugal	0,47	0,47	0,42	0,53
Czech Republic	0,43	0,29	0,03	0,55
Slovenia	0,42	0,18	0,03	0,33
Cyprus	0,42	0,15	0,19	0,12
Spain	0,41	0,47	0,53	0,41
Malta	0,41	0,03	0,00	0,03

Country	Summary Innovation Index	Finance and support	Venture capital	Public R&D expenditure
Italy	0,41	0,33	0,29	0,36
Lithuania	0,39	0,32	0,20	0,45
Greece	0,39	0,28	0,11	0,45
Slovakia	0,33	0,15	0,05	0,25
Hungary	0,33	0,26	0,34	0,19
Latvia	0,32	0,61	1,00	0,21
Turkey	0,31	0,26	0,00	0,26
Serbia	0,31	0,23	0,02	0,43
Poland	0,29	0,22	0,24	0,20
Croatia	0,29	0,19	0,08	0,30
Bulgaria	0,23	0,10	0,16	0,03
Northern Macedonia	0,21	0,09	0,00	0,09
Romania	0,16	0,17	0,31	0,03
Ukraine	0,13	0,04	0,08	0,00

Source: Compiled by the author.

Let's examine the relationship between Summary Innovation Index and some financial policies indicators of innovation development providing by conducting a correlation-regression analysis, the results of which are summarized in Table 7.

Table 7. Functional dependency between Summary Innovation Index and some financial policies indicators of innovation development providing (prepared by the author)

Indicator	Correlation coefficient	Functional dependency	Determination factor (R ²)	Fisher coefficient (fact)	Fisher coefficient (table), α=0,05
Finance and support	0,8629	$y = 1,246x - 0,1514$	0,7446	99,1112	4,13
Venture Capital	0,5195	$y = 0,9829x - 0,0979$	0,2699	12,5882	4,13
Public R&D expenditure	0,8329	$y = 1,4509x - 0,2206$	0,6936	79,9885	4,13

Source: Compiled by the author.

Thus, there is a direct correlation between Summary Innovation Index and the indicator of finance and support. The correlation coefficient is high (0.8629), indicating a strong relationship. The determination factor (0.7446) and Fisher coefficient (99.1112 exceeds the table value of 4.13) indicate the significance of the result. A similar conclusion can be drawn regarding the relationship between the Summary Innovation Index and public R&D expenditure (direct, strong, meaningful relationship). Instead, the relationship between Summary Innovation Index and the venture capital is straight and moderate (correlation coefficient 0.5195), insignificant cause of determination factor is 0.2699, which indicates the low value of the obtained result. In continuation of the research we consider the Global Innovation Index, which is a leading ranking of the world economies, covers multidimensional aspects of innovation. It is based on the assessment of innovation opportunities, represented by about eighty indicators, grouped in two subindices: 1) sub-index of innovative input: a) institutes; b) human capital and scientific research; c) infrastructure; d) the level of market development; e) complexity of business; 2) sub-index of innovative output: a) science-intensive and techno-intensive products (knowledge and technologies outputs); b) products of creative work (creative outputs). Accordingly, each sub-indexes component contains a number of individual indicators. In 2019 Ukraine ranked 47th among 129 world countries (32nd among 39 European countries), down 4 points compared to 2018. In some areas Ukraine occupies the following positions (the highest possible result - 1 among 129): knowledge and technology results – 28th; creative results – 42nd; complexity of business – 47; human capital and research – 51st; level of market development – 90th; institutes – 96th; infrastructure – 97th (The Interactive Database of the GII 2019 Indicators). We conclude that the institutional and infrastructure components, as well as the level of market development, are the weakest sides of Ukraine on the way to achieve a decent level of innovation. The dynamics of Ukraine's position in the Global Innovation Index from 2009 to 2019 is presented in Figure 1.

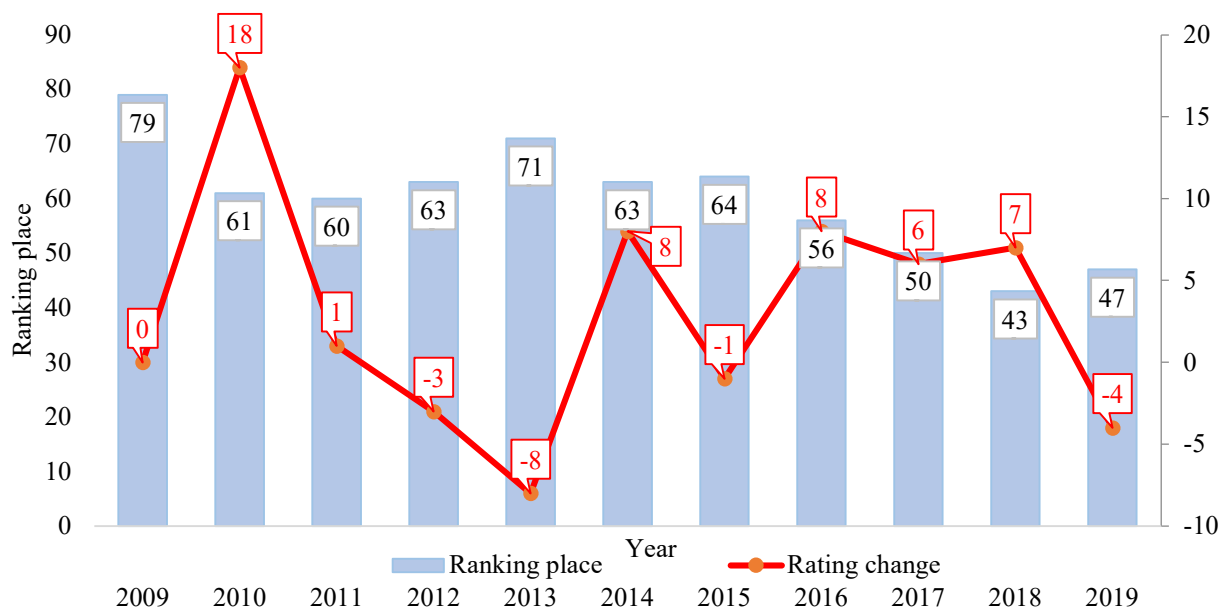


Figure 1. Dynamics of Ukraine's position in the Global Innovation Index (made by the author according to the data (Past Reports of the Global Innovation Index))

Source: Compiled by the author.

In general, the trend is ambiguous: in 2009-2011 there was a significant improvement, in 2012-2014 – decline, in 2014-2018 – improvement, in 2018-2019 – decline. It can be explained by the systemic crisis in Ukraine in 2014, socio-economic and the political instability of 2018-2019 and the corresponding negative consequences of these developments in the economic and innovation spheres. Investigating the factors influencing the innovation development level, we consider that the priority, high importance is given to the financial support of innovation activity and its structure. Some selected indicators of the Global Innovation Index-2019 are presented in Table 8.

Table 8. Selected indicators of the Global Innovation Index-2019, which characterize the financial support of innovation development and its structure (made by the author according to the data (The Global Innovation Index, 2019, The Interactive Database of the GII 2019 Indicators))

Ranking place	Country	Overall score, points	Score on individual indicators, points										
			Gross expenditure on R&D (GERD)	GERD performed by business enterprise	GERD financed by business enterprise	Ease of getting credit	Domestic credit to private sector	Venture capital deals	Ease of protecting minority investors	GERD financed by abroad	Ease of resolving insolvency	Market capitalization	Foreign direct investment
1	Switzerland	67,2	73,7	60,8	81,1	60,0	85,6	39,5	50,0	19,4	62,7	100,0	65,5
2	Sweden	63,7	73,8	61,2	73,2	55,0	63,8	27,0	68,3	12,7	79,5	-	54,1
3	USA	61,7	61,1	52,0	81,2	95,0	94,1	100,0	64,7	11,7	90,9	65,4	52,9
4	Netherlands	61,4	43,6	29,9	66,4	45,0	53,6	30,7	58,3	26,5	84,3	47,8	84,4
5	United Kingdom	61,3	36,4	28,7	66,1	75,0	65,9	76,3	75,0	29,7	80,3	-	57,0
6	Finland	59,8	60,2	45,7	72,8	65,0	44,9	38,4	58,3	23,1	92,8	-	57,4
7	Denmark	58,4	67,5	50,8	74,7	70,0	80,6	38,0	66,7	16,9	85,1	-	50,5
8	Singapore	58,4	47,0	33,5	69,1	75,0	61,9	50,2	80,0	13,0	74,3	96,8	79,0
9	Germany	58,2	66,2	53,4	83,3	70,0	36,4	20,0	58,3	11,2	90,1	22,1	51,7
10	Israel	57,4	100,0	100,0	44,3	65,0	30,5	89,3	73,3	95,1	72,7	30,1	56,2
11	Korea	56,6	99,5	91,8	97,4	65,0	70,2	6,3	73,3	2,3	83,0	41,8	49,3
12	Ireland	56,1	22,6	18,7	62,6	70,0	19,6	33,5	75,0	45,1	79,1	17,0	91,5
13	Hong Kong	55,5	17,2	9,0	63,8	75,0	100,0	14,0	78,3	8,4	65,7	100,0	100,0
14	China	54,8	46,3	41,9	97,7	60,0	75,8	19,5	60,0	1,2	55,8	29,4	51,5
15	Japan	54,7	69,9	64,1	100,0	55,0	82,0	3,0	60,0	1,2	93,5	48,7	48,5
16	France	54,2	47,7	36,1	69,0	50,0	48,4	56,9	66,7	14,5	74,1	39,8	51,7

Ranking place	Country	Overall score, points	Score on individual indicators, points										
			Gross expenditure on R&D (GERD)	GERD performed by business enterprise	GERD financed by business enterprise	Ease of getting credit	Domestic credit to private sector	Venture capital deals	Ease of protecting minority investors	GERD financed by abroad	Ease of resolving insolvency	Market capitalization	Foreign direct investment
17	Canada	53,9	36,7	20,8	52,3	85,0	-	100,0	78,3	20,7	81,5	54,1	53,3
18	Luxembourg	53,5	27,2	17,2	60,1	15,0	50,6	49,9	48,3	6,4	45,5	42,1	91,8
19	Norway	51,9	45,6	28,0	55,2	55,0	71,0	5,5	75,0	18,1	85,4	25,5	44,1
20	Iceland	51,5	46,9	35,2	46,5	60,0	42,5	52,6	70,0	46,7	81,8	-	0,0
21	Austria	50,9	41,8	56,3	69,0	55,0	39,6	6,9	68,3	30,5	77,5	11,7	40,3
23	Belgium	50,2	56,5	44,8	74,8	65,0	30,6	19,7	61,7	31,5	83,9	37,0	42,9
24	Estonia	50,0	28,7	15,8	61,5	70,0	30,7	28,6	56,7	25,9	62,5	-	52,7
26	Czech Republic	49,4	39,0	28,6	50,2	70,0	23,2	1,1	58,3	47,7	80,0	-	55,1
30	Italy	46,3	29,5	21,2	66,5	45,0	38,4	9,3	58,3	18,7	77,3	9,8	49,3
31	Slovenia	45,3	40,3	35,1	88,4	45,0	19,8	3,1	70,0	19,4	83,7	3,7	54,3
33	Hungary	44,5	29,4	25,1	72,0	75,0	14,0	2,3	50,0	31,6	55,0	6,2	69,3
34	Latvia	43,2	10,9	3,5	27,5	85,0	27,5	13,1	63,3	53,0	59,6	-	53,2
37	Slovakia	42,0	19,0	12,1	59,0	70,0	27,4	1,1	53,3	20,4	66,9	5,1	56,5
38	Lithuania	41,5	19,2	8,1	49,8	70,0	18,0	2,4	66,7	36,6	46,9	-	52,8
39	Poland	41,3	22,4	17,0	67,8	75,0	23,6	5,3	61,7	10,5	76,5	12,4	54,1
40	Bulgaria	40,3	16,6	13,7	55,7	65,0	22,7	-	68,3	65,3	57,5	4,7	55,8
46	Russian Federation	37,6	24,0	16,9	38,5	80,0	23,7	0,1	61,7	4,9	58,6	15,4	51,3
47	Ukraine	37,4	9,5	6,6	38,4	75,0	16,5	1,7	58,3	46,5	31,7	7,9	54,4
48	Georgia	37,0	6,3	-	-	85,0	28,7	-	81,7	28,0	56,0	-	66,9
50	Romania	36,8	10,7	7,2	63,1	80,0	10,5	0,3	60,0	18,9	59,9	1,5	53,8
58	Moldova	35,5	6,3	1,4	22,8	70,0	10,8	-	68,3	7,1	54,1	-	52,6
72	Belarus	32,1	12,6	10,1	54,9	55,0	10,5	-	63,3	26,8	52,6	-	53,3
79	Kazakhstan	31,0	2,8	1,6	50,6	65,0	12,2	0,3	85,0	2,9	67,8	9,3	59,4
84	Azerbaijan	30,2	3,7	0,3	40,9	80,0	8,3	-	81,7	0,1	63,8	-	63,2
100	Tajikistan	26,4	2,2	-	2,0	40,0	4,1	-	66,7	0,4	30,9	-	54,9
104	Honduras	25,5	0,0	-	-	85,0	26,1	-	41,7	-	32,1	-	58,6
113	Algeria	24,0	11,4	0,9	8,5	10,0	9,7	-	35,0	0,0	49,2	-	48,6
125	Guinea	19,5	-	-	-	30,0	2,0	-	40,0	-	39,1	-	62,4
129	Yemen	14,5	-	-	-	0,0	0,0	-	53,3	-	25,9	-	44,6

Source: Compiled by the author.

Let's analyze the dependency and impact of the indicators in Table 8 on summary innovation level in the world countries (according to the method of calculating the Global Innovation Index), establishing functional dependence, calculating correlation coefficients, determination factors, Fisher coefficients, substantiating the importance of dependence (Table 9).

Table 9. Functional dependency between summary innovation level in the world countries and financial policy indicators of innovation development providing (calculated by the author)

Indicator	Correlation coefficient	Functional dependency	Determination factor (R ²)	Fisher coefficient (fact)	Fisher coefficient (table), α=0,05
Gross expenditure on R&D (GERD)	0,8029	y=1,6461x-42,138	0,6446	78,0016	4,07
GERD performed by business enterprise	0,7338	y=4141x-38,664	0,5384	50,1583	4,07
GERD financed by business enterprise	0,7797	y=1,6418x-20,901	0,6079	66,6551	4,07
Ease of getting credit	0,2976	y=0,4609+41,116	0,0885	4,1773	4,07
Domestic credit to private sector	0,7510	y=1,5981x-37,16	0,5641	55,6395	4,07
Venture capital deals	0,6293	y=0,0389x ² -1,9221x+20,433	0,4554	28,1915	4,07
Ease of protecting minority investors	0,2821	y=0,2473+52,357	0,0796	3,7175	4,07
GERD financed by abroad	0,2609	y=0,4039+2,4298	0,0681	3,1400	4,07

Table 9 (cont.). Functional dependency between summary innovation level in the world countries and financial policy indicators of innovation development providing (calculated by the author)

Ease of resolving insolvency	0,7541	$y=1,0617x+17,691$	0,5687	56,7073	4,07
Market capitalization	0,5506	$y=0,0362x^2-1,8775x+23,134$	0,3555	17,7081	4,07
Foreign direct investment	0,1436	$y=0,1734x+48,656$	0,0206	0,9049	4,07

Source: Compiled by the author.

Thus, analyzed indicators of financial policy of innovation development providing have a priority importance in the overall assessment of the level of innovation activity and development. Percentage of gross R&D expenditures in the GDP structure, share of GERD performed by business enterprise and the share of GERD financed by business enterprise, the volume of domestic credit to private sector, and ease of regulation / resolution of insolvency issues, – these indicators have a direct (positive), strong dependence (based on the obtained correlation coefficient values) and a significance of the correlation (determination factor is greater than 0.5) with summary innovation level. A direct (positive) and strong relationship (correlation coefficient is more than 0.5) was established for indicators such as venture capital agreements and market capitalization. But a determination factor is less than 0.5, so the significance of this relationship is negligible. For other indicators the correlation with summary innovation level is direct (positive), but weak, and it is justified that the significance of the link in these cases is negligible.

Conclusions

The general results of impact formalization of the financial policy indicators of innovation development providing on the summary innovation level in the world countries are presented in Table 10.

The following hypotheses were confirmed: 1) increasing the percentage of GERD in the GDP structure contributes the development of innovative activity; 2) increasing GERD performed by business enterprise encourages an increase of the innovation level; 3) increasing GERD financed by business enterprise contributes the expansion of innovative development opportunities; 4) increasing the volume of domestic credit to private sector facilitates their implementation; 5) simplicity of solution of insolvency is a guarantee of fast recovery of solvency, which is a prerequisite for stable innovative development; 6) the development of the financial system helps to increase innovation activity.

The following hypotheses were partially confirmed: 1) increasing venture financing is a catalyst for innovation; 2) increasing market capitalization is the basis for innovation expansion.

Accordingly, the rest of the hypotheses have not been confirmed: 1) simplification of getting credit will increase the financial capacity of innovators; 2) the guarantee degree of protecting minority investors will stimulate innovation and investment activity; 3) increasing GERD financed by abroad will enhance innovative development opportunities; 4) growth of foreign direct investment will stimulate innovation.

Table 10. Results of impact formalization of financial policy indicators on the general level of countries innovative development (developed by the author)

Hypothesis / Expected Dependency	Indicators	Correlation coefficient	Type of dependency (regression equation)	Determination factor	Fisher coefficient	Importance of dependency	Result of hypothesis confirmation
Increasing the percentage of GERD in the GDP structure contributes the development of innovative activity / positive	Gross expenditure on R&D (GERD)	0,8029	$y=1,6461x-42,138$	0,6446	78,0016	considerable	confirmed
Increasing GERD performed by business enterprise encourages an increase of the innovation level / positive	GERD performed by business enterprise	0,7338	$y=4141x-38,664$	0,5384	50,1583	considerable	confirmed
Increasing GERD financed by business enterprise contributes the expansion of innovative development opportunities / positive	GERD financed by business enterprise	0,7797	$y=1,6418x-20,901$	0,6079	66,6551	considerable	confirmed
Simplification of getting credit will increase the financial capacity of innovators / positive	Ease of getting credit	0,2976	$y=0,4609+41,116$	0,0885	4,1773	minor	not confirmed
Increasing the volume of domestic credit to private sector facilitates their implementation / positive	Domestic credit to private sector	0,7510	$y=1,5981x-37,16$	0,5641	55,6395	considerable	confirmed
Increasing venture financing is a catalyst for innovation	Venture capital deals	0,6293	$y=0,0389x^2-1,9221x+20,433$	0,4554	28,1915	minor	partially confirmed
	Venture capital availability	0,8286	$y=-0,0042x^2+1,1069x-3,3935$	0,6947	61,3548	considerable	
Guarantee degree of protection of minority investors will stimulate innovation and investment activity / positive	Ease of protecting minority investors	0,2821	$y=0,2473+52,357$	0,0796	3,7175	minor	not confirmed
Increasing GERD financed by abroad will enhance innovative development opportunities / positive	GERD financed by abroad	0,2609	$y=0,4039+2,4298$	0,0681	3,1400	minor	not confirmed
Simplicity of solution of insolvency is a guarantee of fast recovery of solvency, which is a prerequisite for stable innovative development / positive	Ease of resolving insolvency	0,7541	$y=1,0617x+17,691$	0,5687	56,7073	considerable	confirmed
Growth of foreign direct investment will stimulate innovation / positive	Foreign direct investment	0,1436	$y=0,1734x+48,656$	0,0206	0,9049	minor	not confirmed
Increasing market capitalization is the basis for the innovation expansion / positive	Market capitalization (by GII)	0,5506	$y=0,0362x^2-1,8775x+23,134$	0,3555	17,7081	minor	partially confirmed
	Market capitalization (by GCI)	0,8831	$y=0,0036x^2+1,4949x-45,688$	0,7805	99,1592	considerable	
Development of financial system helps to increase innovation activity / positive	Financial system	0,9268	$y=-0,0087x^2+1,8634x-5,278$	0,8810	170,620	considerable	confirmed

References

1. Bloomberg Innovation Index. Available at: <https://www.bloomberg.com/news/articles/2020-01-18/germany-breaks-korea-s-six-year-streak-as-most-innovative-nation> Accessed 20 February 2020.
2. Crespob, N.F., Crespob, C. (2016). Global innovation index: Moving beyond the absolute value of ranking with a fuzzy-set analysis. *Journal of Business Research*, Volume 69, Issue 11, p. 5265-5271. <https://doi.org/10.1016/j.jbusres.2016.04.123>
3. European Innovation Scoreboard. Available at: https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en Accessed 06 March 2020.
4. Ghosh, I. (2020). Ranked: The Most Innovative Economies in the World. Available at: <https://www.visualcapitalist.com/world-most-innovative-economies/> Accessed 10 March 2020.
5. Gorin V.A., 2016. Development of the system of indicators for monitoring of innovative activity. *Russian Journal of Agricultural and Socio-Economic Sciences*, 60(12), 123-129. Available at: <http://cyberleninka.ru/article/n/development-of-the-system-of-indicators-for-monitoring-of-innovative-activity> Accessed 10 March 2020.
6. Hal'chuk, A.A. (2016) Mistse innovatsiynoho potentsialu ukrayiny v mizhnarodnykh ekonomichnykh reytynhakh. *Investytsiyy: praktyka ta dosvid*, № 8, 70-72 [Halchuk, A. Place of Innovative Potential of Ukraine in International Economic Rankings. *Investments: Practice and Experience*, No. 8, 70-72.]. Available at: http://www.investplan.com.ua/pdf/8_2016/16.pdf Accessed 10 March 2020
7. Hollanders, H., Es-Sadki, N., Merkelbach I. (2019). *European Innovation Scoreboard 2019. Luxembourg: Publications Office of the European Union*. 95 p. Available at: <https://ec.europa.eu/growth/sites/growth/files/ris2019.pdf>
8. Ilyashenko, S.M., Shypulina YU.S., Ilyashenko N.S. (2018). Analiz pozytsiy Ukrainy u mizhnarodnykh reytynhakh innovatsiynoho rozvytku. *Stalyy rozvytok — XXI stolittya: upravlinnya, tekhnolohiyi, modeli. Diskusiyi 2018: kolektyvna monohrafiya / M.A. Minenko, V.I. Bendyuh, B.M. Komarysta ta in. / za nauk. red. prof. YE.V. Khlobystova*. Kyiv: NTUU «Kyyivs'kyi politekhnichnyy instytut imeni Ihorya Sikors'koho»; Natsional'nyy universytet «Kyyevo-Mohylyans'ka akademiya»; Vyshcha ekonomiko-humanitarna shkola, 183-195. [Ilyashenko, S.M., Shipulina Y.S., Ilyashenko N.S. (2018). Analysis of Ukraine's position in international innovation development rankings. *Sustainable development - 21st century: management, technologies, models. Discussions 2018: a collective monograph / MA Minenko, VI Bendyug, B.M. Komarista and others. / for science. ed. prof. EV Khlobystova*. Kyiv: NTUU "Igor Sikorsky Kyiv Polytechnic Institute"; National University "Kyiv-Mohyla Academy"; Higher School of Economics and Humanities, 183-195.]. Available at: [https://essuir.sumdu.edu.ua/bitstream-download/123456789/70781/1/Illiaschenko_Shipulina_Illiaschenko_Nedin_2018.pdf;jsessionid=614F4DC6EEC06B2713A1A1A090236F83](https://essuir.sumdu.edu.ua/bitstream/download/123456789/70781/1/Illiaschenko_Shipulina_Illiaschenko_Nedin_2018.pdf;jsessionid=614F4DC6EEC06B2713A1A1A090236F83) Accessed 10 March 2020.
9. Mamatova, L. Sh. (2018). Rozvytok innovatsiynoyi diyal'nosti Ukrainy v mizhnarodnomu konteksti. *Reporter of The Priazovskyi State Technical University, Section: Economic sciences, Issue 36, 279-291*. [Mamatova, L. (2018). Development of innovation activity of Ukraine in the international context. *Reporter of The Priazovskyi State Technical University, Section: Economic Sciences, Issue 36, 279-291*]. Available at: <http://eir.pstu.edu/bitstream/handle/123456789/23400/42.pdf?sequence=1> Accessed 10 March 2020.
10. Miller, T., B. Kim, A., M. Roberts, J. (2019). 2018 Index of Economic Freedom. *Washington: The Heritage Foundation*. 492 p.
11. Miller, T., B. Kim, A., M. Roberts, J. (2019). 2019 Index of Economic Freedom. 25th Anniversary Edition. *Washington: The Heritage Foundation*. 496 p.
12. Past Reports of the Global Innovation Index. Available at: <https://www.globalinnovationindex.org/about-gii#reports> Accessed 20 February 2020.
13. Salahodjaev, R. (2019). Why Should Uzbekistan Improve its Position in the Global Innovation Index? Available at: <https://cabar.asia/en/why-should-uzbekistan-improve-its-position-in-the-global-innovation-index/> Accessed 10 March 2020.

14. Schwab, K. (2018). World Economic Forum. The Global Competitiveness Report 2018. Geneva. 671 p. Available at: http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf
15. Schwab, K. (2019). World Economic Forum. The Global Competitiveness Report 2019. Geneva. 666 p. Available at: <https://www.weforum.org/reports/how-to-end-a-decade-of-lost-productivity-growth>
16. Smolij, L. Revutska, A, Novak, I. (2018). Influence of Innovation Factor in Economic Dynamics in Europe. *Marketing and Management of Innovations*, 1, 247-258. DOI: 10.21272/mmi.2018.1-18
17. The Global Innovation Index 2018: Energizing the World with Innovation (2018). Cornell University, INSEAD, and WIPO: Ithaca, Fontainebleau, and Geneva. 429 p. Available at: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2018.pdf
18. The Global Innovation Index 2019: Creating Healthy Lives – The Future of Medical Innovation (2019). Cornell University, INSEAD, and WIPO: Ithaca, Fontainebleau, and Geneva. 451 p.
19. The Interactive Database of the GII 2019 Indicators. Available at: <https://www.globalinnovationindex.org/analysis-indicator> Accessed 06 March 2020.
20. Yehorov, I.YU. (2016) Innovatsiyne tablo YES ta vyznachennya mistysya u n'omu Ukrayiny. Visnyk NAN Ukrayiny, № 5, 87-91. [Yegorov, I.Yu. (2016) The EU Innovation Scoreboard and the definition of Ukraine's place in it. Visnyk of the National Academy of Sciences of Ukraine, No. 5, 87-91.] Available at: <http://dspace.nbu.gov.ua/bitstream/handle/123456789/104822/24-Egorov.pdf?sequence=1> Accessed 10 March 2020