

STRATEGIC ANALYSIS OF INNOVATION- BASED COMPETITIVENESS IN THE GLOBAL ECONOMY

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Abstract

In the context of a sustainable development of national economy under the globalization, the innovation-based competitiveness becomes an effective instrument for achieving strategic goals at macro-level. The strategic analysis of innovation-based competitiveness determinants is an important condition of creation an up-to-date national economy model at globalized highly competitive environment.

The main purpose of research is to give more specific understanding of innovation competitiveness policy at macro-level by defining the determinants of innovation-based competitiveness for efficiency-driven economies with econometric methods and strategic analysis tools. The research is based on the data generated from Global Innovation Index (INSEAD), Global Competitiveness Index (World Economic Forum), analyzed with STATISTICA 7.0 software. Obtained result allows to determine the strategic priorities for governments and firms.

Strategic analysis of innovative capacity revealed critical gaps for the most important determinants of Ukraine's competitiveness. The strengthening of competitive position may be realized through systemic overcoming the critical lags and threats, simultaneously with creation the competitive edges. It is proposed to determine the strategic goals to enhance competitiveness by using the scenario method.

Key words: *global competitiveness, innovative capacity, competitive edges, strategic analysis, strategic goals, scenario method.*

1. Introduction

In the current unstable economic environment and increased impact of global risks it is the only way to ensure economic growth and competitiveness of countries with the requirements of sustainable development based on innovative competition. Effective methodological tool for analyzing competitive factors as sources of competitive advantage is the *resource-based view* – RBV, founded by Ricardo (1821), Schumpeter (1827), Penrose (1959), Pfeffer and Salancik (1978) and developed by Wernerfelt (1984), Rumelt (1987), Teece (1990), Corner and Prahalad (1996) etc. From the beginning of XXI century *resource-based theory* became the basis of economic analysis, strategic management and strategic planning. Kleiner (2002) being based on J. Kornai (2002) system paradigm, justified the possibility to apply the resource theory to all economic systems both of micro and macro level.

Resource theory assumes that competitive advantage is determined by resources and the ability to use them effectively. Fagerberg and Srholec (2007) have shown the role of national innovation systems and innovative potential as sources of countries' competitive advantage. In line with the resource theory they analyse the role of capabilities for economic development of countries and identifies four different types of capabilities: the development of the "innovation

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system”, the quality of “governance”, the character of the “political system” and the degree of “openness” of the economy. The regression analysis results, obtained by Fagerberg and Srholec, reveal that innovation systems and governance are shown to be of particular importance for economic development. Works of Kogut (2000), Hamel (2002), Venkatraman and Subramaniam (2002) focus on the role of resource theory in terms of the knowledge economy and network connections.

Porter (2004) in his stage competition concept showed that competitive advantage is affected by factors that have different nature and mechanisms of action. The factors driving competitiveness together with specific competitive advantages determine the country’s economic model. In line with this concept World Economic Forum presents: factor-driven economies, efficiency-driven economies and innovation-driven economies. Furthermore, there are two groups of transition: from the first stage to the second, and from the second stage to the third. In a knowledge economy innovative resources (technology, infrastructure, intellectual resources, knowledge workers) and institutional conditions and organizational capacity for their effective use (regulatory policies, business climate, new business models, quality management) acquire high priority. Sustainable development and respect for the principles of responsibility also become an important determinant of innovation competitiveness. The research focus of the paper is to identify priority areas increasing Ukraine’s competitiveness in the global environment by improving innovative capacity, creating and strengthening the innovative competitive advantages.

2. Defining the specific determinants of country’s innovative competitiveness

At present Porter’s stage competition model requires some modifications, in which all countries must introduce elements of innovative model of competitiveness. Another path leads to the conservation of old policies and the inhibition of development in the long run, to significant reduction in global competitiveness and loss of competitive position in the geo-economic space. The role of innovation components in the overall economic model and impact of innovative factors on competitiveness determines the type of competitiveness model (innovation-based, traditional or mixed). Identification of competitiveness factors and competitive advantages specific to certain countries requires profound study of national innovative capacity.

Porter (2004) defines national innovative capacity as a country’s potential to produce a stream of commercially relevant innovations. He analyses the determinants of national innovative capacity at the context of global competitiveness. Innovative capacity is not simply the realized level of innovation, but it also aims to measure the fundamental conditions that create the environment for innovation in a country. A comprehensive strategic analysis of national innovative capacity determinants enables to formulate strategic goals at the macro-level, depending on the internal and external conditions, and identify ways to achieve them.

Detailed structure of components of countries’ innovative capacity and its assessments with appropriate indexes provide international analytical institutions – International Business School INSEAD (Global Innovation Index), EFD – Global Consulting Network (Innovation Capacity Index), Boston Consulting Group (Global Innovation Index BCG) etc.

The analysis data is generated by Global Innovation Index INSEAD (GII), calculated since 2007 on the basis of 132 countries. Author of Global Innovation Index Sumitra Dutta (2012) underlines the key role of innovation potential and innovation policy, as a leading driving force of modern changes, engine development and well-being. The GI consists of seven pillars: *Institutions, Human Capital and research, Infrastructure, Market Sophistication, and Business Sophistication, Knowledge and technology output, and Creative output*. The pillars are divided into 21 sub-pillars (composite indicators) and 84 individual indicators, which discover different aspects of innovation-based development and are obtained from databases of World Bank, World Economic Forum, WIPO, UNESCO etc.

Dynamics of the Global Competitiveness Index of Ukraine does not demonstrate satisfactory resistance to the negative impact of external environment. The global financial crisis led to fall in the WEF rankings by more than 10 points and moved Ukraine back into WEF classification

to transitional stage from factor-driven to efficiency-driven economies. Only in 2012 Ukraine regained the competitive position and returned to the group of 33 efficiency-driven economies. A strategic goal of sustaining long-run competitiveness can be reached through the development of innovative capacity.

Ukraine takes 63rd position in the Global Innovation Index-2012 ranking. The worst position is Institutions (117 rank), including Business environment (137 rank). Weak statement is in Ecological Sustainability (110 rank), General infrastructure (98 rank) etc. Competitiveness of country is the function of determinants of national innovative capacity. The set of determinants varies for groups of countries, depending on the stage of competitive development. The adequate definition of specific determinants of national innovative capacity for countries with different economic models is the problem to resolve.

The analysis of efficiency-driven economies was conducted by the author to determine the impact of key factors (components of innovation potential) on the competitiveness.

Regression analysis performed by the author made possible to estimate the effects of innovative capacity determinants on global competitiveness. In the model, dependent variable Y measures competitiveness of countries with WEF Global Competitiveness Index. Independent variables X_i ($i=1... N$; $N=21$) are presented by 21 GII INSEAD composite indicators: *Political environment*; *Regulatory environment*; *Business environment*; *Education*; *Tertiary education*; *Research & development*; *Information & Communication technologies (ICT)*; *General infrastructure*; *Ecological sustainability*; *Credit*; *Investment*; *Trade and competition*; *Knowledge workers*; *Innovation linkages*; *Knowledge absorption*; *Knowledge creation*; *Knowledge impact*; *Knowledge diffusion*; *Creative intangibles*; *Creative goods & services*; *Online creativity*.

The sample includes 27 efficiency-driven economies: Albania, Armenia, Bosnia and Herzegovina, Bulgaria, China, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Georgia, Guatemala, Indonesia, Jamaica, Jordan, Macedonia FYR, Mauritius, Montenegro, Morocco, Namibia, Paraguay, Peru, Romania, Serbia, South Africa, Swaziland, Thailand, Ukraine. Six countries not included into Global Innovation Index are omitted.

The correlation matrix showed different degrees of correlation between Y and X_i . For regression analysis eight dependent variables with correlation coefficient of 0,3 and above were selected. These variables are: X_6 *Research & development*, X_7 *ICT*, X_8 *General infrastructure*, X_9 *Ecological sustainability*, X_{11} *Investment*, X_{15} *Knowledge absorption*, X_{17} *Knowledge impact*, X_{19} *Creative intangibles*.

In regression analysis forward stepwise method has been used. Table 1 presents Summary statistics for dependent variable Y: Global competitiveness.

Table 1: Summary statistics for dependent variable Y

Statistic	Value
Multiple R	0,84592
Multiple R ²	0,71559
Adjusted R ²	0,64787
F(5,21)	10,56726
p	0,00004
Std. Err. of Estimate	0,18633

The correlation coefficient R demonstrates strong relationship between Y and X variables. Coefficient of determination R² means that independent variables explain about 70% of variability. F-statistics and p-value show that the model is statistically significant. The regression summary results, presented in Table 2, show the main effect results of determinants of innovative capacity *General infrastructure*, *Creative intangibles*, *Ecological sustainability*, *Investment*, *Information & Communication Technologies (ICT)* on Global Competitiveness Index.

The B coefficient indicates a positive relationship of X variables with Y variable. The variables *General infrastructure*, *Creative intangibles* and *Investment* are significantly correlated with *Global competitiveness*. *Ecological sustainability* and *Information & Communication Technologies* have less significant effect to competitiveness.

Table 2: Regression summary results for dependent variable Y

Variables	Beta	Std. Err.	B	Std. Err.	t(21)	p-level
Intercept			2,43810	0,27261	8,94360	0,00000*
X8 General infrastructure	0,49991	0,13662	0,02068	0,00565	3,65918	0,00146*
X19 Creative intangibles	0,34495	0,11826	0,01126	0,00386	2,91692	0,00824*
X9 Ecological sustainability	0,19849	0,13754	0,00468	0,00324	1,44313	0,16374
X11 Investment	0,28265	0,13816	0,00515	0,00252	2,04592	0,05349**
X7 ICT	0,15521	0,13685	0,00563	0,00496	1,13411	0,26953

*p< 0,05

**p< 0,06

The regression model was obtained for efficiency-driven economies:

$$Y=2,43810+0,02068 X8+0,01126 X19+0,00468 X9+0,00515 X11+0,00563X7$$

For better understanding the content of innovative capacity determinants it is necessary to make decomposition of composite indicators. Thus *General infrastructure* includes the indicators of energy (electricity) output consumption; quality of trade; transport infrastructure and gross capital formation. *Creative intangibles* consists of number trademark registered/bn PPP\$ GDP; ICT business model creation; ICT organizational model creation. *Investment* means ease of protecting investors; market capitalization as % GDP; total value of stock traded, % GDP; and venture capital deals/tr PPP\$ GDP. *Ecological sustainability* indicators are: GDP /unit of energy use, 2000 PPP\$/kg oil eq; Environmental Performance Index calculated by Yale University and Columbia University; ISO 14001 environmental certificates/bn PPP\$ GDP. *ICT* includes ICT access; ICT use; Government's online service; UN E-participation Index. The general scores combine qualitative and quantitative estimates.

In this connection, awareness of the priority of energy independence acquires particular importance for Ukraine competitiveness. Implementing ICT business and organizational models is important for competitiveness. Investment support is crucial at the context of transition to a new model.

3. Competitive advantages and critical gaps: strategy for Ukraine

Develop strategic measures to increase competitiveness must be preceded by an analysis of factors of competitiveness in the context of identifying Ukraine's competitive advantages and critical gaps. It is possible to apply the strategic analysis method to examine Ukraine's innovation potential in the context of innovative competitiveness at the basis of data from Global Innovation Index-2012 (table 3). The factors which place the country into the first half of the ranking, are referred to competitive advantage: the first quarter of Global Innovation Index rating includes factors for which Ukraine has a real competitive advantage; the features related to potential competitive advantage are in second quarter ranking. weakness factors take third quarter rating; threat factors are at the last quarter ranking. In its turn, factors whose scores are in the third quarter rankings should be considered as lagging behind the average level. Conservation of such lagging constitutes a potential threat to competitiveness. In the last quarter of Global Innovation Index rating are the critical lags, hindering development and constitutes a real threat to competitiveness.

The results of analysis found that *Knowledge creation* is the only Ukraine's real competitive edge. This composite indicator includes data on domestic and PCT (Patent Cooperation Treatment) resident patents, utility models, scientific and research articles.

Also there are a number of potential advantages mainly connected with education and knowledge. It determines possibility to increase competitiveness, but do not look in the best way. Ukraine lost its 15th rank in *Education* as well as 20th rank in knowledge absorption took in previous year; worsened the positions by indicators *Knowledge workers* and *Knowledge diffusion*. It should be noted that an advantage in education and quality of human resources is the most significant for Ukraine. It is seen as strategic one in terms of innovation economy model creation. The analysis showed that this advantage is being lost very rapidly. The indicators *R&D* and *Credit* take places at the lower boundary of "Potential competitive advantages" sector with ranks 57 and 59 from 141. Slight increase in two points was demonstrated by Tertiary education. All the components of Innovative competitiveness model are at "Lagging behind the average level" (*ICT, Investment*) and "Critical gaps" (*General infrastructure, Ecological sustainability, Creative intangibles*) sectors of the matrix. This situation indicates the inconsistency of the economic model of Ukraine to the principles of innovation competitiveness.

Table 3: Strategic analysis of Ukraine's innovation capacity

<i>Real competitive advantages</i> (Rank/Score)	<i>Potential competitive advantages</i> (Rank/Score)
Knowledge creation (21/53,8)	Education (51/56,6) Tertiary education (34/44,8) Research and development (57/25,1) Credit (59/33,1) Knowledge workers (55/49,2) Knowledge absorption (33/44,7) Knowledge diffusion (55/29,9) Online creativity (47/30,0)
<i>Lagging behind the average level</i> (Rank/Score)	<i>Critical gaps</i> (Rank/Score)
Political environment (91/46,7) Regulatory environment (86/61,1) Information&communication technologies (ICT) (77/29,9) Investment (88/18,6) Trade and competition (65/64,2) Innovation linkages (85/33,1) Knowledge impact (66/33,9) Creative goods & services (75/19,7)	Business environment (137/12,2) General infrastructure (98/30,8) Ecological sustainability (110/20,4) Creative intangibles (100/33,5)

Close interdependence, interconnection and complementarity of causal factors of competitiveness should be emphasized. For example, *General infrastructure* is impossible without *Investment*. That needs in turn the favorable *Regulatory environment* and *Business environment*. *Creative intangibles* may be realized by *Knowledge workers* only etc. Hence, improving the competitive position of Ukraine should be based on overcoming critical gaps and threats simultaneously with moving to innovation-driven stage of competitive development by the implementation of comprehensive measures for creation and sustaining the competitive edge based on the knowledge economy.

Strategy of Ukraine's competitiveness predetermines a complex goal, some components of which are formulated for scenario method. Potential competitive advantages are:

a) Reduction (minimize) the threats caused by unsatisfactory scores of *General infrastructure, Ecological sustainability, Creative intangibles* as well as *Business environment*. Possible options are: increasing ranks and scores of components within the last quarter of the ranking field "Critical gaps" (baseline); move components from the field "Critical gaps" to the field "Lagging

behind the average level" (optimistic scenario). They also include the task of improving score of *Business environment* (137 rank) within the field "Lagging behind the average level" (baseline);

b) Creating competitive advantage through withdrawal from the field "Lagging behind the average level" factors *ICT* and *Investment*, and transfer to the field "Potential competitive advantages" (baseline); transfer to the field "Real competitive advantages" (optimistic scenario);

c) Converting the potential advantage to the real one by increasing ranks and scores of factors *Education*, *Tertiary education*, *Knowledge absorption* and others (baseline); then switch to the withdrawal of these factors from the field "Potential competitive advantages" and move them to the field "Real competitive advantages" (optimistic scenario).

The main strategic goal for Ukraine is to gain a strong position in the group of efficiency-driven economies and to make gradual shift to transitional group from efficiency-driven to innovation-driven economies.

4. Conclusion

In the context of a sustainable development of national economy under globalization, the innovation-based competitiveness becomes an effective instrument for achieving strategic goals at macro-level. The strategic analysis of innovation-based competitiveness determinants is an important precondition of creation an up-to-date national economy model in globalized highly competitive environment.

The regressive analysis, conducted by author to estimate the effects of innovative capacity on global competitiveness for efficiency-driven economies, shows the main effect results of determinants *General infrastructure*, *Creative intangibles*, *Ecological sustainability*, *Investment*, *Information*. An econometric model that determines the influence of national innovation potential on competitiveness must be taken into account when developing the innovative competitiveness strategy of Ukraine.

Strategic analysis of the innovation potential of Ukraine, conducted by author in the context of innovation competitiveness, revealed lack of competitive advantages and significant lag on factors that make a decisive influence on competitiveness. Improving the competitive position of Ukraine with regard to the requirements of sustainable innovative development should include a system to overcome critical gaps and threats, while creating and strengthening competitive advantage. Author offers to determine the strategic objectives of competitiveness of scenario method.

Further studies are needed to estimate the effects of innovative capacity on global competitiveness for other groups of economies, to identify the factors of competitiveness for implement the baseline and optimistic scenarios, and develop appropriate operational strategies and specific action plans for their implementation.

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