

Dynamics of International Economical Relationships in The Global Context of Innovative Modernization

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ABSTRACT

Innovative modernization of economy provides abilities to rapidly change the internal and external economic interactions in the countries, to increase level of their own integration into global economic space; but also, generates a number of socio-economic problems associated primarily with asynchronous dynamics of innovation processes in the world. The paper based on the macroeconomic indicators analysis determines patterns of innovatization global dynamics, tests a hypothesis about countries' positioning in the global modernization process, supposes forecasts on global high-tech and innovative products' markets development, taking into account modern competition's dynamics.

KEYWORDS

Innovative modernization, high-tech
markets, technology, innovative
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Introduction

Mismatching of the rate of national economic development to requirements of innovative progress; differentiation of starting conditions of macroeconomics' connections to the innovative modernization processes and national policies in the fields of competitiveness's stimulating (basing on technological progress) have determined global high-tech production's stratification, international division of labor and cooperation (Mann, 2002) within four types of innovative economies.

Investigation of the national economic systems global positioning in frames of innovative modernization process, definition of its factors, would allow neutralizing the impact of the global economic differentiation problems, defining new international cooperation platforms adequate to the requirements of scientific and technological progress.

The purpose of the study - based on the macroeconomic indicators analysis to identify main patterns of international economic interactions in the global process of innovative modernization.

In connection with this purpose following research objectives were set:

- analyze the factors of the modern national economic systems' complexity, which determines the rate of asynchronous of their innovative modernization;
- offer author's methodology for assessing the rate of economic systems' innovative modernization based on a combination of objective indicators of their development;

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- offer author's classification of economic systems of the world in terms of their innovative modernization defining their positioning in the global scientific and technological progress, in the process of innovations' generating and disseminating;

- develop a methodology for assessing the national innovative systems competitiveness.

The study tested the following scientific hypotheses:

1. Asynchronous of innovative modernization dynamics and very heterogeneity of the starting conditions of countries connection to this process were the main factors of formation the modern structure of international division of labor in the world system of innovations generation and commercialization.

2. The role of states in the framework of current systems of labor division is the determining factor of global innovative markets' dynamics, and process of scientific and technological development.

3. High indirect quantitative indicators of innovative spheres role in national economic system, such as the share of employment in innovative sectors, shares of innovative product in national exports and so on are not criterion of national economics' transition to the innovative level of development.

4. The processes of post-industrial and innovative modernization are not completely similar. Socio-economic systems atypical for postindustrial world also demonstrate the ability for own rapid innovatization.

Modern Macroeconomic Systems Positioning in The Global Process of Innovative Modernization

Analysis of static and dynamic indicators of innovatization processes in different regions of the world over the last 15-20 years, allows to distinguish four groups of national economies differing by number of criteria of their economic development innovativeness, role of information technology in own national economies, business relations and public administration.

First group of the leaders includes macro-economic systems in which informatization processes ran parallel with the economic structure modernization. As a result implemented technologies and products met the commercial interests of business representatives (Marchand, 2009).

The population of the leading countries actively uses the information product, which rapidly turned into a commodity of prime necessity (Atkinson & Leigh, 2003). Government also created very attractive conditions for entrepreneurship in high-tech manufacturing (budget support, economies of scale of their commercial activities, determined by strong domestic demand for IT products).

Under such conditions, rapid business consolidation and large innovative holdings accumulating the potential of thousands of highly skilled workers formation are not surprising.

With the IT business movement at the transnational level, companies from the leading countries were the only ones with global competitive advantages (Marchand, 2009), capable to form strong cross-border systems of intellectual production and "global brain" exploitation.

The second group consists of pursuers countries - economies that currently have high technological and innovation potential, which rapid development was

stimulated and initiated by authorities, and was actively ensured at the first stages due to Governments' administrative and financial resources.

Countries of the second group have certain potential (natural resources, production factors, especially low-cost labor, geographical location) rapidly adjusted or radically changed the industrial focus of own economic development (Dunleavy, Margetta, Bastow & Tinkler, 2005), started to actively import information products and implant them in the current economic system.

Often, these processes required high costs due to the lack of economies of scale (weakness of domestic IT products consumption) and asynchronous development of the national economy and encouraged innovation.

As an example, we can consider the United Arab Emirates that in a short time created not only a modern economic model, that much less than neighbors depends on oil products export; formed a society that is actively consuming high quality innovative products, developed an ultra-modern infrastructure.

There are few significant differences between the economies of the innovative leaders and the pursuers-countries, especially in terms of intensity, depth of their informatization (Tymoshenko, 2016).

Except in geographically small and having a high level of population, business and finance concentration countries and territories (such as Singapore, Dubai, Hong Kong, Taiwan) it is obvious inequality, virtual absence of a common national information space, integrated into the world one; preservation of various types of infrastructural problems, government restrictions and high entry barriers in innovative production.

For example, Thailand produces the greatest amount of hard disks for computers in the world; high-tech products share is over 45% of Thai national exports (Montri Chulavatnatol, 2006), but only two-thirds of the local population (40 million people in 2014) are active internet users.

The example of China, which, in spite of the rapid pace of modernization (the share of high-tech products in the country's exports has grown since 1990 from 5 to 35%) is maintained even illiteracy of the population (about 9%) and very low rates of its coverage by IT services (only 45% of the population have Internet access) (Hutton, 2007).

The third group of countries – passive – consists of macroeconomic systems, which strategic line of development does not deny an importance of national economic systems innovation, but does not give special attention to these processes due to the presence of a large number of unresolved socio-economic problems, low-grade of countries' integration into the global information space, lack of domestic demand for IT products, resources or administrative capacities of the authorities.

Informatization processes in these countries have slow dynamics, are covering only a small fraction of the local corporate or customer segments, due to the initiatives of multinational companies (Howlett & Rayner, 2006). In this connection, the potential spread of IT products in passive systems is limited only by export-oriented industries, associated with natural raw materials extraction and processing, production of consumer goods, tourism; and by a small segment of the local population, having high income and often also associated with the work of the MNC and exporting enterprises (Ingraham, 2005).



Table 1. Groups of macroeconomic systems depending on their positioning in the global process of innovatization (made by author)

Indexes	Groups of macroeconomic systems			
	Leaders	Pursuers	Passive	Outsiders
Population access to high-tech production	High	High / Average	Low	Low
R&D spends	High	High / Very high	Average / Low	Low
Government role in the processes of innovatization	Stimulates own technologies generation, foreign expansion of national IT companies, protects their commercial interests and intellectual property	Stimulates own IT companies establishing and development, support IT import	Supports attraction of MNC and foreign IT companies, buys old technologies in a broad	Not actively participates
Countries role in the global high-tech markets	Development of new technologies, their global distribution, economical expansion	Attraction of best foreign technologies, their modernization by own potential, attempt to develop own innovative product with further export	Buying of old patents, attraction of technologies due to MNC activities	Buying of old technologies and simple manufacturing
External priorities	Maintaining of innovative leadership due to monitoring of technological processes overseas, supporting of brain potential import, outsourcing, protection of intellectual property	Obtaining the leadership due to brain potential inflow, creation of ultra-modern infrastructure and domestic IT manufacturing	Supporting of high tech industries transfer to own territory, copying and imminovation strategies, producing and global distribution of not advanced and cheap IT products	Established by MNCs, following their commercial interests only
Technologies' price in domestic market	High	Average	High	Very high
Paces of innovatization	Correlated with paces of economical modernization	High, stimulated by Government and business	Average, stimulated by MNCs and export-oriented manufacturing	Low
Strategies for innovatization	Intensive	Extensive	Extensive	Absent
High tech export	New technologies after their debut in domestic markets		Brain potential	Absent
High-tech import	Know-how, high skilled labor force		Old technologies	
Entry barriers				
- infrastructural	Very low	Very low	High	Very high
- legislative	Very low	Very low	Low / average	Average / high
- scale effect	Very high	Average	Low	Very low
Examples	USA, Japan, France, UK, Sweden, Finland	UAE, Malaysia, China, India, Russia, Thailand	Egypt, Tunisia, Philippines	Albania, Niger, Congo, Myanmar

Finally, the fourth group of countries - so-called outsiders - is currently characterized by own standing out of innovatization processes due to the closeness of their social systems, internal instability, presence of unresolved domestic

economic and social problems (poverty, hunger, unemployment, lack of investment resources). Within the boundaries of these economic systems there are whopping entry barriers for informatization, related to the lack of infrastructure, domestic demand and, consequently, high cost of IT products (lack of economies of scale), number of political and ideological constraints, and so on.

Comparative analysis of all types of macroeconomic systems, depending on their position in the global process of information is given in Tab. 1.

Pace of Innovative Modernization in The World: An Alternative Assessment Method

Significant quantitative indicators of the high-tech sectors role in the economic systems (for example, number of employees in high-tech sectors, proportion of high-tech products in the national export and so on) are not unique criterion of their transition to an innovative stage of development (Smart, 2009).

It confirms firstly, the predominance of quality components of high-tech spheres growth in the national economy as evidence of its innovatization (Skufina et al., 2016), and secondly, shows needs to consider the principally new features (formation of innovative environment, effectiveness of innovative process, quality of innovations' commercialization, intellectual property protection, level of innovation and prospects for its adapting to requirements of the global social and economic development).

Table 2. Employment in high - tech industries in countries of the world, 2015 (made by author, using data of World Bank)

№	Country	Employment in high-tech industries, 000 people	№	Country	Employment in high-tech industries, 000 people
1	China	37247,04	11	UK	1373,76
2	USA	8890,5	12	Germany	1255,79
3	India	5167,8	13	Russia	1194,91
4	Japan	3415,55	14	Malaysia	1060,4
5	Indonesia	3170,59	15	France	1027,14
6	Philippines	2484,1	16	Vietnam	480,68
7	Thailand	2206,4	17	Netherlands	444,04
8	Mexico	2129,4	18	Italy	423,63
9	Brazil	1993,82	19	Canada	415,744
10	South Korea	1525,39	20	Morocco	290,73

- Only working places related with generation, commercialization, promotion and sales of IT products considered
- Only countries with high-tech export over 0,5 bln USD per year analyzed
- Index was calculated by experimental method. Experimental results were compared with data of official statistic in few countries (such as Russia, France, Japan, and China). Bialy in sampling is less than 6%. It allows usage of suggested method.

Quantitative analysis of the indirect signs of innovatization (for example, the rate of high-tech products share in national export) is not correlated with actual pace of macro-economic systems innovativeness by previously identified reasons, such as transnationalization of high-tech industries, global spread of modern technologies and so on.



It requires some quality indicators, associated with the number of employees in high-tech manufacturing and also with indices of innovative and human capital, GDP share created in the tech sectors.

As a main indicator characterizing innovativeness of economic systems in this research we consider the value of labor productivity in export-oriented high-tech sectors because it calculated basing on the numerous quantitative indicators of high-tech sector development (for example, the share of sector in the consumer value creation, in the national exports and employment) and represents also its qualitative characteristics, possibilities of global distribution, level of competitive advantage in global markets.

Table 3. Labor productivity in export oriented high-tech spheres in the countries of the world, 2014 (made by author using data of World Bank)

№	Country	Labor productivity in high-tech industries, 000 USD	№	Country	Labor productivity in high-tech industries, 000 USD
1	USA	396,97	31	Indonesia	1,97
2	Japan	133,95	32	Portugal	1,92
3	China	63,55	33	Israel	1,75
4	UK	49,68	34	South Africa	1,5
5	Germany	48,86	35	Czech	1,46
6	France	39,83	36	New Zealand	1,32
7	South Korea	19,63	37	UAE	1,03
8	Mexico	17,13	38	Saudi Arabia	1,01
9	Netherlands	16,6	39	Poland	0,87
10	Italy	14,72	40	Argentina	0,84

Based on the data in Tab. 2, and share of consumer value created by export-oriented high-tech industries in the modern countries, we can define the sector - regional labor productivity (Tab. 3).

Obviously, the leaders in labor productivity in absolute terms are the states of Western Europe, USA, Japan, Australia, BRICS, countries of Southeast Asia - recognized initiators and leaders in the process of their social formations' and economic systems' innovatization.

As an indication of external (global) competitiveness we used the coefficient of revealed comparative advantages - RCA.

This technique related to high-tech production allows emphasizing how local product is attractive for foreign consumer comparing to the rest of exported items (The Global New E-Economy Index: A Cyber-Atlas, 2012) (Tab. 4).

As can be seen data from Tab. 3 and Tab. 4, is weakly correlated. So, the USA, countries of Northern and Western Europe that have the highest advantages in innovations' implementation in their own economic systems ranked only in second ten by external (global) competitiveness of their innovative sectors, following newly industrializing countries of South-East Asia.

It can be explained, first of all, by fundamental restructuring of pursuing countries' economies in the direction of their innovatization and modernization, also due to borrowed technologies, attraction of intangible intellectual assets of Western multinationals, activation of the technological production transfers (for

example, transfer of all Japanese automobile industry to Thailand and China, computer assembling from the largest American companies to Malaysia, and so on). It led to reduction of their low-tech exports and increasing of export orientation of newly established technological sectors.

Table 4. Indexes of revealed comparative advantage (RCA), countries of the world, 2013 (made by author using data of World Bank)

№	Country	RCA	№	Country	RCA
1	Singapore	2,77	11	Hungary	1,36
2	Malta	2,72	12	Netherlands	1,36
3	Malaysia	2,06	13	Japan	1,31
4	Costa-Rika	1,73	14	UK	1,12
5	Thailand	1,64	15	Cyprus	1,03
6	Ireland	1,59	16	Switzerland	1,03
7	South Korea	1,54	17	Mexico	0,98
8	Hong-Kong	1,5	18	Finland	0,98
9	USA	1,5	19	Denmark	0,93
10	China	1,4	20	Israel	0,89

More attractive conditions of high-tech companies' activity in the countries of Southeast Asia and the Caribbean caused a reduction of technologically advanced products' manufacturing in the countries - initiators of technological progress and, consequently, an increasing of high-tech imports.

It should also be noted that RCA used in the study took into account only the quantitative indexes of export. Together with this the high-quality gap between the US, countries of Western Europe, Japan and successfully modernizing economies of the Asia-Pacific region, former socialist camp is preserved.

Table 5. Dynamic of RCA in countries of the world, 1992-2014 (made by author using data of World Bank)

№	Country	RCA changes, %	№	Country	RCA changes, %
1	Indonesia	1115,47	11	Mauritius	203,85
2	UAE	963,48	12	Egypt	203,85
3	Hungary	450,73	13	Vietnam	127,88
4	Ecuador	431,74	14	Nicaragua	127,88
5	Paraguay	431,74	15	Bahrain	127,88
6	Greece	317,79	16	Saudi Arabia	127,88
7	Morocco	317,79	17	Iran	127,88
8	China	279,81	18	Cyprus	108,89
9	Slovakia	279,81	19	Hong-Kong	102,56
10	Lithuania	279,81	20	Mexico	99,4

Conclusion

The study of IT sphere role in the shaping of countries macroeconomic indicators and trade between them, led to several conclusions.

Shares of high-tech sectors in employment or in the gross domestic product formation, or national export currently are not a factors or criteria for its innovatization, its transition to new level of institutional relations, which is determined, above all, by globalization and transnationalization trends. Last ones allowed the formation of effective export-oriented industries exploiting local advantages of high-tech manufacturing (cheap labor, minimal entry barriers,



weakness of the administration in the host countries) within the borders of the emerging economies.

The analysis based on the hypothesis that country has a set of IT – producing and sales advantages allowed identifying indicators of external competitiveness of the industry based on:

- the comparison of labor productivity in other industries and in IT – sphere;
- assessment of the social, economic and demographic factors, forming set of high-tech production advantages;
- on the analytical performance of the national IT industry role in global exports.

The selected system of indicators allows to realistically assess the role (quantitative and qualitative) of countries in world IT products production in statics and dynamics; determine the directions and structure of world high-tech products trade; monitor and predict trends in the global technology market; qualitative characteristics and factors of national IT sphere competitiveness in the world economy.

The conducted analysis demonstrates the low correlation between presence of state socio-economic advantages in innovative modernization and real results of the latter that are measurable by quantitative and qualitative assessment.

It actualizes the role of national authorities' policy of innovative modernization, degree of national economic systems integration in international innovations' transfers; defines the modern diversity of innovative modernization strategies.

Thus, based on the comparison of objective conditions of innovative modernization of the consumer economy, transitive and catching-up economies, some shortcomings of the first ones may be noted such as:

- forming of netocracy and saentocracy within them and raising of entry barriers in innovative production;
- increasing of skilled labor and innovative companies' costs;
- disproportional development of sectors oriented on the growing domestic demand for daily consumption goods;

and advantages of the latter, such as:

- rapid period of innovations' adaptation to economic needs due to later connect of these countries to technological progress;
- greater government competence in economy's regulating (Tiihonen, 2004);
- low consolidation of national industries.

This refutes an analogization of the processes of post industrialization and innovative modernization (Giddens, 2007), demonstrates capacity of atypical for postindustrial socio-economic systems for rapid innovations' implementation; suggests the possibility of today's global innovation and technological pyramid of the countries restructuring (due to their vertical rotation), and its transformation into system of relatively autonomous regional innovation models (Lundvall, 1992).

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