Technological Determinism of the Knowledge Economy Building in Transitive Countries

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Abstract **This paper analyses the standpoint that ideas of the Neo-Schumpeterian theory of economic development with its leading role of technological innovation are very fruitful for explanation the patterns of contemporary economic crisis in case of the European post-socialist countries in general and in particular for Ukraine .**

Keywords - **knowledge economy, Schumpeterian economy, innovation cycle, innovation policy.**

I. INTRODUCTION

A characteristic feature of the current economic policy in the post-soviet transitive countries is the expressed intention to exploit the resources of knowledge economy as a main factor of economic growth. In reality, for example in Ukraine, this policy has not been implemented because a many economists and politicians consider that an active innovative policy requires large resources, which are only available in future. As a result, the problems of the needed knowledge-innovative development remain mostly in the rearguard of current economic policy. Meanwhile, there is a direct connection between the absence of innovative reconstruction of economy and the weak stimulus to innovators from economical environment in a country. The paper will show the basic issues and necessity of the crucial innovation structural change for the Knowledge Economy building. It will be developed using the Neo-Schumpeterian approach that considers the special concept of innovation development with its leading role of technological innovations as main factor of economic growth. It also gives methodological base to find ways to overcome current financial and economic crisis, including the cases of transitive countries.

The modern paradigm outlining the essence and the factors of a country's global competitiveness in terms of methodology is directly linked to the new category introduced into scientific usage by an originally English term "knowledge-based economy." Only after a certain period of conceptualization of its contents, the term started to be used in its shortened form "knowledge economy." This linguistic history manifests a conscious attempt to render the conceptual meaning as accurately as possible. The relevance and timeliness of such linguistic rigor have also found their proof in Ukraine, where most specialists translate this category into Ukrainian as "economy of knowledge". Such a translation prompts a common perception of this category as a branch phenomenon similar to the economy of industry, agriculture, transport, etc. Nonetheless, this translation is confusing, because the main conceptual meaning of this category is positioning the knowledge resource as the major incentive of the economic growth of a country. The methodological core of this category is presented not by the features of functioning of specific branches which deal with knowledge production in its various forms, but rather by the final synergetic result constituted by the application of knowledge to ensure sustainable economic development. For Ukraine, this "nuance" is critical, because we have a substantive gap between the achievements of individual branches of knowledge and the standard of well-being in the country on the whole.

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II. KNOWLEDGE ECONOMY AND LEVELS OF COMPETITIVENESS

The concept of knowledge economy advances a cardinally new theoretical and practical conclusion, i.e. that the principles of policy to obtain global leadership become a necessity for outsider countries as well, provided they do not give up on the economic growth. This especially concerns the countries striving for powerful development [1-3]. The peculiarity of today's phase of the global economy evolution is that it is now impossible to hesitate about implementing the strategy used by the leading countries of the world without being an outsider. The main impetus of this strategy is presented by efficient knowledge application via creation and global diffusion of R&D innovations. This conclusion is convincingly validated by a well-known group of scientists headed by Michael Porter with a series of researches into competitiveness factors conducted as part of the annual Global Competitiveness Report preparation under the aegis of the project of the Davos World Economic Forum [4].

In the 2002 Global Competitiveness Report, Michael Porter's group presented one interesting result of a multicriterion research into the factors of the countries' competitiveness, namely, that the level of global competitiveness of a country can in an aggregated way represent one indicator - utility patents granted per million population. The analysis of competitiveness by dozens of parameters has shown the same assessment result, as by the above one, which actually reflects the efficiency of the processes of applying innovative and technological knowledge. The analysis of this parameter brought about the conclusion that all countries could be grouped into two categories: the key technologically innovative ones and the rest. The first group is formed by the most successful countries according to their level of well-being and competitiveness, while the

classification into this group depends on ensuring such a level of innovative technological development when the indicator of utility patents exceeds 15 [5]. In 2001, there were 24 such countries, which substantively surpassed other countries' indicators (according to the 2006 Report, these countries were joined only by Luxemburg, which was not presented at all in 2001). The analysis also showed that for the first group of countries the technological factor ensured half of the total high level of the general competitiveness indicator, while for the countries classified as the non-innovating the contribution of the technological factor did not exceed one third.

Unfortunately, for Ukraine this indicator equaled only 0.5 patents in 2006. This proves that our country is seriously lagging behind with regard to the level of global competitiveness. This is also confirmed by the multicomponental general index, according to which in 2006 we ranked only 73rd among 131 analyzed countries. The indicator of the number of USPTA utility patents granted in 2006 per million population for the countries neighboring Ukraine was the following: Russia - 1.2; Poland - 0.8; Hungary - 4.9; Slovakia - 0.7; Romania - 0.4; Bulgaria - 0.4; and Turkey - 0.2. These data can be somewhat reassuring if one ignores the dynamics of these processes, which can be observed using the statistics of the US National Science Foundation. Ukraine is not even presented in the statistics, which proves that the number of patents granted to our citizens is insignificant. This is confirmed by the data of the State Statistics Committee of Ukraine.

It can be noted that according to the criterion under discussion, Russia, Hungary, the Czech Republic, and Poland have a serious strategic competitive advantage over Ukraine, which is not only falling considerably behind, but (and this is more dangerous) does not demonstrate any changes for the better. Nonetheless, if we consider the experience of the countries, which have recently successfully implemented their strategy of an economic breakthrough and have substantively bridged or even liquidated the gap with the world leaders, one can see that their economic achievements were directly dependent on targeted extraordinary efforts and targeted policy on the platform of dynamic formation of innovation knowledge economy.

In our opinion, Table 1 convincingly illustrates the above said. It presents data concerning the countries, which in the 1980s were not yet members of the group of the key technological and innovating states and which have caught up with the leaders during the last 20 years. Among these countries are the Republic of Korea, Singapore, Taiwan (China), Hong Kong, and Ireland. Economic achievements of these countries are well-known and assessed according to many parameters. But the discussed criterion of knowledge economy development not only confirms its mono-representativeness, but also gives a very palpable demonstration of the nature of the measures that have ensured the success, i.e. active application of acquired innovation technological knowledge. The rate of such processes in these countries is impressive: within 20 years our criterion has increased by 94.7; 39.0; 21.9; 8.0; and 4.7 times respectively.

Table 1. Growth Rate of Knowledge Factor, i.e. US PTA Utility Patents, Used by Countries, Which Have Caught Up with Key Technologically Innovative Countries (admission level - 15 US PTA Utility Patents Granted per Million Population) in the Past 20 Years

Rating 2006	Country	Qty US PTA Utility Patents Granted in 2006 per Million Population	2006 Growth Rate to the Average Annual of 1980s, %
8	R. of Korea	123,1	9469%
11	Singapore	93,6	3900%
3	Taiwan, China	280,2	2189%
21	Hong Kong	43,4	804%
22	Ireland	41,4	470%

Source: The Global Competitiveness Report 2007-2008. - The World Economic Forum, Geneva, 2007.

This example is very representative for the Ukrainian situation, where the economic policy is so far characterized only by declarations about the goodwill concerning the "innovation vector of the economic growth," while top politicians have for many years delayed cardinal reforms aimed at developing modern knowledge economy of the post-industrial type. They still do not dare to take radical measures to stimulate progressive structural reconstruction and efficient reforms in education, science, and innovation.

III. INTERRELATIONS BETWEEN INNOVATION CYCLE STAGES

The analytical database presented in the Global Competitiveness Report 2007-2008, drawn up under the supervision of Klaus Schwab and Michael Porter [4], allows a more detailed analysis of Ukraine's global competitive position from the point of view of conceptual approaches and criteria concerning the formation of knowledge economy.

As remarked, the main peculiarity of these criteria is their focusing on the final result of the innovation cycle, i.e. the application of innovation technological knowledge. The traditional linear model of this cycle, which distinguishes management systems for its different stages (education - R&D - manufacturing technologies - implementation), today is justly criticized for its concentration on the R&D stage and not on the final result - commercial application of innovations. Developed individual stages do not guarantee the desirable final result, which is transformation of available knowledge into a factor of economic growth. Ukraine's situation can be clearly identified by using the rating of the above Global Competitiveness Report.

To this end, we have arranged certain indicators used to build the aggregate competitiveness index according to their inclusion in different stages of the innovation cycle. Then we have compared the country ratings by each indicator to assess the development of each stage and compared these indicators. Such analysis can also be used to compare situations in different countries. In this analysis we have also compared Ukraine, Poland as a counterpart country, and Finland as a recognized world leader in developing knowledge economy and as a country which has very quickly managed

the transition from a European outsider to a leader of the global competitiveness rating.

Innovation Cycle Stages present the following indicators of the above report:

Education Stage:
1. Tertiary education enrolment. 2. Quality of the educational system. 3. Quality of math and science education. 4. Quality of management schools.

R&D Stage:
5. Capacity for innovation. 6. Quality of scientific research Institutions. 7. Company spending on R&D. 8. Government procurement of advanced technology products.

Innovation Management Stage:
9. Nature of competitive advantage *(scale 1-7, global competitiveness of companies is established by 1=low cost and availability of local resources, 7=unique products and technologies.)* 10. Production process sophistication *(scale 1-7, production process involves 1=labor-intensive methods and outdated technologies, 7=world best and most efficient technologies.)*11. US PTA utility patents. 12. Extent of marketing.

Knowledge Application Stage:
13. Brain drain *(the lower the drain, the higher the rating*). 14. Availability of latest technologies. 15. Firm-level technology absorption. 16. FDI and technology transfer.

Table 2. Ratings by the Davos World Economic Forum for the Selected Countries by Indicators of the Innovation Cycle Stages in 2006, *Number of place in rank*

Stage, #indicators	**Ukraine**	**Poland**	**Finland**
Education			
1.	17	22	2
2.	47	49	2
3.	44	48	1
4.	85	50	12
R&D Stage			
5.	40	44	5
6.	60	64	6
7.	67	42	9
8.	75	89	11
Innovation			
9.	78	51	6
10.	69	62	6
11.	58	51	4
12.	87	67	29
Knowledge Application			
13.	93	77	10
14.	97	80	2
15.	91	76	7
16.	106	81	74

Source: The Global Competitiveness Report 2007-2008. - The World Economic Forum, Geneva, 2007.

Table 2 presents the ratings of the three countries for all the above competitiveness indicators, which reflect the situation of a certain stage of the innovation cycle. The analysis of the Report lists a total of 131 countries. The best rating is 1, the worst - 131.

If the stages of education and R&D present us quite favorably and approximately at the same level with Poland, the final stages of the cycle, which imply getting a commercial innovation result, show our lag. The data on Finland, a world leader in developing knowledge economy, reveals the importance of striking a balance in the development of all innovation cycle stages. It also illustrates a previously made conclusion about the comprehensive organic nature of knowledge economy, where all stakeholders efficiently cooperate to achieve the final innovation result while maintaining continuous feedback between the presented stages. Such methodology reveals the fallacy of the policy by which specific innovation cycle stages are managed separately, which is exactly the case in Ukraine.

IV. KNOWLEDGE ECONOMY DEVELOPMENT POLICY

The presented analysis has once more shown that the technological determinism in many ways shapes the nature and the results of the "civilizing" competition between national economies for a position in the global development rating and for the corresponding well-being and social and economic prosperity of these countries. Hence, Ukrainian society and its authorities desperately need to understand the objective nature of these processes.

Today's situation of international competition simply leaves Ukraine no other choice, but to implement a policy mobilizing the national potential to ensure an efficient integration of Ukrainian economy into the technological path of human evolution, which today depends on the ability of a country to implement the concept of knowledge economy. The factor of innovative technological changes is of great importance specifically for mid-term and long-term economic development. Although a country can improve living standards during a short-term period without such changes, for instance, by increasing investment, it does not guarantee a sustainable result. Modern economic analytical studies convincingly prove that only the factor of technological changes ensures a continuous economic development of a country regardless of its position in the global development rating.

International comparative research has shown that one can identify three main hindrances in the outsider countries which prevent them from efficient implementation of innovative technologies.

- an insufficient legislative and institutional framework to stimulate dynamic, independent, risky business competition;
- a decreasing number of businessmen motivated to work on the high technologies market;
- low income per capita, which does not provide incentive and financial opportunities to work for the long-term perspective.

Real development of knowledge economy should start with a design and implementation of the following three clusters of social economic policy:

1. Designing a comprehensive national strategy to start and maintain sustainable development of knowledge economy.
2. Implementing this concept on a broad social platform of participation and responsibility
3. Ensuring close and efficient cooperation, coordination and balancing of the development of the key sectors of economy, which are required for progress towards knowledge economy, as well as accelerated establishment of modern information infrastructure for broad access to modern advanced knowledge.

Social economic consistency and comprehensive nature of knowledge economy should be ensured by the coordinated and balanced development of the next major governance segments, which guarantee efficiency of the corresponding state policy.

-To set up a system of economic motivation and institutional environment to stimulate large-scale and efficient use of national and global knowledge in all the sectors of economy, to activate entrepreneurship, and to provide opportunities and support to economic and social transformations, required by the current stage of the scientific and technological revolution.

-To form the society of highly qualified, mobile, and creative individuals, who, during their life, have a constant opportunity to master new state-of-the-art knowledge and to have a broad access both to public and to private funding ofinnovation activities.

-To establish a dynamic information infrastructure, a competitive and innovative information sector in the economy, which would expedite spreading efficient and competitive information and provide broad communicative possibilities for all social strata.

-To set up an efficient innovation system and a favorable business environment, which would stimulate innovation and business. The national innovation system includes companies, scientific and research centers, universities, analytical centers, and other organizations capable of mastering and processing information from a constantly growing global "knowledge bank", making their own contribution to it, and also efficiently using this knowledge to meet the needs of their own country and to createnew products, technologies, services, and business trends.

-To set up a favorable financial environment and its institutional structure capable of ensuring capitalization of high-technology manufacturing facilities as the final result of innovative activities. This should create a growing effective demand for technological and product innovations, foster a structural reform of manufacturing facilities on the platform of the modern technological base, which should build a reliable foundation for sustainable economic growth of the country.

-To set up a new cultural environment maximally adequate for implementing the policy of developing knowledge economy. Experience shows that quite a lot of countries have a cultural environment which constrains the development of knowledge economy and remains conservative and dominated by historical and mental tradition that is not always favorable for succeeding in today's situation of international competition. Thus, for certain countries lack of transformations in the cultural environment can be a negative factor for meeting the development challenges.

It is important to emphasize that the policy of forming knowledge economy will be efficient, provided all the above segments of state governance work for the final result, i.e. national mass production of innovative products and technologies, which would be competitive on the world market. Special importance is acquired by the upgrading of "assembly shop" elements of this complex system, i.e. the scientific and technical innovation sphere of the national economy. In Ukraine this sphere is lagging behind the potential of the educational and scientific-and-technical spheres, but the latter need cardinal innovation reforms, too.

V. Conclusion

The presented analysis has once more shown that the technological determinism in many ways shapes the nature and the results of the "civilizing" competition between national economies for a position in the global development rating and for the corresponding well-being and social and economic prosperity of these countries. The very important result is conclusion that we must consider the R&D and technological innovation sphere of a country not so much as consequence, but rather as the reason for a lot of macroeconomic changes, especially on aspects of economic cycle and growth. Hence, some transition countries, especially Ukraine, need to recognize the objective nature of these processes. Today's crisis situation and the international competition increasing push the European post-socialist countries to implement a policy mobilizing the national potential to ensure an efficient integration into global technological trends.

VI. References

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