

THEORY OF TECHNO-ECONOMIC PARADIGM AND THE ENHANCING COMPETITIVENESS POLICY IN TRANSITION ECONOMY OF UKRAINE

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Abstract

The article is devoted to grounding of the adequacy of use of the modern Neo-Schumpeterian theory provisions during the formation of Ukrainian economic development strategy, where the main category must be the techno-economic paradigm. It dwells upon the peculiarities of appearance and evolution of technological trajectory and their influence on the dynamics of long-term economic growth of the country. It proves the presence of technological determinism in the context of the welfare of nations and concerning to places in the global rank of their competitiveness. It stresses the importance of understanding the objectiveness of these processes for all countries. Article analyzes the dynamics of structural aspects of Ukrainian industry development in the context of the conception of techno-economic paradigm. It is offered the approach to statistical classification of relevant groups of industrial branches in order to present each techno-economic paradigm separately. Proposed approach was using to calculate the corresponding structural dynamics of Ukrainian industry. The article makes a conclusion that under present conditions of international competition Ukraine has no other choice for the economic development model apart from mobilization of the national potential for the efficient adaptation of Ukrainian economy to contemporary techno-economic paradigm of civilization evolution.

Keywords: Schumpeterian economy, techno-economic paradigm, market structure, innovation policy, country competitiveness, transitive economy.

JEL codes: O14, O33, O38, O57.

1. Introduction

Nowadays we can often hear calls that economists must give grounded answers to strategic appeals of time. But what is the essence of these calls? And what should be done to answer adequately? This article regards these matters from the point of view of determination of a special role of innovative technological change for long-term social and economic development of the country. This technological determinism in many ways determines the character and results of "civilization" efforts of national economies to secure a place in the national development rating and a high level of welfare in the country.

The rapid development of the knowledge sphere of the rich countries today is one of the most notable mega-trends in the evolution of human civilization. The actualization of the "knowledge factor" as a solution to the general problems of economic growth is a very important and controversial subject of economic policy in Ukraine. The advantages of the modern innovations that belong to the current techno-economic paradigm cause the existing economic and technological gap between rich and poor countries. But those advantages may and must be used to the overcoming of such gap. From other hand, a containment of dynamic development of the knowledge economy will determine the social and economic weakness of the country. To search for answers these challenges it could be fruitfully to use the Schumpeter's theory with its leading role of technological innovation for economic development. It may bring important economic policy implications. It can help to form more effective economic policy based on implementation of the knowledge-based new economy approaches.

The growth of national wealth depends, in the first instance, on the tempo and quality of economic growth, whose principal factor is effective investment in the innovation process which guarantees permanent structural re-organization of the national economy on a new technological basis, and reaching of the purpose of a constant increase in the productivity of the aggregate labor forces in the national economy. Therefore, the central point in the policy of economic development must be creation of stimuli and legal institutional conditions to promote an augmentation in the general factor of productivity.

It is essential that the transitive countries like Ukraine and its policy maker authority must recognize the objectiveness of this technological determinism, which, without exaggeration, is

a fatal factor that crucially influence on the successful economic growth in long-run perspective. The last means that in reality we have generally no other choice for Ukraine in terms of model of dynamic economic development apart from mobilization of our possibilities for the effective inclusion of Ukrainian economy in the technological path of human civilization development. Practical realization of this task will require considerable management efforts and first of all we need an objective economic assessment of the technological structural development of Ukrainian economy in the context of the global development of techno-economic paradigms in order to develop and implement those institutional, regulatory and economic motivational measures to ensure accelerated development of the branches of 5th and 6th techno-economic paradigms.

2. Neo-Schumpeterian concept of economic development

Introduction of a characteristic of technological change into the economic analysis serving as a separate key development factor studied endogenetically, not as a “black box” of the general productivity factor, was mainly done within the framework of a theoretical trend which is known today under a general name “Schumpeterian economy”. This block of theories regards scientific and technical innovations as the main stimulus for economic growth. Fundamental theoretical grounds for this theory were laid as far back as the beginning of the XX century; one of its main founders was the world-famous outstanding Ukrainian economist and politician of the times of Ukrainian People’s Republic M. I. Tugan-Baranovsky (Tugan-Baranowsky, 1901). Besides him, among the luminaries of this theoretical trend we can name his student and the conceptual successor M. Kondratiev (Kondratiev, 1925), a German scientist A. Spiethhoff (Spiethhoff, 1903), and the classic of economic theory J. Schumpeter (Schumpeter, 1911:1934, 1939).

J. Schumpeter showed the influence of technological revolutions on the economic development. He established a tight connection between putting into operation of basic R&D and technological innovations and long-term cyclical fluctuations of economic development. One of the main categories in this theory is “destructive creation”, when basic technological innovations simultaneously ruin old branches of production and create new ones. In this context, it is important to make a clear distinction of “old” and “new” branches in the analysis and during the formation of the economic policy, as well as the problem of “leading sectors” and methods of their state support.

The economic theory of technological dynamics is related to latest achievements of economic science connected with the development of new paradigmatic path of Schumpeterian tradition – evolutionary technological dynamics (Nelson, 1995; Freeman and Louka, 2001; Perez, 2002; Dosi, 2001; Malerba *at al.*, 2003). Technological changes are regarded here as the main material object – the species that dynamically develops by itself and determines the ways of evolution of the modern civilization system. Waviness of this process is described by Kondratyev's theory of "long waves" (Tylecote, 1992; Freeman, Clark, and Soete, 1982; Freeman and Louka, 2001) but we consider more productive the approach which concentrates less on the fixation of precise time phases of this wave, studying the essence of the process and its reasons. In this sense it is more important to recognize the technological changes which condition structural reconstruction of the economy as a main factor that have been causing the "long wave" of economic development. The cyclical periodicity depends on the frequency of appearance and putting into operation of basic innovations, leading to the creation of branches-locomotives of the general development and their further spreading in the economy. Today among such "locomotives" we see the branches that are connected with information technologies (Castells, 1996-1998: 2000-2004; Freeman and Louka, 2001).

The Development of the Neo-Schumpeterian conception created a theoretical basis for a new vision of the basic principles to ensure a countries' economic development and set new requirements to the state economic policy (Elgar Companion to Neo-Schumpeterian Economics, 2007). This new vision is connected with perception of the national economy's structure as a phenomenon occurring from the different waves of technological complexes. But in many cases of policy analyses we can meet domination of more traditional vision under consideration the characteristics of structural change. As a rule it is structure of enterprises according a form of property, dynamics in the context of interrelations of various economic indicators and sectors: commodity or service production, creation of added value, investments, such kinds of activity as the capital flows, final consumption, export, import, etc. Such analysis reveals connections between different parameters of the economic system, establishes certain regularities suitable for international comparisons, etc., but it is limited for the tasks of strategic planning of the state economic policy as it does not give a clear vision of the influence of established structural processes on the future state of the economy. So a more modern instrument of analysis is the vision of structural dynamics of production through regularities of technological systems development.

Development of this Neo-Schumpeterian approach and putting the category of technological system as the basis of long-term cyclic economic development on the center of contemporary economic policy to ensure sustainable growth of national economy are connected with the names of C. Freeman (Freeman, 1982, 1987), D. Dosi (Dosi, 1984, 2001), C. Perez (Perez, 2002). By developing the ideas of J. Schumpeter and G. Mensch (Mensch, 1979) as to the influence of basic scientific and technical innovations on the long-term economic dynamics, C. Freeman, Clark, J., and L. Soete introduce the notion of a technological system, the change of which happens as a technological revolution. The latter is understood as the total of economically and technologically connected innovations which make up a new technological system (Freeman, Clark, and Soete, 1982). Technological revolution results in drastic changes in the leading trends of the state system of technological paradigms that influence all important sides of economic functioning (Perez, 2002).

The period of existence and the necessity to change the technological paradigm are conditioned by purely economic reasons. Achieving the limit of economic growth, the economic system reaches the state when the interaction of technical and economic spheres stimulates the creation of a new paradigm, which introduces a revolutionary change into the production system once again. Old social and institutional mechanisms that were adapted to the old paradigm could not be adequate for the new structure of investments, market behavior, etc. They are ousted by the process of diffusion (spreading) of the new technical and economic system. Change of paradigm conditions brings about a radical change in the usual type of engineering and management thinking regarding the effective economic practice (Innovation and Economic Development, 2007).

The conception of techno-economic paradigm follows from the fact that technological changes occur relatively quickly and surpass changes in the institutional structure of the country which is less reactive as it is prone to conservative interests and support of subjective belief in the "good old days". The period of time necessary for drastic changes in the social and economic structure is the period of formation of the technological paradigm which corresponds to the new principles of management in different spheres that become generally recognized for the regular phase of development. According to scientists, this formation will last for 48-68 years, which corresponds to long-term length of Kondratiev's "long wave". The

change in paradigm has all the features of the general technical and management revolution that starts the formation of a more efficient social and economic system.

Reaching the limit of economic growth, the old economic system comes to the situation when the interaction of technical and economic spheres starts the creation of a new technological paradigm which drastically changes the whole production system again. Old social and institutional mechanisms that were adapted to the old paradigm could not be adequate to the new structure of investments, market behavior, etc. They are ousted by the process of diffusion (spreading) of the new technical and economic system. Change of paradigm conditions a radical change in the usual type of engineering and management thinking regarding the effective economic practice.

Social and technological paradigms are considered to be the reasons for Kondratiev's "long waves". That's why their numeration depends on the numeration of the "long waves" above. Six paradigms of this kind may be singled out (five realized ones and the sixth one is still ahead, the year of the beginning or the end means the point of reference of the time period), where the key factors are: for the first long wave (1790-1850) – substitution of machinery for handwork in weaving; for the second long wave (1851-1895) – coal mining and the steam engine; for the third long wave (1896-1946) – iron industry; for the fourth long wave (1947-1989) - energy (oil and organic chemistry products); for the fifth long wave (1990-2040) - microelectronics; for the sixth long wave (2041- ?) - biotechnology. It should be noted that the key factor of a certain paradigm is also effective for the technologies that appeared in previous paradigms though it changes their technical quality.

The key factor concerns mass demand for corresponding technical changes. That's why the leaders of the global community master these technologies in advance. The branches that actively use the key factor and adapt its most successfully to the requirements of the corresponding production organization, are the main investors in advanced technologies and form the technological paradigm of the society. In this context, these branches play the role of priority branches. Understanding of the main peculiarities of development and change in technical and economic paradigms and their connection with institutional structure of the society is an important factor of economic policy formation. Specific features of the new technological paradigm, having been determined, show the way of looking for goals and ways of strategic support of its development in the country.

3. The structure of Ukrainian economy under concept of the technological paradigm

The analysis of innovation technologies development in the context of the economic dynamics encounters certain methodical problems. The statistic information base is oriented to the accounting of types of products (productions) and is structured into separate branches by types of manufactured products. The attempts to conduct separate accounting of technologies development in the context of economic analysis requirements failed as the problem of identification of natural connection of new technology implementation and economic production result remained unsolved. Let alone the problem of separation for the statistic accounting of different types of technologies in the conditions of a united production cycle, the new technology may be non-representational as to the economic result of production.

So certain kinds of technologies in the analysis are represented by certain branches of production or aggregated kinds of products. This approach allows using the extended economic statistics and, which is very important, clearly fixes innovational results of the new technology. The last point is especially important for transitional economies which inherited the feature of command economy, when the most up-to-date technology is implemented as a single research sample which did not influence the technological level of the whole production and the level of products' competitive potential. The specific problems of innovation activities in post-soviet transition countries were analyzed by P.Hogselius (2005).

The modern analytical practice of the economic evaluation of technological development is mainly based on the comparative analysis of branch development with a different stage of branch structure detailing. Classification of enterprises by the criterion of their belonging to this or that technological paradigm is as a rule made with the help of two methods.

The first one is connected with expert analytical evaluation of the history of regularities of technologies development and estimates as to its future. The paradigmatic list of technologies here is the result of scientific research and estimated evaluations.

The second method is built up on a more exact foundation: measuring the indicator of research intensity of different enterprises. By ranging a selection of enterprises as far as their research intensity is concerned, we can single out high-, mid- and low-technology branches.

It should be noted that the results of branch classification obtained with the help of these two methods are in principle the same, which also testifies to the correctness of the neo-Schumpeterian technological paradigm theory. So, high-, mid- and low-technology branches may correspond to 5th, 4th and 3rd technological paradigms accordingly.

4. Methodology and Data

For the analysis of structural aspects of Ukrainian industry development in the context of the conception of techno-economic paradigm, we made a relevant grouping of industrial branches in order to present each mentioned mode separately. In the statistics of Ukraine and other countries, it is necessary to make a clear general classification of the kinds of technologies by technical characteristics, as only products can really serve as the objects of mass studies. That's why international practice adopts the approach of grouping corresponding branches of goods production for macro characteristics of technologies development; such goods in principle represent a certain economic type of technologies determined by the scales of the following type: advanced-traditional-obsolete or high-tech-mass-routine enterprises.

With the help of this analogy we can propose a classification of goods the technology of production and technical essence of which will approximately correspond to the essence of different technical and economic paradigms. It is clear that this classification is quite relative, but, in our opinion, it can become an effective instrument of the analytical economic evaluation of technological evolution of production facilities of the economic activity in the context of technological determinism conception related to social and economic development of the country.

For statistic accentuation of enterprises by technological modes, we used the approaches employed by the Organization of Economic Cooperation and Development (The OECD Science, Technology and Industry Scoreboard 2007). They use the principles of dividing industrial enterprises into groups by the type of advanced technologies used:

- (1) high technologies,

- (2)mid-high technologies,
- (3)mid-low technologies,
- (4)low technologies.

This classification actually corresponds to the classification by technological paradigms (Bazhal *at al.*, 2002). High-tech branches correspond to the fifth paradigm, mid technologies – to the fourth one, and low technologies – to the third paradigm.

It should be noted that the classification of technologies used by OECD mostly covers processing industry and, which is important for us, it is coordinated with the International standard branch classification of all kinds of economic activity which was created in order to satisfy demands for international comparative analysis and which is still used by Ukrainian statistics today (classification of the kinds of economic activity).

The key approach to the processing industry sectoral unification into separate technological clusters is the product principle, that is, unification into taxons of technologies used in the main activity of enterprises to produce goods and services. However, this or that technological taxon is not always oriented to finished products. Transition to each subsequent technological level of the classification of finished products manufacturing makes it difficult to present them in different technological groups. For example, the branch “Aircraft construction” (production, assembly, reconstruction and repair of aircraft, gliders and parts and elements for aircraft), under the technological classification of OECD, belongs to the cluster of mid technologies production, but production of electrical devices for air navigation and measurement instruments for aircraft belongs to the groups which already belong to high-tech productions. This fact makes it more difficult to compare them with the data of the State Statistics Committee of Ukraine, but in general it does not eliminate the possibility to get a notion of the structure of Ukrainian industry both in the level of technologies (using OECD methods) and by technological modes.

Using this approach, we grouped the positions of the kinds of economic activities presented in statistic bulletins of the State Statistics Committee of Ukraine, in the context of technological paradigms representation (*numbers* – groups above by the level of technologies) in the following way:

Fifth technological paradigm: production of electric, electronic and optic equipment (1).

Fourth technological paradigm: production of charred coal and oil products (3); chemical production (2); production of rubber and plastic products (3); production of other non-metal mineral products (3); metallurgic production and production of ready-made metal products (3); production of machines and equipment (2); production of vehicles and equipment (2).

Third technological paradigm: raw materials industry (4); production of food, drinks and tobacco products (4); textile industry (4); production of clothes, fur and fur products (4); production of leather, products made of leather and other materials (4); processing of wood and manufacturing products of wood, apart from furniture (4); paper and pulp industry (4); printing industry (4); production of electrical energy, gas and water (4).

5. Analyzing the structural dynamics of Ukrainian industry

We used the above classification of the groups of branches of industry by the type of technology level to calculate the corresponding structural dynamics of Ukrainian industry in 2001-2007. This data is given in Table 1. From this you can also go to the analysis of structural dynamics by technological paradigms as stated above.

It is clear from Table 1 that the structure of Ukrainian industry evaluated by the level of technologies does not correspond to the requirements of time. In 2007 high-tech branches amounted only to 3%. It is 4-5 times less than in developed economies. We also have a considerable retardation of industrial structure regarding the group of mid-high-tech branches. Of 22.0% of the group of mid-low-technological branches, we can single out metallurgic production and production of ready-made metal products. In the group of low-technology branches, we can single out the production of food, drinks and tobacco products. But the most important thing is the picture of structural dynamics which shows the trends of future economic development of the country. The seven years analyzed were the years of fast economic development of Ukraine. Among the branches which considerably changed their position in the structure of industry during this period were: production of vehicles and equipment and production of charred coal and oil products, and production and distribution of electrical energy, gas and water. As we see, it is difficult to talk about progressive structural policy in Ukraine. From the point of view of the theory of technological paradigm, this is the biggest threat for the present-day economy of Ukraine.

Table 1. Structural dynamics of the industry of Ukraine by type of technologies in
2001-2007

*(in % to the industry in general; realized products in current prices
for the corresponding year)*

Branches of industry	Group of branches by level of technologies	2001	2003	2005	2007
High-tech					
Production of electric, electronic and optic equipment	1,0	2,7	2,9	2,9	3,0
Mid-high-tech					
Chemical production	2	4,7	5,0	4,7	4,3
Production of machines and equipment	2	4,8	4,5	4,4	4,2
Production of vehicles and equipment	2	2,7	4,8	5,4	6,5
Mid-low-tech					
Production of charred coal and oil products	3	4,9	7,4	9,4	7,3
Production of rubber and plastic products	3	1,3	1,4	1,7	1,8
Production of other non-metal mineral products	3	2,7	2,6	2,9	3,8
Metallurgic production and manufacturing ready-made metal products	3	18,0	20,0	22,1	22,0
Low-tech					
Raw materials industry	4	9,7	7,7	8,3	7,9
Production of food, drinks and tobacco products	4	16,6	17	16,3	15,3
Light industry	4	1,4	1,3	1,1	1,0
Textile industry; production of clothes, fur and fur products	4	1,0	0,9	0,8	0,7
Production of leather, products of leather and other materials	4	0,4	0,4	0,3	0,3
Processing of wood and manufacturing wood products, apart from furniture	4	0,7	0,8	0,8	0,8
Paper and pulp industry; printing industry	4	2,4	2,5	2,5	2,4
Production and distribution of electrical energy, gas and water	4	24,8	20,4	15,9	18,2

Source of information: State Statistics Committee of Ukraine.

We see an even worse situation in the analysis of the structure by technological paradigms. If we perform the above grouping of branches by three paradigms, we will get the results presented in Table 2.

Table 2. Structural dynamics of Ukrainian industry by technological paradigms in 2001-2007.
(in % to the industry in general; realized products in current prices
for the corresponding year)

Paradigms	2001	2003	2005	2007
5 th technological paradigm	2,7	2,9	2,9	3,0
4 th technological paradigm	39,1	45,7	50,6	49,9
3 rd technological paradigm	57,0	51,0	46,0	46,6

Source of information: State Statistics Committee of Ukraine.

Today, the dynamics and quality of economic development in developed countries are determined by branches of the 5th technological paradigm. In the industry of Ukraine, its part in the XXI century did not exceed three percent. This figure is very small. As we see from Table 2, these years saw the strengthening of positions of the 4th technological paradigm, which corresponds to the philosophy and actual priorities of the current economic policy of Ukraine.

We will see the same picture as far as external economic relations are concerned. As it is known, the indicator of the share of export of high-tech branches is one of the most important evaluation criteria of the level of the country's competitive strength. In Table 3 we see the data concerning the structure of Ukrainian export based on the evaluation of groups of production by level of technologies determined with the help of methods used above.

We see again a very small share of the products of high-tech branches – only 4,6%. The advanced developed countries have the indicator of 30%. The mid-low technological branches dominate in Ukrainian export – 56,1%. It means that

the country is oriented to the production of traditional industrial commodities realized at competitive saturated markets. The drawback of this external economic position consists in the fact that such markets have no special prospects of development, which raises doubts as to the possibility of supporting the long-term dynamics of economic growth of the countries oriented to such markets. That's why developed countries constantly try to make expansion to new innovational markets that can ensure their stable strategic development.

Table 3. Structure of Ukrainian industrial export in 2006
by type of branches on the basis of the level of technologies.

Type of branches of industry by the level of technology	Export of industrial products		Trade balance (export – import) by groups of branches, thous. \$
	Volume, thous. \$	Structure, %	
High-tech	1763305	4,6%	-3 076 512
Mid-high-tech	6361707	16,6%	-7 589 546
Mid-low-tech	21509082	56,1%	3 999 054
Low-tech	8733513	22,8%	12 991
Total	38367610	100,0%	-6 654 012

Source of information: COMTRADE statistics

Looking into the future, the advanced countries are already deploying prerequisites for the expansion of productions of the 6th paradigm, where biotechnologies are predicted to be the key factor. In Ukraine, the share of such enterprises is not only meager, it is also impossible to trace the priority of investment flows for this group. Meanwhile, advanced mastering of future technologies of the sixth techno-economic paradigm may give Ukraine a chance to catch up with the "peloton" of the developed countries in XXI century. As we see, the actual priority today is given to 3rd and 4th paradigms. It may be reflected by simple reproduction of the state of technological basis formed in the past. It is clear that such policy cannot ensure long-term economic growth of the country.

The information in Table 3 shows one more worrying tendency of Ukrainian economy: huge negative trade balance in the groups of high and mid-high technologies. These figures testify

to very low innovation potential of the country. Using high-tech products, the country does not create its own production base for adequate increase in the competitive production. This situation cannot be satisfactory in the context of the task (necessity) to create pretexts for future economic growth of Ukrainian economy.

6. Economic policy application

Judging by the fact that effective innovational technological changes are the main factor of long-term social and economic development, all developed countries have created the so-called “national innovational system”, which is a complex of institutional, legal and economic measures related to the stimulation of innovational economic changes in the country to ensure strategic national advantages and effective international competitive advantage both on the internal and on the external markets (ed. Nelson, 2003). Considering the above, there is an urgent need to build up the national innovational system in Ukraine as well, and the problems of stimulating investments into technological changes must obtain a priority status in the activity of the legislative and executive branches of power.

The high competitive level of high-tech products, as we may see by the experience of the dynamically developing countries, is the result of successful completion of the stage of "apprenticeship" which serves as a basis of the products of companies – pioneers of innovational process, which are still mass ones on the market, but already old in comparison with the implemented newest ones. The world's leading innovational companies "go" from the traditional market and give the competitors a possibility to "enter" it with the help of improving innovations. Some time ago it was widely used by Japan and new industrial countries to conquer the international markets of high-tech products (Hirooka, 2006). As a result, they created scientific and industrial potential which allowed these countries to strive for more – to compete in the high-tech sphere with the world's leading companies.

Analysis of character of the international technological competition shows that the countries which were not traditional technological leaders but later entered their number, started conquering export markets with imitation of innovations, then found the methods of their improvement and after that became leaders in some trends. That's why the countries which first had no possibility of producing competitive products for different reasons (labor resources, raw materials, etc.), were first oriented to the transfer of scientific and

technological innovations from other countries and their diffusion on the internal market, and then set ambitious tasks related to the presence on world markets.

Use of the methods of techno-economic paradigm during the formation of strategy of the economic development of Ukraine is important because of peculiarities of economic heritage related to command-administrative economy. Transition to market relations in the post-Soviet countries revealed the problem of low efficiency of resources use and excessive cost of production on a micro- and macro-level in all former Socialist countries. This problem is still urgent for Ukraine. Old inefficient structure of production supports stagflation processes that are an attempt to recover macroeconomic balance by reduction of effective total demand.

It is impossible to find the way out of crisis prerequisites of this kind by direct interference of the country with the economy by methods of fiscal or monetary macroeconomic policy. Recipes of quick resolution of the situation are first of all connected with institutional measures of stimulation of dynamic structural changes. Such processes may take place mostly through innovation technological change. However, there is no effective mechanism of corresponding transformational policy provision in Ukraine today.

Technological appeals to the Ukrainian society also come from the part of modern tendencies of global development. The last quarter of XX and the beginning of the new century are characterized by an unprecedented increase in the influence of science and new technologies to the socio-economic state of all the countries. It came out that inability to ensure structural reconstruction of the national economy in accordance with the requirements of the new technological paradigm or delay in performing such structural changes not only slows down its development but also leads to economic degradation. That's why the most challenging task at present consists in building up an integral national system of strategic management aimed at the provision of the said structural changes. The new important peculiarity of development is a considerable increase in the international competition not only on the external but also on the internal markets.

Transition from the development based on the import of technologies to national innovative production is not easy. It will require direct participation of the country in the provision of high level of innovations with the help of budget and private investments in the research and development, improvement of the level of education, strengthening of capital markets and

regulatory system which stimulates the appearance of high-tech enterprises. Advanced training of personnel is becoming more important. It is evident today that competitive advantage largely depends on the possibilities of creation and activity of regional innovational clusters.

It is a new phenomenon at the present stage of human evolution that innovation development of technologies is going along the way of a permanent increasing of their complexity. But corresponding production management systems will require the same complication. Empiric research of evolution of organizational structures of the world's leading companies showed that long-lasting success in the sphere of complicated innovational technologies is directly dependent upon the ability of companies to reorganize their organizational structure into a more complicated management and technological complex. The natural consequence of this process is the company's interaction with other companies within the framework of a complicated multi-branch network of enterprises. That's why the evolution of the development of innovational production systems is concentrated on the search for new organization forms which allow increasing the productivity of resources involved. These are the main feature and reason of the creation of new global enterprise agglomerations, in particular those of cluster type.

7. Conclusions

Nowadays the theory of techno-economic paradigm is fully proved by practice. All developed and dynamic countries prove the correctness of the conclusions of this theory by efficiency of their economic policy which is built up on these principles. In Ukraine, it is hard to acknowledge the objective character of this theory as one can often see real negligence of its provisions, their usage only for beautiful rhetoric. However, as was shown in the article, Ukrainian economy has no other choice of the model of economic development apart from mobilization of all possibilities for the effective introduction of Ukrainian economy into the technological trajectory of human civilization evolution. However, practical realization of this task will require considerable political and economic measures to form an effective institutional, regulatory, economic and motivating environment in Ukraine which will be able to ensure accelerated development of branches of 5th and 6th techno-economic paradigms.

Conclusions of this theory directly concern the problem of choosing development priorities to introduce state support for their realization. It is clear from the analysis given that

technologies of current and future technological paradigms must be such priorities. Then the structural reconstruction becomes most effective from the point of view of achieving high speed of economic growth. Support of old traditional enterprises does not guarantee achievements of economic aims of structural transformation.

But in Ukraine, the state continues to support the traditional structure of production. Powerful lobbying of interests of branches in the Parliament and the government has practically no innovational trend. Analysis proves that there is no effective mechanism of guarantee of progressive technological changes in the country. State institutions mostly support the existing enterprises and they do not have sufficient funds or motivation for revolutionary innovational transformations.

On the other hand, non-state and private commercial structures have no economic motivation to engage in innovational activities today. Competitors that maximize their profit are often unable to bear additional expenses to get the monopoly profit of the innovator; they cannot undertake economic responsibility related to the risk of a new product introduction or extending to a new market, either. That's why free competition cannot quickly mobilize resources and possibilities of the society to perform the required effective technological changes. The countries with market relations that do not support innovational processes by special methods quickly find themselves in the rearguard of world economic competition.

The world practice confirms that the most effective mechanism of technological changes stimulation is the market competitive environment, where the country interferes in such a way as to protect and support the market players who take the burden of innovational initiative. That's why the country must actively conduct innovational policy. In this context, the current problem for Ukraine is the creation of the management structure which would perform evaluation, planning and support of strategic technological changes in the country in accordance with general national interests. The main aim of this organization must be state support of innovational and technological activities by provision of regulatory and resources base which would condition efficient technological changes in the country as a factor of long-term economic growth.

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