The Effect of Innovative Processes on the Cyclical Nature of Economic Development

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ABSTRACT

The article describes the main characteristics of the economic cycles, a chronology of technological mode with an indication of the driving sectors and sources of energy, in addition it is noted that the economic cycle depends on technological modes and innovative development. It is pointed that the effectiveness of innovative development of organizations lies in achieving of technical, resource, economic and social effects (multi-effect). The article presents the author's interpretation of the term "innovation activity". Innovation activity is the activity that includes scientific, technological, organizational, financial and business activities, is based on the intellectualization and focused on the commercialization of scientific knowledge, technology and equipment; it combines the social, economic, technical, resource effects. The result of innovation activity is an innovation, as a product (service) or process (technology), and its development is a factor of economic dynamics. The factors influencing innovation activity were emphasized and classified into internal and external, constant and variable-based factors. The conclusion was drawn that the emphasized factors not only affect the innovative activity of organization, but also characterize the life cycle stage of organization, the development of which is also a cyclic process. The article is theoretical.

Introduction

The innovative processes are the driving force of economic development on the whole, as they eliminate the non-viable organizational structures and outdated technologies, relieve from non-competitive or unclaimed one, and open possibilities for the new and progressive one, promoting to the development of both economy and society on the whole (Schumpeter, 2008; Tukkel', 2013).

The development of world economy takes place in accordance with the range of conditionalities: firstly, in a wavelike way in accordance with the theory of long waves of N. Kondratieff; secondly, the level of social-economic development is

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determined by the effect of big number of factors, social, political, technological, cultural and etc.; thirdly, the main driving force is the level of technological and information development (Kondrat'ev, 2002; Nosonov, 2011). The economic development of the society depends on the technological modes (Figure 1), where the main driving branches and sources of energy were specified.
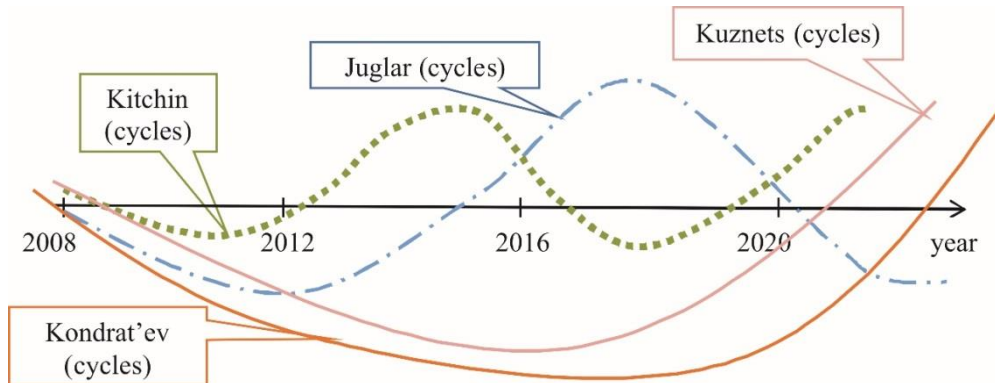
Fidure 1. Chronology and characteristics of technological modes (made by author on the basis of generalization of literary sources).

Thus, the first technological wave is based on the new technologies in textile industry and usage of water energy; the second one – usage of steam engine and development of railways transport; the third wave – development of heavy industry and usage of electric engine; fourth wave – invention of the internal-combustion engine and automobile-building (Grinin, 2013; Mil'ner, 2013).

The modern economy is at the end of fifth and at the beginning of sixth technological waves, where the fifth wave is characterized by gas technologies and branch of computer engineering and the sixth wave is aimed on the search of alternative sources of energy, net models of business conduction, Internet and usage of innovative technologies (Babanova & Kireeva, 2013; Aivazov, 2013; Dlimbetova et al., 2016).

There are many scientific approaches, directions, opinions of various economic schools, for the notion of the causes of economic cycles (Metz, 1992; Nosonov, 2011). Thus, monetarists believed that the cyclicality is the result of instability in financial sector; neo-Keynesian school considers the cause of the crises in overproduction and lack of propensity to consume; Marxists point out to the unbalance in actions of economic entities and the emergence of macroeconomic imbalances (Schumpeter, 2008; Barmashov, Barmashova & Viktorova, 2013). In addition, psychological causes of cycles are noted, which connects business activity with a mood swing, the changeover from the mass optimism to pessimism (Schumpeter, 2008; Akaev, 2013).

In this context, studying cyclicality and characterization of phases of economic cycles are among the most difficult theoretical and methodological problems, which attract the attention of scientists and a satisfactory positive decision for them still have not been found.

Therefore, there is a need to study the impact of innovative processes in the cyclical development of the economy, identifying the relationship of innovation and development of innovative development of enterprises, as a major economic entity of any country, as well as characterization of the factors influencing the innovation activity of organizations.

The change of technological modes is characterized by appearance of innovations, which determine the dominant factor of production (labour, land, capital, knowledge, entrepreneurship) and is accompanied by the economic crises.

Materials and Methods

The methods used to study were the methods of scientific knowledge. In particular, dialectical, monographic, abstract-logical methods were used during composition of the chronology, characteristic of technological modes, defining the interrelation of innovation activity and innovative development, the allocation of the factors influencing the innovation activity of the organization; as well as a comparative analysis used to classification of economic cycles, and the study of time series to characterize Kondrat'ev waves.

Data, Analysis, and Results

The first systematic statement of periodic economic crises, in contrast to the existing theory of economic balance, was offered by J. Sismondi in 1819. Up to the point the classical economy denied the existence of business-cycles. The development of theory of periodic crises of J. Sismonde de Simsondi (1819) was continued in the theory of cycles of Ch. Dunoyer and J. Rodbertus. The periodic crisis at capitalism lied in the basis of K. Marx theory "Capital" (Nosonov, 2011).

In the mid of XIX century H. Clark initiated the beginning of studies of long-wave dynamics, when in 1847 year he paid attention to 54-year period between crises. Till the beginning of XX century the presence of three types of cycles was detected: "big cycles" (40-60 years), "average cycles" (7-11 years) and "short cycles" (2-3.5 years) (Aivazov, 2013). In the modern economic literature four basic types of economic cycles are separated (Table 1).

Table 1. Classification of economic cycles.

Cycle	Period	Reasons
Short-term cycles of Kitchin (1923)	3-4 years	Connected with movement of inventories. Presently the time of mechanism of formation of these cycles is usually connected with delays in time (time lags) in movement of information, effecting on making decisions by commercial firms
Average-term cycles of Juglar (1862)	7-11 years	Characterized by fluctuations not simply in the filling level of the existing industrial capacities (and, correspondingly, in the volume of inventories), however the fluctuations in the volumes of investments in the fixed capital
Cycles of Kuznets (1930)	15-20 years	Connected with demographic processes, in particular, inflow of immigrants and building changes. Presently, the rhythms of Kuznets are considered as infrastructure cycles
Long waves of Kondrat'ev (K-cycles or K-waves)	45-60 years	The studies and conclusion of Kondrat'ev was based on empiric analysis of the big number of economic indicators of different countries in enough long-term intervals of time, covering 100-150 years (Barmashov *et al.*, 2013). These indicators included indexes of prices, state debt securities, nominal wages, indicators of eternal turnover, extraction of coal, gold and production of lead, cast iron etc. (Grinin, 2013).

Kondrat'ev cycles (K-cycles), which according to definition of N. D. Kondrat'ev consist from two waves: downward and upward one, lie in the basis of whole "Periodical system of world capitalistic development". During passing of

downward wave of world economy endures heavy and long-term crises, while during upward wave the crises, as a rule, are not very long-term and not very deep (Solomatina, 2013).

Yakovets Yu. V., Peres K., Grinin L. E., Nosonov A. M. state that modern economy is on the downward stages of fifth Kondrat'ev wave (Figure 2).
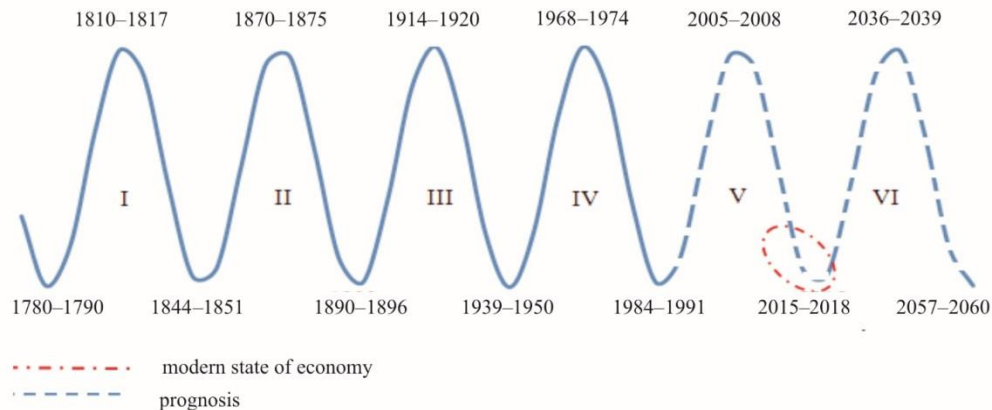

Figure 2. The scheme of Kondrat'ev waves (built by the author on the basis of analysis and generalization of literary sources).

N. D. Kondrat'ev statistically detected the phenomena, which were called "empirical regularities", but couldn't explain them theoretically: a) at the beginning of rise phase the mass implementation of technical inventions takes place; b) the rise phases are characterized by the bigger number of social shocks, than the phases of recession; b) in the phase of recession the agriculture suffers most of all; c) average and small cycles are "threaded" on big cycles (Nosonov, 2001).

The schematic placement of economic cycles is shown on Figure 3, where the phases of rise and recession for each one are reflected:

- development takes place by spire, as economy doesn't return on the previous level of development, but transits on the next stage that has upward tendency;
- many economists separate the other limits of cycles in dependence on the selected mathematical method or scientific studies;
- limits can change under effect of acyclic policy of countries, force-majeure situations, connected with financial crisis, political and economic sanctions, natural-climatic anomalies and etc.
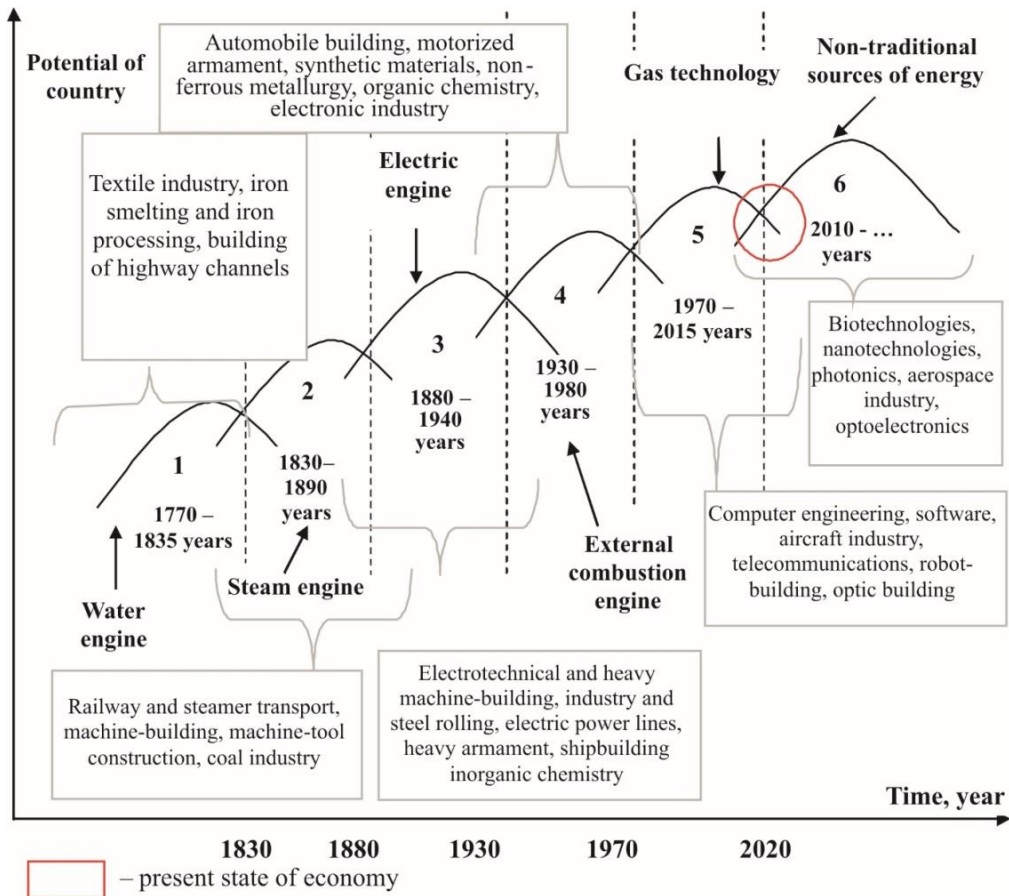
Figure 3. Cycles of economic development fluctuations in Russia (built by the author on the basis of analysis and generalization of literary sources).

The basic essence of big cycles theory of economic conjuncture was firstly stated by N. D. Kondrat'ev in the book "World Economy and Its Conjunctures During and After the War" (1922). K-wave and its phases see the Table 2.

Table 2. K-wave and its phases (Babanova and Kireeva, 2013).

Serial number of long wave	Phase of long wave	Period of war beginning	Period of war end
Long waves, identified by N. D. Kondrat'ev			
I	A: upward	End of 1970's – beginning of 1790's	1810-1817
	B: downward	1810-1817	1844-1851
II	A: upward	1844-1851	1870-1875
	B: downward	1870-1875	1890-1896
III	A: upward	1890-1896	1914-1920
	B: downward	1914-1920	no prognosis
"Post-Kondrat'ev" long waves (according to the data of N. D. Kondrat'ev fund site)			
III	A: upward	1890-1896	1914-1920
	B: downward	since 1914 to 1928/29	1939-1950
IV	A: upward	1939-1950	1968-1974
	B: downward	1968-1974	1984-1991
V	A: upward	1984-1991	2005-2008
	B: downward	2005-2008	2007-2020

J. Schumpeter (2008) was the first one, who studied Kondrat'ev big cycles. He offered complex theory of three cycles – Kondrat'ev, Juglar, Kitchin, – that received name "Great Union". Schumpeter J. subdivided each K-wave into four phases: restoration, prospering, recession and depression, and the very innovations are basic and improving one. The big cycle of Kondrat'ev consists of six cycles of Juglar, and one cycle of Juglar covers three cycles of Kitchin. The fact that one big cycle of Kondrat'ev consists of the whole number of Juglar's cycles are confirmed by modern studies (Grinin, 2013), however, as a result of gradual reduction of duration of Kondrat'ev big cycle, their number already makes not six, but five. Kitchin cycles also endured big changes. Their general duration essentially increased from three to five and a half year. Consequently, the separate Juglar cycles sometimes contain not three, but only two Kitchin cycles. Moreover, in connection with improvement of the process of inventories management, the amplitude of economic activity fluctuations within the framework of Kitchin cycle also weakened essentially (Barmashov et al., 2013).

L. E. Grinin (2013) separates the following dating of post-Kondrat'ev long waves (Table 3). It was expected that 1990-s and 2000-s years will bring the new radical waves of innovations, compared according to the revolutionary character with appearance of computer technologies and capable to create new technological mode. Namely those directions, which were already specified, were called as breaking through, and which now, as it is supposed, will become the basis for the new one – six K-wave.

However, the development and diversification of the already created digital electronic technologies and impetuous development of financial technologies became the basis for the fifth wave. Those innovations, which were really formed within the fifth K-wave, as for example, technologies of green and low-carbon energy, still take the small part in the general power engineering.

There is nothing surprising in the delay of transition to the sixth K-wave. Firstly, the center can't endlessly pass ahead in the development of periphery, i.e. the gap between developed and developing countries couldn't intensify all the time. Secondly, the economy can't constantly pass ahead political and other constituents, or very strong disproportions and deformities appear. Coming of new technologies of wide application, undoubtedly, would accelerate the development of economy and intensify disproportions.

Thirdly, implementation and distribution of the new basic technologies takes place not on itself, but only in the corresponding social-political environment. In order that basic innovations appeared in the forms appropriate for business, except for other things, the structural changes in the political and social areas are required that in a final result will give impulse for their synergy and wide "launch" in business. Fourthly, the arena of modern changes became global one, correspondingly political, social and other changes, necessary for pulling up, also have regional-international character. On the downward phases of K-waves enough serious changes in different areas of life must happen, however, namely on this – second – stage of scientific-cybernetic principle of production, especially serious changes must occur. Correspondingly, they require big efforts (Grinin, 2013).

Table 3. Peculiarities of V and VI K-waves and their phases in accordance with theory of principles of production and industrial revolutions.

Number of wave and phase	Peculiarity that is not resulted from theory of K-waves	Explanation with the help of theory of production principles and industrial revolutions
Fifth K-wave, A-phase (1982–2007)	1) Smaller tempos of growth of GDP in comparison with A-phase of fourth wave. 2) Weak tempos of growth in the center of World-System and, on the contrary, high ones on the periphery. 3) Delay of new generation of basic technologies.	In the period of second (distribution and modernization) stage the scientific-cybernetic principle of production, the new generations of innovations are not created, as the main vectors of development such as improvement of already made innovations, pushing up of the levels of periphery to the center, distributions of innovations on the maximal quantity of territories. So, the general tempos of growth become slower, and also some leveling of development of regions strongly different according to economic indicators takes place. Leveling leads to higher tempos of periphery growth and less one – of center.
Fifth K-wave, B-phase (2007–2020)	Very heavy epoch-making crisis of 2008-2013, but at that the development goes much faster in the center, than on the periphery.	The necessity of pulling up of periphery to the center on the second stage of scientific-information principle of production for leveling of standards of development; the necessity of pulling up of the political constituent of development to the economic one.
Six K-wave (2020–2060)	A-phase turns out to be essentially more powerful, than A-phase of the fifth K-wave, and B-phase – less depressive and short. If the final phase of cybernetic revolution stays too long, A-phase of sixth wave will be less powerful, but the seventh K-wave must display itself.	In the process of development of this wave the final phase of cybernetic revolution will begin, the density of innovations will grow and remain such one for long enough, from here A-phase will be more powerful, and B-phase (similarly to B-phase of the first wave) – more depressive (Barmashov *et al.*, 2013).

Discussions

The significance and value of each effect is increased by the advantageous external factors, for example, the effect of innovation activity reduces or requires large investments and costs on an upward wave and on a downward wave of the economic cycle. Development of innovation activity is a factor of economic dynamics in the cycle theories and socioeconomic concepts (Schumpeter, 2008).

In this case, the derivable effect from innovation activity should not be limited to economic effect, it is necessary to aspire the totality of social, economic, resource and technical effects (multi-effect). In this regard, the factors of innovation activity were emphasized and classified, affecting on which the possibility of innovation activity stimulation appears.

It is important to mention that enterprises are subjected not only to economic cycles, but also develop according to enterprise life cycle (formation, growth, maturity, transformation), which should be considered for the development of innovation activity. Thereby, the method of determining the enterprise stage of

development, taking into account the selected factors is required, which would suggest a differentiated approach to the development of innovative activity.

Conclusion

Thus, the development of economy take place in cyclic order, correspondingly, the crisis is natural state of certain way of production that can be prognosticated with the aim of modern prevention and exit of it owing to activation of innovation processes, which allow development of the new goods (services), conduct modernization of production due to innovation technologies, thus reduce the cost price, material intensity and labour input, and increase the quality of production. All this stimulates the stable growth and transition on higher phase of the economic development at the expense of increase of profitability of enterprises, production growth, stimulating the demand of population and increasing the quality and level of life. The harmonious cooperation is required for the development of state, production and science, and the very society itself.

Disclosure statement

No potential conflict of interest was reported by the authors.

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