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N. D. KONDRATIEV'S LONG WAVE THEORY AND MODERNITY: THE DIGITAL AGE

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Abstract

The object of this study is the "long wave" theory by N.D. Kondratiev. The purpose of this article is to study N.D. Kondratiev's long wave theory and its influence on the present. Methods. The authors of the article used such general scientific research methods as analysis and synthesis. Their choice was conditioned by the need to understand the influence of Kondratiev's long wave theory on modern economic reality. In particular, the authors used a systematic approach to analyze the system of economic indicators that cause wave-like changes in the economy, as well as empirical and economic-analytical methods to study open empirical data that explain the features of economic activity and the functioning of social actors.

Keywords

Para Citar este Artículo:

Introduction

At the present stage, the strategic priority of the Russian economy is the transition to an innovative path of development and the use of the main provisions of N.D. Kondratiev's long wave theory is quite important. The market economy is primarily characterized by the unevenness of its development that is associated with changes in capital, which are qualitative, and the change of technical cycles (technical generations). Based on this, crises associated with the uneven development of both economic systems as a whole and their parts, as well as associated with fluctuations in production volumes, should be considered and studied in the context of the general development laws characteristic of a market economy.

The cyclical problem, which has attracted the attention of scientists since the middle of the 18th century, remains one of the central problems of economic theory. The cyclical development of the economic system as the desire to achieve macroeconomic equilibrium is a manifestation of the very essence of economic development, its natural property, and the way it progresses.

Materials and methods

In this article, we applied such general scientific research methods as analysis and synthesis to study cyclically changing market indicators, systematization and comparison to identify patterns in wave-like changes in the development of a market economy. We also used empirical and economic-analytical approaches to analyze and study open practical data on market dynamics. The results obtained are presented under the requirements for the development of scientific and methodological foundations of the studied problem. The problem of researching N.D. Kondratiev's long wave theory in modern socio-economic conditions has been studied by many modern scientists, such as R.R. Sidorchuk[1], O.V. Oshkaderov[2], D.A. Volkov[3], A.B. Sukhotin, L.S. Chernova[4], N.V. Galitskaya[5], A. Smirnov[6], A. Yu. Davydov[7], L.E. Grinin[8], A.M. Nosonov[9], A.A. Sattarova[10],

[1] R. R. Sidorchuk, "Dlinnye volny N.D. Kondratieva: marketingovyi aspect". XXIII Kondratievskie chteniya: Tupiki globalnoi ekonomiki, poisk novoi nauchnoi paradigmy Sbornik statei uchastnikov konferentsii, (2015): 245-247.

[2] O. V. Oshkaderov, "Teoriya dlinnykh voln N.D. Kondratieva i perspektivy preodoleniya mirovogo finansovogo krizisa", Molodoi uchenyi, num 3 (2015): 121-124

[3] D. A. Volkov, "Analiz teorii volnovykh protsessov i issledovanie obshchei prirody dlinnykh ekonomicheskikh tsiklov", Molodoi uchenyi, num 1-2 Vol: 1 (2016): 167- 173.

[4] A. B. Sukhotin y L. S. Chernova, "Territorialnyi aspekt narushenii koordinatsii i kognitivnosti ekonomicheskogo razvitiya i tselostnosti stran v dinamike dlinnykh voln Kondratieva. Nauchnoe nasledie N.D. Kondratieva i sovremennost Sbornik nauchnykh trudov uchastnikov X Mezhdunarodnoi Kondratievskoi konferentsii, posvyashchennoi 125-letiyu so dnya rozhdeniya N.D. Kondratieva. Pod redaktsiei V.M. Bondarenko; Mezhregionalnaya obshchestvennaya organizatsiya sodeistviya izucheniyu, propagande nauchnogo naslediya N.D. Kondratieva, (2017): 362-368.

[5] N. V. Galitskaya, "Tsiklichnost makroekonomicheskikh pokazatelei: istoriya i sovremennost", Voprosy statistiki, num 12 (2010): 51-54.

[6] A. Smirnov, "Eshche raz o mife Kondratievskikh voln", Ekonomist, num 4 (2012): 36-60.

[7] A. Yu. Davydov, "Bolshie tsikly" amerikanskoi ekonomiki, SShA. Kanada. Ekonomika-politika-kultura, num 2 (2010): 3-18.

[8] L. E. Grinin, Kondratievskie volny, tekhnologicheskie uklady i teoriya proizvodstvennykh revolyutsii. Kondratievskie volny. Aspekty i perspektivy. Ed. by A. A. Akaev, R. S. Grinberg, L. E. Grinin, A. V. Korotaev, S. Yu. Malkov (Volgograd: Uchitel, 2012).

and many others. Despite the demonstrated interest in the topic being studied, it should be noted that this issue is not widely researched and widespread, which primarily emphasizes its relevance. One of the key concepts of macroeconomics is its cyclic character. The cyclic character is a continuous fluctuation of the economy, which is inherent in all countries in the world and is expressed in the growth and decline of production, increase and decrease in business activity. It should be understood that most often periods of lowering economic activity are characterized by an intensive path of development, and the periods of economic growth are characterized by an extensive path. Studying the cyclical nature of economic processes, one needs to consider N.D. Kondratiev's long wave theory (K-waves). The Russian economist conducted his research in the 1920s. Kondratiev took an unusual approach at that time: the economist studied the features of changes in indicators such as wages, average prices, indicators of foreign trade turnover, and so on at certain time intervals.

Results

The cycles studied by N.D. Kondratiev start from 1785-1790 and end in 1915-1930. During this period, the economist and researcher distinguished and identified two and a half major cycles. However, it should be noted that the length (duration) of these waves (cycles) is not always the same; fluctuations are observed in such time intervals as 47-60 years. Inaccuracy is also observed in cycle turning points, varying in the range of 5-7 years. In his theory, Kondratiev called the waves downward and upward. Table 1 shows the characteristics of the ascending and descending waves.

Period of the cycle	Characteristic
Ascending wave	Recovery and expansion of fixed capital; Total dynamic changes and a shift in focus of the main productive forces of society[11]; Rising prices, increasing production and turnover and intensifying competition; Expansion of the world economy in new regions and improving the efficiency of the use of already developed; Increased competition in foreign markets, creating a threat of foreign policy conflicts; An aggravation of the domestic political situation, associated with the confrontation of new and old social forces, entailing inflation of internal conflicts.
Descending wave	Changes in pricing policies related to falling prices and interest rates; Reducing the intensity of production growth and the pace of trade; Observed stagnation in foreign and domestic political processes, as well as a slowdown in the pace of social relations; An increase in the level and speed of savings, especially in conditions of an increase in the real disposable income of the population; Strengthening scientific and technological progress, increasing the number of innovations and technologies; Stagnation percentage on capital.

Table 1
The main characteristics of the waves

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[9] A. M. Nosonov, "Kontseptualnye osnovy tsiklicheskogo razvitiya", Pskovskii regionologicheskii zhurnal, num 14 (2012).
[10] A. A. Sattarova, "Dolgosrochnaya i srednesrochnaya tsiklichnost v mirovoi ekonomike", VEPS, num 3 (2012).
[11] A. A. Sattarova, Dolgosrochnaya i srednesrochnaya…

Kondratiev also noted the existence of the so-called "rules of thumb":

1. The recovery phases are characterized by a large number of social upheavals.

2. The rising phase (namely, its initial stage) is determined by the introduction of technical inventions that are massive.

3. Agriculture suffers, to a greater extent, in the recession phase.

4. Medium and small cycles are included in large cycles.

N.D. Kondratiev presented the scheme of transitions of cycles from equilibria of various orders. The First-order equilibrium is the impossibility of increasing production efforts and supply volume, so an increase in demand can only affect inventory. The Second-order equilibrium is established at the expense of available stocks of capital goods that allow the production of consumer goods. Then there is an increase in manufacturing in the sectors of the economy, in which the means of production are made, which have a great influence on the scale of production of consumer goods[12].

In the framework of the study of N.D. Kondratiev's long wave theory, we made the following conclusions and generalizations:

1. The dynamics of the totality of the considered indicators of the state of the market determines the existence of cycles, each of which can be characterized by the presence of upward and downward waves.
2. The study identified two groups of indicators (parameters):
a) indicators characterized by cyclical wave-like changes (here we distinguish price, wages, loan interest, etc.);
b) indicators in which cyclic manifestations are characterized by a change in growth and fall rates.
3. Major cycles that determine the state of the market have temporary coincidences and are international. Almost the same data cycles are observed in the US and the European capitalist countries.

In the course of research N.D. Kondratiev distinguished and substantiated three long waves of conditions lasting for 48 to 55 years (Table 2).

Cycle	Wave	Period
Cycle 1	ascending wave	from the end of the 1780s and the beginning of the 1790s to 1810-1817
	descending wave	1810-1817 to 1844-1851
Cycle 2	ascending wave	1844-1851 to 1870-1875
	descending wave	1870-1875 to 1890-1896
Cycle 3	ascending wave	1891-1896 to 1914-1920
	possible descending wave	1914-1920

Table 2
Kondratiev's long cycles

[12] R. R. Sidorchuk, Dlinnye volny N.D. Kondratieva: marketingovyi aspect. XXIII Kondratievskie chteniya: Tupiki globalnoi ekonomiki, poisk novoi nauchnoi paradigmy Sbornik statei uchastnikov konferentsii, (2015): 245-247.

After N.D. Kondratiev, who completed his work on the alleged downward wave of the third cycle, many scientists turned to the theory of long waves, such as R. Cameron, G. Amber, F. Braudel, and others. Together, Russian and foreign scientists have developed a continuation of Kondratiev's long wave theory until 2025-2030.

Table 3 shows the development of Kondratiev cycles 4 to 6.

Cycle	Wave	Period
Cycle 4	ascending wave	1928-1933 to 1925-1965
	descending wave	1925-1965 to 1971-1975
Cycle 5	ascending wave	1971-1975 to 2007-2008
	descending wave	2007-2008 to 2014-2015
Cycle 6	ascending wave	2014-2015 to 2025-2030
	possible descending wave	2025-2030

Table 3
The development of Kondratiev cycles 4 to 6

The duration of the cycle, in our opinion, varies for the following reasons (Figure 1).
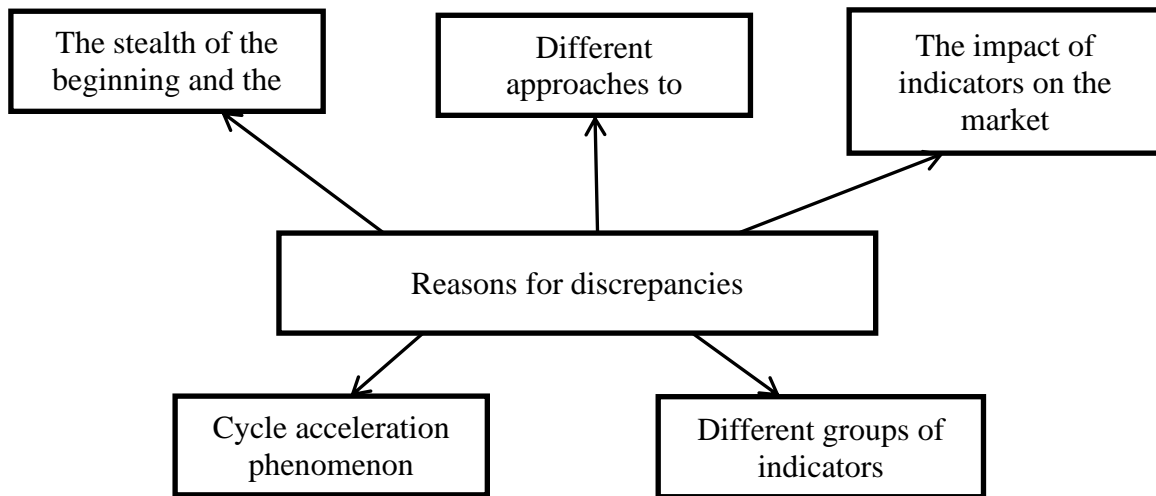
Figure 1
Causes of the discrepancy in the periodization of long waves

In the analysis of N.D. Kondratiev's long wave theory, we came to the following conclusions regarding the basic prerequisites for the formation of an upward wave of market conditions: capital accumulation; low prices, leading to higher savings and long-term investments; concentration of capital in the business and financial centers; the formation of a new layer of technology; a high level of innovative activity. As a result of this conclusion, we may argue that during the crisis period the formation of these prerequisites at the state level will accelerate the development of the rising wave and overcome the crisis. In the theory of long waves, several debatable questions remain, for which scientists have not yet found an unequivocal answer. The main issues, in our opinion, are the following: the presence of cycles under socialism, the industrial-technological shell of the theory, the exact periodization of cycles.

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These periods, of course, are conditional, but you can trace the dynamics of upward and downward waves in conjunction with events in the world.

The year 1933 was marked by the beginning of the 4th wave and was associated with the three-fold rise in the price of gold announced by F. Roosevelt and the lifting of the ban on changing its price.

During the rising period of the 4th wave, the Second World War of 1939-1945 began, the subsequent period was associated with discoveries in the field of atomic physics, namely the appearance of atomic weapons, the successful space exploration of the USSR and the US. These events are the turning points of the cycle, followed by an economic downturn.

The beginning of the fifth wave is due to the economic crisis of 1973-1975, which manifested itself in the energy and structural sectors of the economy. The basis of this crisis is the rejection of the Bratton Woods system of fixed exchange rates in the early 70s. Plastic cards late became the innovations in technology. Analyzing several economic indicators, in 2008-2011, we observe a downward wave of the fifth cycle.

Table 4 illustrates the relative growth in GDP, reflected in percent on the example of such countries, Russia, the US, and Japan. According to these three countries, in total, there is an increase in GDP before 1960 and in Japan until 1970, where a decrease begins. The critical values of the economic recession are indicated in 1990-2000. After that we observe another stage of renewed growth of economic indicators.

Of course, in three countries we can observe a different picture of changes in the level of GDP in the indicated period. There are temporary discrepancies at the end of the fourth downward wave and the beginning of the fifth upward wave. Nevertheless, the general cyclical nature remains in place.

Countries	1938	1950	1960	1970	1980	1990	2000	2008
Russia	27.27	50.00	109.52	41.36	23.47	4.69	-46.02	166.27
USA	-6.07	65.40	37.93	44.67	33.41	29.10	32.11	44.78
Japan	37.43	-13.62	118.02	176.86	56.72	48.33	7.54	29.04
Total:	58.63	101.78	265.47	262.89	113.60	82.12	-6.37	240.09

Table 4
The GDP growth dynamics

Let us illustrate in Figure 2 the dynamics of GDP growth in Russia, the US, and Japan.
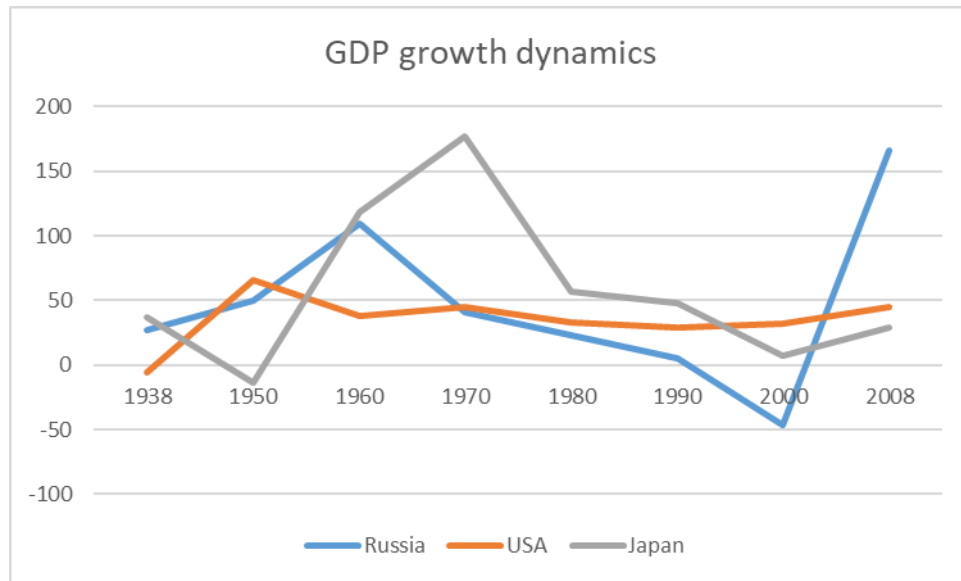
Figure 2
The GDP growth dynamics

In the 1920s, the Soviet economist N.D. Kondratiev, having analyzed several statistical indicators of European countries, developed the theory of major economic condition cycles, or long-term economic fluctuations, lasting 40-60 years each. In each cycle, one can distinguish an upward wave, which includes the phases of recovery and rise, and a downward wave of the crisis and depression phase. According to Kondratiev's theory, each cycle is based on technological innovation, the development and use of which ensures a long economic recovery.

With the invention of the steam engine in the 18th century, the construction of railways and the electrification of the 19th century, the automotive industry and the development of the information society in the 20th century, five long waves or K-cycles succeeded each other, starting with long periods of prosperity and ending with a serious crisis and stagnation at low economic indicators. The financial crisis that shook the world in 2008 and is often referred to as the greatest shock since the Great Depression marked the transition of the fifth K-cycle to a downward wave. According to the scenario of the development of major cycles, after the phase of depression lasting 7 to 13 years with the onset of the economic recovery phase, the sixth Kondratiev cycle will begin. Economists, politicians, and investors around the world are wondering what trends and processes will play a major role in the new cycle. N. Kondratiev lists four main characteristics of changes leading to a new cycle:

1. Exhaustion of the possibility of further development and operation of some innovations of past cycles that are still used in this cycle;

2. A high level of excess financial capital (compared with physical capital);

3. The period of severe recession (often accompanied by radical changes in various fields);

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4. Social and/or institutional transformations[13].

The aforementioned criteria, indicating the process of reorientation of the economy, characterize the current financial and economic situation.

Currently, there is a gradual decrease in productivity growth, which was based on improvements based on the innovations of the first computer with the properties of a modern computer — the Z3 computer, created by German engineer Konrad Zuse in 1941.

The creation of faster and more powerful computers no longer increases the productivity of the workflow; at the moment, a more important role in economic processes belongs to communication technologies that have already reached wide distribution.

In the period preceding the beginning of the financial crisis of 2007, the US economy experienced a significant excess of financial capital.

With the prevalence of financial capital in the country's economic system over the physical (fixed assets), investors began to seek profitability in projects such as real estate lending and operations with financial derivatives.

The purpose of concluding such a contract is to make a profit by changing the price of an asset, while the number of derivatives may exceed the number of assets. Besides, their value may exceed the value of underlying assets, which leads to speculation, with which analysts connect the latest global financial crisis[14].

In 2007, given the huge number of consumer loans, a mortgage crisis hit America, followed by a recession in the banking system. With a glut of the real estate market, which is the guarantee of a mortgage loan, there was a drop in demand for housing and, as a result, a drop in prices, which led to losses for the lender and the exhaustion of bank capital reserves.

In 2008, the mortgage crisis was transformed into a financial one; stock market quotes collapsed. There was a widespread decline in production volumes, the depreciation of raw materials and the associated drop in demand for it, followed by a period of massive bankruptcy of companies and increased unemployment.

As in the 1920s and 1930s, the crisis, which began in the US, then struck the whole of Europe, and the crisis that came in 2008 is called the most global since the Great Depression.

According to the laws of cycles, at the moment, the leading countries of the world are in a post-crisis depression. It is during this period that conditions are created for the

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[13] A. B. Sukhotin y L. S. Chernova, Territorialnyi aspekt narushenii koordinatsii i kognitivnosti ekonomicheskogo razvitiya i tselostnosti stran v dinamike dlinnykh voln Kondratieva. Nauchnoe nasledie N.D. Kondratieva i sovremennost Sbornik nauchnykh trudov uchastnikov X Mezhdunarodnoi Kondratievskoi konferentsii, posvyashchennoi 125-letiyu so dnya rozhdeniya N.D. Kondratieva. Pod redaktsiei V.M. Bondarenko; Mezhregionalnaya obshchestvennaya organizatsiya sodeistviya izucheniyu, propagande nauchnogo naslediya N.D. Kondratieva, (2017): 362-368.
[14] R. R. Sidorchuk, Dlinnye volny N.D. Kondratieva: marketingovyi aspekt. XXIII Kondratievskie chteniya: Tupiki globalnoi ekonomiki, poisk novoi nauchnoi paradigmy Sbornik statei uchastnikov konferentsii, (2015): 245-247.

revival and regrowth of the economy: there is a restoration of the supply-demand ratio, the low interest rate and the price level contribute to the renewal of the fixed capital necessary to start the growth of productivity, reduce the cost of production and increase the profit of the producer[15].

The world is approaching a new cycle — the sixth K-wave. In the fifth K-cycle, globalization has become an accelerator of the economy: a huge database of information, data exchange, export and import of services and goods regardless of state borders and currencies, all this is possible due to the achieved level of development of communication technologies, including the Internet. While the interconnectedness and interdependence of economic entities around the world are growing, the demographic gap is widening. According to the report of the 2017 Department of Economic and Social Affairs of the UN Secretariat on the global demographic situation and the prospects for its change, by 2030 the population of the world will be 8.6 billion people, by 2050 — 9.8 billion. In the next 33 years, half of the world's population growth will be focused in nine countries, which include: Democratic Republic of the Congo, India, Indonesia, Nigeria, Pakistan, US, Tanzania, Uganda, and Ethiopia. According to the report, in recent years 47 least developed countries have shown the highest birth rate (4.3 births per woman), which led to rapid and intensive population growth of 2.4% per year (Figures 3-4).

The French economist T. Piketti in his work "Capital in the 21st Century" notes that growth is a combination of such components as demographic and economic. The so-called process of catching up development is observed in Asia, Africa and Latin America, which will last several decades[16]. However, in general, a decrease in the birth rate was observed in the world, since many countries showed birth rates below the level necessary to replenish the population (about 2.1 births per woman) in 2010-2015. This birth rate was in 83 countries, accounting for 46% of the world's population. Among these countries, the following ten with the largest number of residents were noted: Brazil, UK, Vietnam, Germany, Iran, China, Russia, US, Thailand, and Japan.
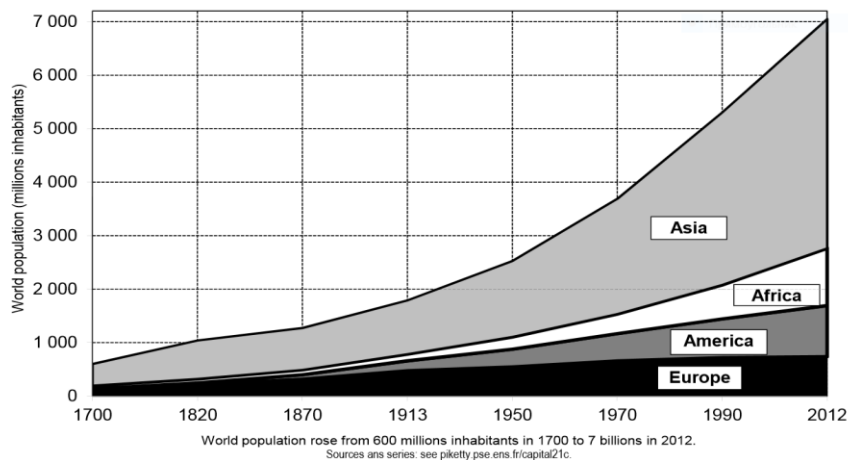
Figure 3
The growth of the world population 1700-2012[17].

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[15] O. V. Oshkaderov, "Teoriya dlinnykh voln N.D. Kondratieva i perspektivy preodoleniya mirovogo finansovogo krizisa", Molodoi uchenyi, num 3 (2015): 121-124
[16] T. Piketti, Kapital v XXI veke (Moscow: Ad Marginem Press, 2015).
[17] T. Piketti, Kapital v XXI veke…

The growth rate of world population was above 1% per year from 1950 to 2012 and should return toward 0% by the end of the 21st century. Sources and series: see piketty.pse.ens.fr/capital21c.
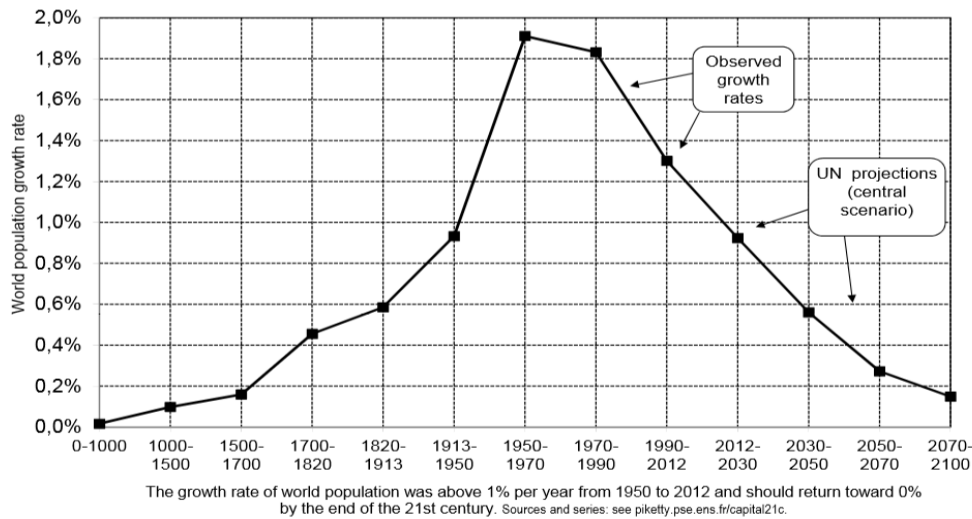
Figure 4
The growth rate of the world population from Antiquity to 2100[18]

Over the next decades, the world population is projected to increase with an increase in the birth rate, mainly in developing countries, while in developed countries the birth rate is expected to be lower than the reproductive level and aging population[19].

Discussion

Based on the role of globalization and demographic processes in the world, the following long-term prospects can be assumed:

1) the shift of the center of activity of business processes to Asia;

2) the role of developed countries in the sixth Kondratiev cycle is increasing. Due to the ongoing globalization and population growth of the world, the center of activity of business processes is gradually moving to Asia. Asian countries not only make up about 60% of the world's population (with a population of almost 4 billion people) but also own almost half of all foreign exchange reserves.

According to estimates of the Asian Development Bank, by 2050, the share of Asian countries in world production will be about 50% and China will surpass the US and Europe in this area. According to analysts based on a World Bank study on wealth growth, low-income countries will grow twice as fast as high-income countries in the coming decades and China and India will make up about 44% of the global middle class by 2030. As a result, the demand for commodities in emerging markets will increase not only quantitatively due to population growth, but also qualitatively[20].

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[18] T. Piketti, Kapital v XXI veke…
[19] N. V. Galitskaya, "Tsiklichnost makroekonomicheskikh pokazatelei: istoriya i sovremennost", Voprosy statistiki, num 12 (2010): 51-54.
[20] A. B. Sukhotin y L. S. Chernov, Territorialnyi aspekt narushenii koordinatsii i kognitivnosti ekonomicheskogo razvitiya i tselostnosti stran v dinamike dlinnykh voln Kondratieva. Nauchnoe nasledie N.D. Kondratieva i sovremennost Sbornik nauchnykh trudov uchastnikov X Mezhdunarodnoi Kondratievskoi konferentsii, posvyashchennoi 125-letiyu so dnya rozhdeniya N.D.

As indicated above, before the start of the upward wave for ten to twenty years, there has been an accumulation of innovations and intensive development of technologies, as well as an increase in scientific and inventive activity. Only at the very beginning of the upward wave is the active introduction of these inventions and technologies.

Studying Kondratiev's major cycles, J. Schumpeter developed an innovative cycle theory, where he pointed to innovation as the reasons for the Kondratiev cycles. Introducing into the economic system, innovations undermine its balance and displace obsolete technologies, which provokes intensive economic growth. A distinctive feature of innovations is their group nature, in other words, innovations form clusters within which mutual influence and intensification of action take place, which indirectly leads to powerful economic growth. Basic technologies and the clusters formed by them provide the emergence of new industries and lead to the formation and development of an upward wave of the big Kondratiev cycle. The peak of the big Kondratiev cycle is observed during the period of maximum maturation of innovation.

In his research, J. Schumpeter called entrepreneurs introducing new technologies innovators. Following innovators, imitators appear, who are attributed to a new type of entrepreneurs. Simulators accelerate the spread of innovation in the economy, the consequence of this is an economic recovery. The goal of entrepreneurs is a superprofit, which is precisely what innovations provide. The result of the economic upturn is an increase in demand for labor, raw materials, and means of production and the purchasing power of the population is also increasing. In the social sphere, there is a decrease in unemployment. The second half of the upward wave is characterized by saturation with innovation. Demand for innovative products, which is becoming traditional in the economy, is falling. At this time, the upward Kondratiev wave reaches its peak and starts the transition to the downward stage. As innovative products become traditional, there is a decline in demand for them, and small and weak competitors are leaving the market. Accordingly, the price of innovative products is falling, and entrepreneurs, in the pursuit of profit, seek to reduce costs, which negatively affects the level of employment and wages. Consumption is declining, and economic growth is slowing or stopping. The end of the downward wave is the economic crisis, which is characterized by the stagnation of traditional sectors of the economy. Overcoming the economic crisis is possible through the emergence of new innovative sectors of the economy, its regulation and organization[21]. The well-known Japanese economist M. Hirooka identified three logistic trajectories for the development of the innovation paradigm: technological trajectory, development trajectory, and diffusion trajectory. The technological trajectory is characterized by an innovative scientific discovery, the development path is determined by the production of innovative products using discoveries, the diffusion path reflects the introduction of innovative products on the market and its subsequent saturation. The development of M. Hirooka showed that the innovation paradigm has a cascading structure and lasts about 30 years[22,]

Kondratieva. Pod redaktsiei V.M. Bondarenko; Mezhregionalnaya obshchestvennaya organizatsiya sodeistviya izucheniyu, propagande nauchnogo naslediya N.D. Kondratieva, (2017): 362-368.

[21] I. Schumpeter. Teoriya ekonomicheskogo razvitiya (Moscow: Progress, 1982) y I. D. Grachev y I. N. Mitin, Kondratievskie tsikly i model realno-virtualnykh rynkov", Ekonomicheskii analiz: teoriya i praktika, num 17 Vol: 320 (2013): 24-32.

[22] M. Hirooka, Innovation dynamism and economic growth. A Nonlinear Perspective (Cheltenham, UK: Edward Elgar, 2006) y A. Akaev y A. Korotaev "K prognozirovaniyu global'noi ekonomicheskoi dinamiki blizhaishikh let", Ekonomicheskaya politika, Vol: 12 num 1 (2017): 8-39.

As mentioned above, the penetration and use of PC and the Internet is already very extensive and the potential for further exploitation of this innovation as a base in developed countries is largely exhausted. However, the possibilities of the information age have contributed to the development of developing countries, where wealth growth has not yet been very extensive. One sign of this is the fact that with higher per capita incomes, productivity growth in developed countries is lower than in emerging markets. The real GDP growth in the group of developing countries in the period 2000-2016 reflects this trend: growth in these countries averaged about 5.8% per year, while in developed countries – about 1.8% per year[23].

Although the share of high-tech exports in developing countries has increased significantly in recent years, developed countries still have an advantage in many areas.

Conclusions

While globalization and demography will stimulate demand primarily in emerging markets, especially in Asia, in the transition to the sixth K-cycle, the developed countries naturally aspire to an innovative economy. At present, investors are wondering which main innovations and which sectors can become the basis of the proposal in the next cycle[24]. Now there are no questions whether the climate can change and who is to blame: an increase in average temperature in the northern hemisphere, changes in sea level, and more frequent cases of natural disasters are known facts. The environment is becoming a scarce resource, the consumption of which in modern conditions has its value, the acquisition of rights to CO2 emissions, rising commodity prices, and the risk to businesses in the face of climate change contribute to setting prices for environmental consumption. In the current situation, due to globalization, demographic changes, climate change, and limited resources, there is a need to find a new combination of economy, ecology, and social commitment, increase productivity, resources, and energy. The fields of nano- and biotechnology are of interest in terms of using new materials (and/or material properties) and new processes to make many sectors more environmentally friendly and increase the productivity of resources and energy in the sixth Kondratiev cycle. Besides, based on the development of these areas we can expect to see innovations in the health sector. Considering the conditions under which the fifth K-cycle is replaced by the sixth, we can conclude that the "engines" of the sixth Kondratiev cycle should be sufficiently significant factors to influence the economy, political processes and society to increase productivity in various sectors of the economy at a time.

Among the factors listed in this article, the following groups can be distinguished:

1) megatrends of the future, such as globalization and demographic processes leading to changes in demand,

2) trends and innovations, such as environmental technologies, bio- and nanotechnologies, which can change the supply structure in the economy[25].

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As noted above, to analyze the dynamics of changes in the economic system and study major cycles, scientists use such macroeconomic indicators as GDP, unemployment, personal income, sales, etc. The dynamics of these indicators determine the course of the economic cycle. Therefore, scientists divide economic cycles into procyclical, countercyclical, and acyclical[26].

We carried out an analysis of Kondratiev's major cycles and performed scientific research on this issue, which led to the conclusion that there are two different directions in the study of economic cycles: one of them is based on mathematical modeling[27] and the second is based on the use of the indicator approach, which N.D. Kondratiev used in his research[28].

Along with these methods, economists distinguish the method of economic analogy, which extends to the study of economic processes at the micro-level (regional level).

Based on the data presented in the article, it can be concluded that the economic growth in the new cycle is likely to be based on structural changes in the economy, including environmental and social vectors. In developed countries that have already exhausted the potential for developing innovation of past cycles, technologies using nano- and bio development will become more widespread. This fact will allow developing environmental technologies, the health sector, as well as increasing the productivity of resources. In developing countries, economic growth will be ensured by more extensive use of technologies related only to the fifth K-cycle.

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