

IS THE FIFTH WAVE REALLY IN PROGRESS?

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Abstract

Long waves are the longest economic cycle with an average length of 50-60 years; Technical and technological innovations of the highest level are mostly considered to be their basic cause. N.D.Kondratiev and J.A.Schumpeter were the most important theoreticians of long waves. It is generally accepted that there have been four complete waveforms since the beginning of the industrial revolution. Economists differ in opinion on whether we have been currently witnessing the outbreak of the fifth wave initiated by the so-called “information revolution”; if it is so, then its course differs significantly from the upward phase of the previous four waves.

Key words: K-wave, Innovation, Business Cycles

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Introduction

The theory of so-called long waves (also K-waves) is not a part of mainstream economics; its basic idea is to highlight the role of technical and technological factors in economic development, or rather in the historical process as a whole, which standard economics does not take into account too much. Nevertheless, in the spirit of an innovative wave of the highest orders, qualitatively new technique and technologies lead together with many other factors to a gradual transformation of the society. Based on the theory of long waves, hypotheses of an about approximately 50- years period of these crucial impacts can be constructed. These may be reflected even in the appearance and characteristics of war conflicts, revolutionary events, etc. The main theorists of the long wave concept are N.D. Kondratiev and J.A. Schumpeter, economists, who are very difficult to be classified into one of traditional economic schools.

1 Concept of a long-term cycle

Economic growth is not fluent and its trend is not always stable either. The study of long-term fluctuations in economic activity (monitored e.g. through fluctuations in production and

mainly through easily accessible time series describing price dynamics) first attracted the attention of economists at the break of the 19th and 20th centuries. The first explicit mention about long-term fluctuation of economic indicators is nevertheless much older (H. Clarke, 1847). Later papers prove even long-term fluctuations in economic activity with help of data about industrial production, growth or development of GDP. J. Van Gelderen (1913) and S. De Wolff (1929) belong to pioneers of long wave investigation, who not only proved the existence of long waves, but they also came with the first attempts to explain them.

Nevertheless, a really fundamental approach connected with exact formulation of a long wave theory dates back to the interwar period and as it has already been mentioned in the introduction, it is connected with names of Kondratiev (the 1920s) and Schumpeter about ten years later. Schumpeter also suggested naming long waves as Kondratiev cycles in honour of his predecessor.

Kondratiev compiled empirical material concerning changes in prices of goods, capital interests, wages, exploitation of natural resources, foreign trade turnover, metal production etc. during a period of 140 years. In 1920s referring to this material he came to the conclusion about the existence of three “major cycles of the conjuncture”.

Tab. 1. Kondratiev’s dating of so-called “major cycles of the conjuncture”

First wave	Upward phase from the period 1787-92 to the period 1810-17 Downward phase from the period 1810-17 to the period of 1844-51
Second wave	Upward phase from the period 1844-51 to the period 1870-75 Downward phase from the period 1870-75 to the period of 1890-1896
Third wave	Upward phase from the period 1890-96 to the period 1914-20

Source: Kondratiev, 1989

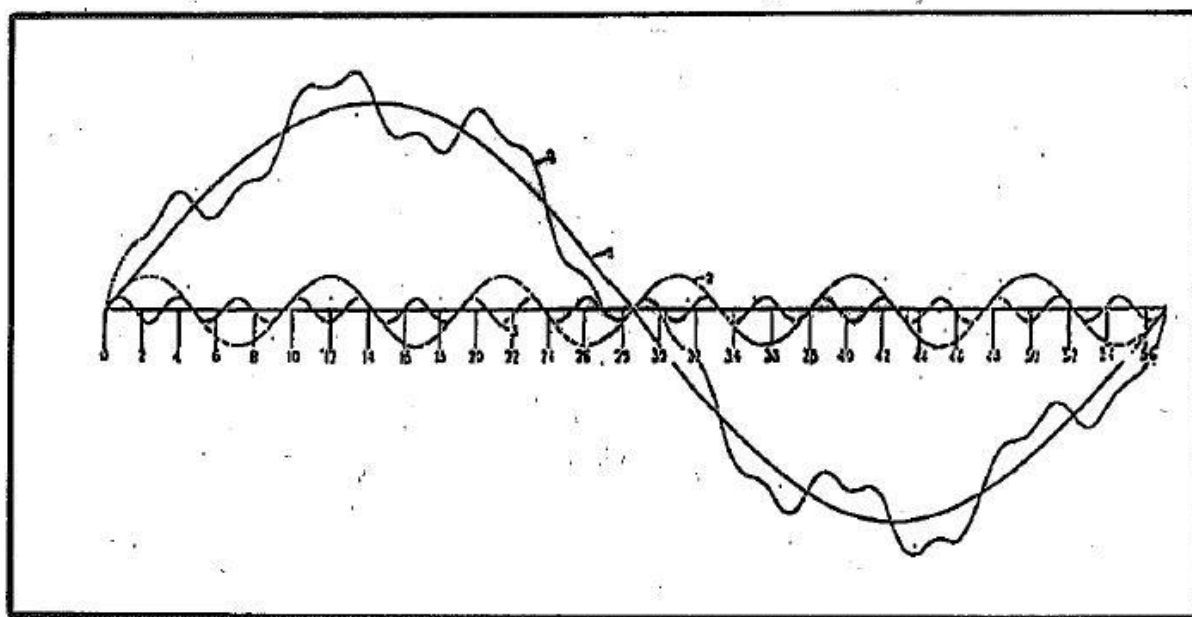
Although Kondratiev recognises the importance of innovations, in his concept he prefers an endogenous explanation based on capital investment causes.

On the contrary, according to Schumpeter it is necessary to prioritize exogenous reasons resulting from technological innovations of the highest order (so-called basic innovations) when explaining a long-term cycle. According to Schumpeter, innovations are staggered irregularly in time, they appear in waves (so-called innovation clusters), as adequate conditions must be created first so that these innovations can be practically applied and as soon as this happens, innovations spread explosively, which leads to technical revolutions. Based on the mentioned innovation clusters Schumpeter characterizes long waves as the longest economic cycles in capitalism.

The important Schumpeter's contribution is time differentiation of economic cycles. On the basis of a statistical analysis he determined the length of three basic types of cyclical fluctuation and named these cycles after their inventors. According to Schumpeter there are short-term Kitchin cycles lasting 3 – 5 years with the average length of 40 weeks, medium-term Juglar cycles lasting approximately 7-11 years and long-term cycles (Kondratiev long waves) lasting approximately 45-60 years (Schumpeter, 1987, p. 86-87).

Schumpeter emphasizes coherence of all economic cycles – individual cycles interfere with each other in a similar way as physical waves do. If all three cycles are in the same phase, especially in a crisis, one can expect a “movement with extraordinary intensity” (Schumpeter, 1089, p. 433). Schumpeter claims that in historical development he found three whole Kitchin cycles per each one completed Juglar cycle and six whole Juglar cycles per each one Kondratiev long-term cycle.

Fig. 1: Schumpeter's scheme of multicyclical character of economic development



Source: Schumpeter, 1989, p. 175.

Kondratiev and Schumpeter described only three long waves, the following fourth one, whose begin is connected with the World War II took place after their death. Its course was described only by Kondratiev's and Schupeter's most important follower G.O. Mensch, who dates K-cycles in the following way: 1785-1824 (67 years), 1842-1898 (55 years), 1897-1940 (43 years), 1940-1995 (55 years). Each cycle is characterized by the major industry (coal and iron, steam and steel, chemistry and automobiles, respectively astronautics, nuclear

weapons and computers) and leading countries (Great Britain, Great Britain and Germany, USA and Germany, respectively USA and Japan). In Mensch's opinion, the fifth cycle was supposed to start in 1995 and it was supposedly preceded by a wave of innovations in 1989; the "decade of innovations" was supposed to start in 1984. Production of microprocessors, genetic engineering, new materials and changes in the energy industry were most important.

The most important Czech author specialized in long waves was F. Valenta. In his works he develops "Schumpeter's innovative legacy" and comes with ten orders of innovations, which differ by their importance for the development of production. Valenta's classification is briefly as follows (Valenta, 2001): order minus n (degeneration), order 0 (regeneration), ratioanalising innovations (order 1-4), qualitative innovations (order 5-8) and technological revolution – order 9. Table 2 brings a summary of ideas of major authorities in the field of long waves:

Tab. 2: Chronology of long waves by some authors

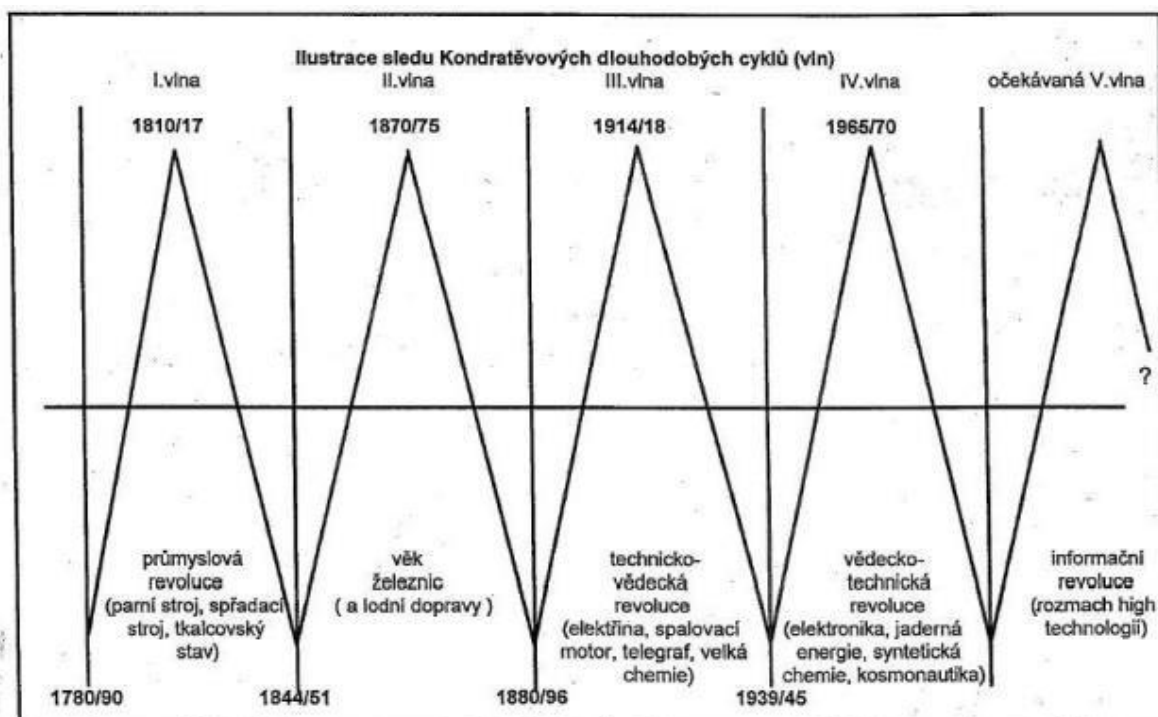
	1 st long wave		2 nd long wave		3 rd long wave		4 th long wave	
	Trough of decline	Peak of growth	Trough of decline	Peak of growth	Trough of decline	Peak of growth	Trough of decline	Peak of growth
1. Kondratjev (1926)	1790	1810/17	1844/51	1870/75	1890/96	1914/20		
2. Schumpeter (1939)	1787	1813/14	1842/43	1869/70	1897/98	1924/25		
3. Dupriez (1978)	1789/92	1808/14	1846/51	1872/73	1895/96	1920	1939/46	1974
4. Rostow (1978)	1790	1815	1848	1873	1896	1920	1939/48	1967
5. Mensch (1979)	1785	1818	1842	1870	1897	1920	1940	1967
6. Van Duijn (1983)	–	–	1845	1872	1892	1929	1948	1973

Source: Van Duijn, 1983,p. 163. Own adjustments of the autors

Mensch is not alone who believes, that the 5th wave has already started. For example Rostow (cited in table 2) believes that the 5th wave started already in 1972. Some other authors are also convinced that at least the most developed economies in the world have already entered the 5th wave, even though Rostow's dating is an exception in this regard; opinions that if the world (respectively at least its economically most developed part) is already in the 5th wave, then it is in its initial phase, generally prevail.

Schematically, opinions on the hitherto four long waves and the 5th wave currently in progress can be presented by a graph similar to the teeth of a saw, as shown in Fig.2:

Fig. 2: Illustration of the sequence of long K-waves in industrial history



Source: Sirůček, 1999, p. 10 and own adjustments of the authors

Each long wave consists of two basic phases of approximately same lengths. These are phases of growth (a phase of growth, long-term expansion, i.e. the upward phase of a long wave) and a decline phase (a period of a long-term depression as a downward part of a long wave). The adequate phase of a long-term K-cycle determines the course of a medium-term Juglar cycle.

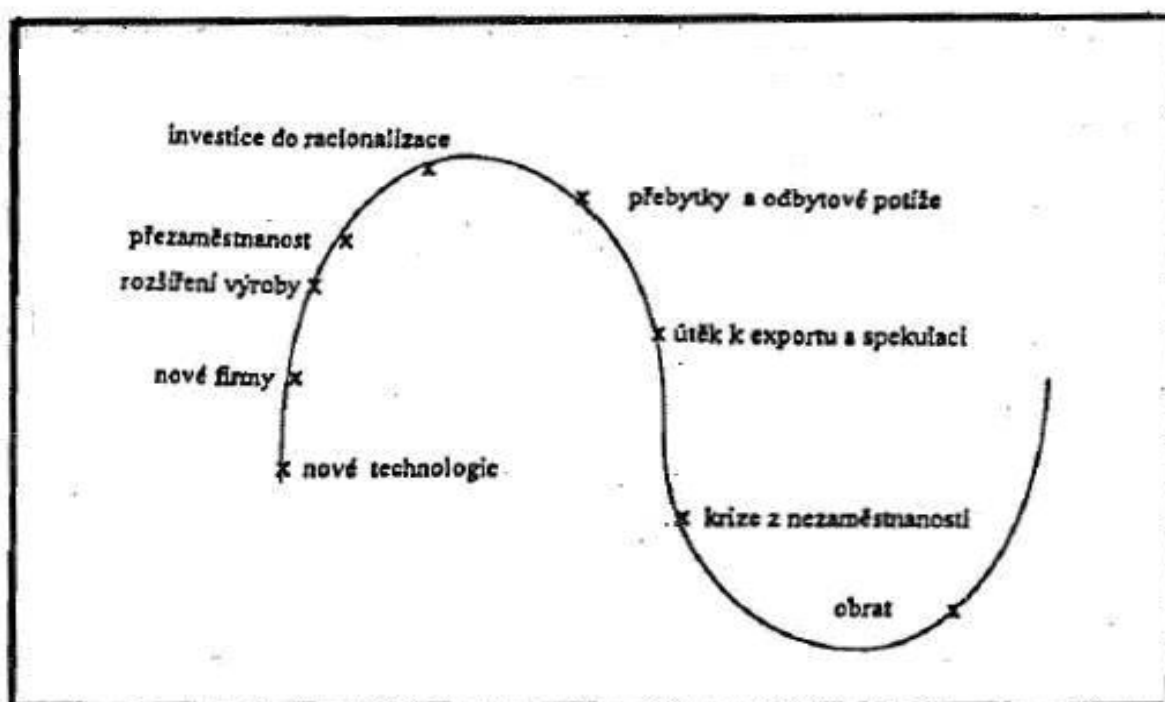
The upward phase of a so-called “long expansion” is characterized by the growing importance of new technologies, growing asset productivity, relatively fast growth in production, employment and wages. Old companies and industries are gradually being edged out. The upward phase of a long wave within a medium-term economic cycle is characterized by the development with relatively short recessions represented by only a slowdown in the production growth and only lower unemployment. Economically “good years” prevail in this period. New technologies facilitate a higher rate of the growth in potential product.

The downward phase, the so-called “long depression” shows in principle decreasing asset productivity in the long run due to obsolete technology, which cannot be replaced by a new one immediately, and relatively lower rates of production growth. The market is starting to be saturated by new products and technologies, competition is growing, employment is decreasing, wages are being damped down. Short-run declines in investments and production

within a medium-term economic cycle often already directly show an absolute decline in comparison with the previous year and behave like so-called crises. In the long run there is substantial slowdown in the growth of economic output and rise of mass unemployment. This is connected with the growth in the interest rate, which may, in repeating moments, exceed the rate of profit. Economically “bad years” usually prevail in this period, which is conditioned by lower rates of growth in the potential product in consequence of complete exploitation of development capacities of old technologies. During this phase pressure on accumulation and investments into production rationalisation and new more prospective technologies is simultaneously growing, too. New technologies, ways of accumulation, methods of management etc. are being searched.

An ideal course of a K-wave as a technological cycle can be depicted as an S-curve (Mensch, 1979). Its individual parts are determined by certain characteristic features in the economy. See Figure 3:

Fig. 3: “S-curve” of a long wave



Source: Mensch, 1979.

The logics of an “s-curve” course of a long wave is based on the fact, that at the beginning, about 20-25 years after launching new technologies, innovations push essential structural changes. Based on inventions and their mass applications, old companies and industries are gradually edged out, new companies and new industries are taking up. Hand in

hand with the growth in the production there is growth in employment, which leads even to overemployment. Investments into rationalisation appear. Countries which succeed in the transformation to new technologies have also capacities for the growth in wages and consumption. Regions or countries which are late get into an unfavourable position (they must e.g. accumulate the resources needed for boosting a new cycle at the expense of workers).

However, the market is gradually saturated, which leads to surplus and sales difficulties. The upward part of the s-curve changes into its downward phase. Processes of competition are getting tougher, pressures on wages and other rationalisation measures stronger, employment is decreasing, crises are arising and there is flight to export and speculations. Social peace disappears; possibility of wars and revolutionary conflicts grows. Only radically new technologies can change the direction of the S-curve again, because when adequate conditions have been created, only they can return the long-term cycle into the upward phase.

2 Where is the fifth wave?

As it was said above, according to a number of economists the world economy should currently be somewhere at the upward part of the 5th K-wave in the present history, see Fig.2. However, if it is really so, then the course of the 5th wave substantially differs from all four previous ones. It is true, that completion of the 4th long K-wave, respectively commencement of a new 5th K-wave (especially on the global level), often connected e.g. with information revolution has still been an open issue.

The main problem is, that the upward phase of a long cycle should be connected with massive increase in the rate of GDP growth, often in double-digit figures. The current world economy, on the contrary, shows only a very low rate of growth, since 1995 (a hypothetical begin of the 5th wave) it has reached in average only 2.9% (Cihelková, p. 14-16). How can this situation be explained?

Basically there are three possibilities:

1. Theoretical conclusions made by Mensch, Rostow, Van Duijn and others are false, there is no 5th K-wave in progress and the so-called “information revolution” is in fact only a part of the exceptionally long 4th wave.
2. The 5th K-wave is currently really in progress, but in the same way as during the previous four waves, even this one, concerns primarily the states and regions that on

global scale represent an economic vanguard. During the previous waves it was Euro-American West, while the “rest of the world” stagnated to a considerable degree. With the current, 5th wave the economic vanguard is represented by countries like China, India, South Korea, etc., while the post-industrial West has already passed its peak and is experiencing a gradual downturn.

3. The 5th wave is really in progress, however, its course differs from the previous ones, as this time it is not connected with any big war or their series. In the case of the 1st wave, there were Napoleon’s wars, in the case of the 2nd wave there was a series of revolutions in 1847-49 followed by Crimean war (with involvement of all European powers) straight afterwards, and in the case of the 4th wave there was the World War II. Apparently the 3rd wave beginning in the end of the 19th century seems to be an exception, however, it cannot be omitted that this period was connected with colonial wars and large armament, leading in its consequences to the World War I. It is true, that these wars always resulted in mass destruction, however, this was also the reason, why they also became a cause of ensuing mass reconstruction and as there are also radical political coups during each war, one can assume, that this violence dismantled artificial social barriers, preventing the development of personal initiative in research and enterprise. The current 5th wave, however, has not been connected with any war on the global scale (at least so far), and this is also the reason, why the current rates of growth do not correspond to what was typical for the previous long-term cycles.

The question, which of these explanations is most true, will undoubtedly be answered by the near future. At the same time new possibilities for further research will be opened. As it will be mentioned in the conclusion, there are some more issues concerning understanding and identifying long waves that have to be brought up in this context.

Conclusion

The chronology of long waves, identified according to the bottom and peak interval of the turning points shows that most authors agree that we have experienced four long-term cycles since the first industrial wave. Belief in their cyclical character and conviction about their connections with innovations absolutely prevails among proponents of the long wave theory. Some studies suggest a possibility of onset of the 5th Kondratiev long-term cycle initiated by a new technological (i.e. information) revolution in the end of the 20th century. Questions concerning of the end of the 4th wave and begin of the 5th K-wave still remain open.

In context of long waves identification there is, however, a key issue of empirical testing of various hypotheses referring to innovative cycles, respectively waves. It namely faces a lack of satisfying innovative statistics and other reliable comparable data for a longer time horizon. The sample so far contains only a short period of four identified long waves since the end of the 18th century. The so-far available sample is too small for explanation of existing differences and discrepancies by application of mathematical and statistical methods. Therefore also the whole number of long wave concepts has not been empirically tested at all. Of course, a quantitative analysis can never absolutely replace a qualitative analysis. Hence the concepts of long waves shouldn't slide into excessive and often ending-in-itself mathematization and formalization and so reduce the object of the research only to creating adequate theoretical quantitative models. This also represents the main limitations as far as a reliable recognition of the so far hypothetical 5th long wave is concerned.

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