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DETERMINATION OF CONDITIONS OF GROWTH BY DEFORMATION OF KONDRATIEV CYCLES

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Abstract

Economic growth is not fluent and its trend is not always stable either. During the economic growth long-term fluctuations of economical activity, caused by innovations of the highest order (so-called basic innovations) occur. The facts listed above are being examined by the economical theory in the context of individual theories of business cycles, especially by theories of long-term economic cycles. Basic innovations determine so called long-term cycles (also long waves), on which the process of medium-term business cycles then depends. The second phase of each long wave is characterized by stagnation phenomena in economics, which is a huge issue of the current situation, because at the moment we are in the final phase of one of these long waves. That is also the reason for the low success rate of the implemented pro-growth precautions. A really fundamental change can be expected in connection with the arrival of a new long wave, the fifth one in the order. Innovations, on which this wave depends, are already beginning to appear.

Keywords: K-wawe, innovation, business Cycles

JEL Classification: B15, E14, E44

Introduction

Developed countries in the world are facing a number of problems, the first one being low rates of growth or almost stagnation trends, which lead to many other maladies from high unemployment to huge indebtedness. This situation can be rationally explained by the theory of long-term economic cycles, or the so-called long waves. This theory describes not only why the current epoch differs in its course from economically successful period several decades ago so much, but it also creates a prognosis of renewed economic expansion in decades to come – under the assumption that some basic prerequisites enabling this expansion are met. Simply said the growth potential of outdated traditional technologies had been exhausted before the society managed to implement modern progressive ones.

The facts listed above are being examined by the economical theory in the context of individual theories of business cycles, especially by theories of long-term economic cycles. The basic idea of long waves (also called K-waves) theory is based on highlighting the role of technical and technological factors in economic development, or historical development in general, which the neoclassical economics does not take into account too much. Nevertheless, qualitatively new techniques and technology, together with many other factors lead – thanks to the wave of innovations of the highest orders - to gradual transformation of the society. By virtue of long-wave theory a hypotheses on an approximately 50-year period of these essential influences, which can also be reflected in occurrence and character of war conflicts, revolutionary events, etc. were created.

The main theorists of long-wave concept are Nikolaj Dmitrijevič Kondratiev and Josef Alois Schumpeter, the economists who are very difficult to be placed in any of traditional schools of economics.

1. IMPORTANCE OF LONG-TERM CYCLES

Economic development is not fluent and the same can be said about trends accompanying it. The study of long-term fluctuations in economic activity (e.g. monitored by fluctuations in production and mainly by easily accessible time series describing price dynamics) attracted more attention of economists at the break of the 19th and 20th centuries for the first time. However, a really essential approach connected with the exact formulation of long-wave theory falls into the first half of the 20th century, and, as it was said already in the introduction, it is connected with the names of Kondratiev (the 1920s) and Schumpeter about ten years later. He also gave long waves the name of his predecessor – Kondratiev cycles.

Kondratiev compiled empirical material dealing with changes in prices of goods, capital interests, wages, exploitation of natural resources, turnover in international trade, metal production, etc. over a period of 140 years. In the 1920s, based on this material, he made a conclusion about the existence of three "major cycles of the conjuncture":

Table 1 - Kondratiev´s dating of so-called "major cycles of the conjuncture"

| First wave	Upturn phase from the period 1787-92 to the period 1810-17
	Downturn phase from the period 1810-17 to the period of 1844-51
Second wave	Upturn phase from the period 1844-51 to the period 1870-75
	Downturn phase from the period 1870-75 to the period of 1890-1896
Third wave	Upturn 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.

Schumpeter´s important 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 phase, "movement with extraordinary intensity" (Schumpeter, 1089, p. 433) can be expected. Schumpeter claims that in historical development he found three whole Kitchin cycles for each completed Juglar cycle and six whole Juglar cycles per each Kondratiev long-term cycle.

Figure 1 - Schumpeter´s scheme of multicyclical character of economic development
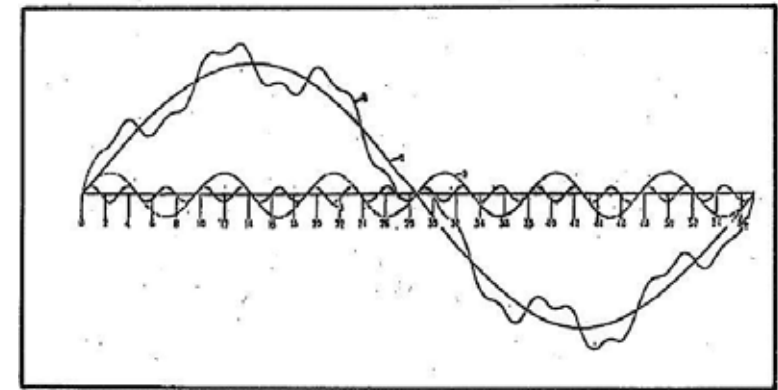
Source: Schumpeter, 1989, p. 175

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

The upturn phase of 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 upturn 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. In this period economically "good years" prevail. New technologies facilitate a higher rate of growth in potential product.

The downturn phase, so-called "long depression", shows in principle falling 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 and wages are being damped down. Short-run declines in investments and production within a medium-term economic cycle often already directly show an absolute slump in comparison with the previous year with features of so-called crises. In the long run there is a substantial slowdown in the growth of economic output and increase in mass unemployment. This is connected with the growth in the interest rate, which may, in repeating moments, exceed the rate of profit. In this period economically "bad years" usually prevail, which is conditioned by lower rates of growth in the potential product in consequence of complete exploitation of development capacities of old technologies. Pressure on accumulation and investments into production rationalisation and new more prospective technologies is simultaneously growing during this phase, 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 2:

Figure 2 - "S-curve" of a long wave
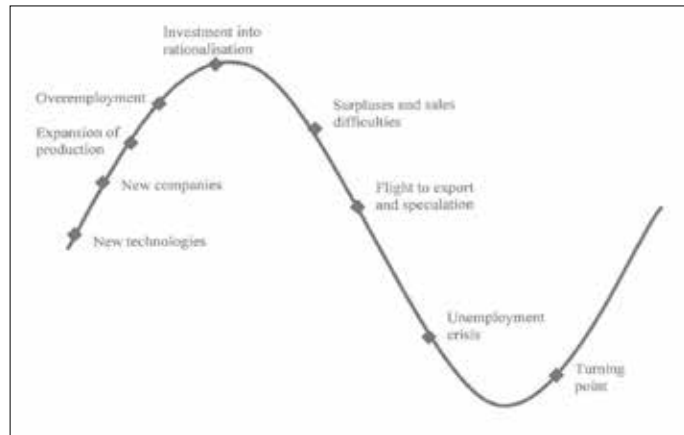
Source: Mensch, 1979

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 over. Hand in hand with the growth in the production there is growth in employment which results even in 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 upturn part of the s-curve changes into its downturn phase. Processes of competition are getting tougher, pressures on wages and other rationalisation measures stronger, employment is decreasing, crises are arising and there is a flight to export and speculations. Social peace disappears; the possibility of wars and revolutionary conflicts grows. Only radically new technologies can change the direction of the S-curve again, since when adequate conditions have been created, only they can turn the long-term cycle back into the upward phase.

Kondratiev and Schumpeter described only three long waves, the following fourth one, whose beginning is connected with 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, the USA and Germany, respectively the 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 in their importance for the development of production. Valenta´s classification is briefly as follows (Valenta, 2001): order minus n (degeneration), order 0 (regeneration), rationalising innovations (orders 1-4), qualitative innovations (orders 5-8) and technological revolution – order 9. Table 2 brings a summary of ideas of major authorities in the field of long waves:

Table 2 - Chronology of long waves by some authors

	1st long wave		2nd long wave		3rd long wave		4th 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 authors

Mensch is not the only one who believes that the 5th wave has already started. For example Rostow (cited in table 2) believes that the 5th wave already started 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; according to generally prevailing opinions, if the world (respectively at least its economically most developed part) is already in the 5th wave, then it is in its initial phase.

A hardly eliminable weakness of these statements, however, is the fact that while the initial halfwaves (see fig.1) of all preceding long waves were characterized by high rates of GDP growth, in the current world, particularly in the most developed countries, prevailing stagnation trends can be witnessed. The current economic development in developed countries reminds us more of a final phase of a declining halfwave of a long cycle, a phase which is becoming much longer compared with the common length of a standard K-wave.

SO WHERE IS THE FIFTH WAVE?

As mentioned above, according to some economists world economy should currently be somewhere in the upturn part of the 5th K-wave from the view of up-to-now history. However, if this is true, this fifth wave differs a lot from all preceding waves. The fact is that the end of the 4th long K-wave or commencement of the new 5th K-wave (especially on a global scale) often connected with e.g. the information revolution, still remains an open issue.

In case of expected (nevertheless, in reality not completed) commencement of the 5th K-cycle around 2000 a hypothetically similar situation should have arrived only at some time in the period 2020-2030, as can be seen from a working scheme (see fig.3). However, the fact that we are experiencing this situation now invalidates any thoughts of an already ongoing fifth wave.

Figure 3 - Model course of the fifth wave
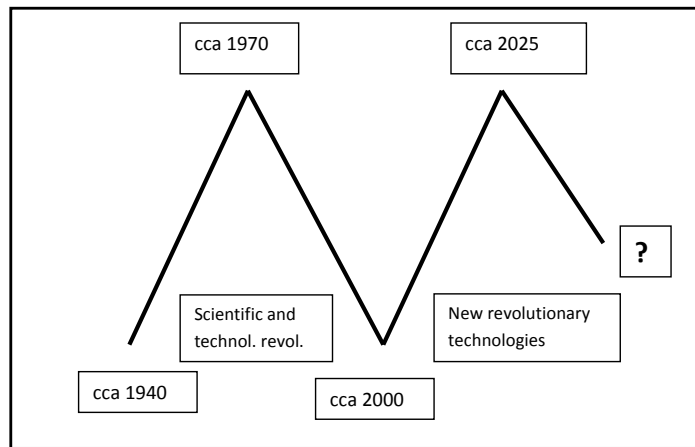
Source: own adjustments

The main problem is that the upturn phase of a long cycle should be connected with a 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 beginning of the 5th wave) it has reached on 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 the"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 countries and regions that represent an economic vanguard on the global scale. During the previous waves it was the 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 the Crimean war (with involvement of all European powers) straight afterwards, and in the case of the 4th wave there was 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 armaments, leading in its consequences to 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, it can be assumed 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.

4. Postponement of the fifth wave might be caused also by high costs of new technologies. Indications of validity of this cause can currently be seen. The imaginary "first herald" of the fifth wave in the form of outbreak of new superprogressive technologies represented by companies such as SpaceX, ATK Orbital and Blue Origin (rocket technique), Tesla Motors (electric cars), SolarCity (utilization of solar energy) or Gigafactory (electric batteries with extremely high capacity), with an outlook of dynamic commencement of space technologies introduced by already existing companies such as e.g. Bigelow Aerospace („inflatable" space stations, hotels and bases) or Planetary Resources or Deep Space Industries, planning exploitation of natural resources in space, activity for which the US Commercial Space Launch Competitiveness Act of November 2015 created a suitable legislation.

Without a doubt the question which of these explanations is the most true, will be answered in the near future. At the same time this will open possibilities of further research. It seems very probable that all the above mentioned causes somehow participate in anomalous transition between the fourth and fifth wave.

Conclusion

The chronology of long waves, identified by 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. Most proponents of the long wave theory believe in cyclical character of these waves and they are convinced about their connection with innovations. 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 the end of the 4th wave and beginning of the 5th K-wave still remain open.

In the 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 an explanation of existing differences and discrepancies by application of mathematical and statistical methods. This is also a reason why a 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 objective 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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FISCAL RULE EFFICIENCY IN EU MEMBER STATES

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Abstract

The implementation of fiscal rules has been the central point of economic debates in the European Union institutions and Member States. They indicate the direction in which policymakers aim to improve public finances in the aftermath of the global financial crisis. The aim of this paper is to analyse the efficiency of the fiscal rule index and fiscal rule strength index in the European Union Member States, with special emphasis on Croatia. The methodology and data of the European Commission's DG ECFIN were used to analyse the efficiency of the fiscal rule index and fiscal rule strength index by type and government sectors in the European Union Member States during the 2007-2014 period. Our analysis shows that trends in the values of the fiscal rule strength index and standardized fiscal rule index indicate that fiscal rules are becoming more important and efficient as policy tools compared to the pre-crisis period, and that the situation in Croatia has been continuously improving since its accession to the EU in mid-2013.

Keywords: fiscal policy, fiscal rule index, fiscal rule strength index, fiscal rule efficiency

JEL Classification: H20, H60, H87

Introduction

In recent years, the public finances of the European Union Member States have been affected by two major changes in the economic and institutional setting: firstly, the establishment of the Economic and Monetary Union and, secondly, the progressive fiscal decentralisation in a significant number of EU Member States. In order to support the process of fiscal decentralisation, EU Member States have to have in force appropriate fiscal policy rules. They can stimulate policy coordination between different levels of government depending on their institutional coverage. According to the most widely accepted definition, fiscal policy rules set numerical targets for budgetary aggregates, i.e. they pose a permanent constraint(s) on the use of policy discretion in order to promote sound budgetary policy-making. Those constraints are usually expressed in terms of a summary indicator of fiscal outcomes, such as the government budget balance, debt, expenditure, or revenue developments. The primary objective of fiscal rules is to enhance budgetary discipline, especially if a particular Member State is under the Excessive Deficit Procedure (EDP). Moreover, they can foster policy coordination between different levels of government depending on their institutional coverage (second objective). In addition, fiscal rules may further contribute to the reduction of uncertainty about future fiscal policy developments. However, fiscal rules can only yield these benefits if appropriate national monitoring institutions and enforcement mechanisms are efficient and/or if they are supported by strong political commitment. The basic elements of fiscal rule creation are related to the statutory basis of the rule, the monitoring of budgetary developments against the fiscal targets, and the existence of corrective mechanisms (like EDP). Non-compliance should be carefully taken into account while designing fiscal rules in order to ensure their effective impact on the

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[*]All views expressed in this paper are those of the authors and do not necessarily represent the views of the authors' institutions.