AN UNDERAPPRECIATED STUDY OF THE ECONOMIC DYNAMICS OF IMPERFECT COMPETITION

Pavel Sirůček – Zuzana Džbánková

Abstract

N. D. Kondratiev (1892–1938?) was a Russian (or Soviet) economist specializing primarily in agriculture, a statistician, and a planning theorist with a turbulent life and unfulfilled ambitions. Using statistical analysis, he formulated and developed the hypothesis of long waves in economic development. In doing so, he laid the foundations for the theory of long-wave fluctuations, which J. A. Schumpeter named Kondratiev cycles. Kondratiev's legacy, however, is much broader, particularly in the context of research on economic dynamics. He does not view long waves merely in quantitative terms. His works from the 1920s are associated with the first sophisticated evidence of the existence of long waves as well as one of the first attempts at a relevant theoretical framework. Through his studies on long waves, N. D. Kondratiev laid the foundations for this research, particularly in the West. Kondratiev's original work influenced a number of followers not only in the study of long-term cycles and can still be inspiring in many ways today.

Key words: economic dynamics, long-wave theory, equilibrium theory, economic growth theory

JEL Code: B31, E32, O40

Introduction

N. D. Kondratiev (1892–1938?) was a Russian (later Soviet) economist specializing primarily in agricultural economics, as well as a statistician and planning theorist whose life was marked by political persecution and unrealized ambitions. He was twice convicted, imprisoned, and ultimately executed, before being posthumously rehabilitated on two separate occasions. Through the application of statistical analysis, Kondratiev formulated and developed the hypothesis of long waves in economic development, thereby laying the foundations of the theory of long-wave fluctuations later termed *Kondratiev cycles* by J. A. Schumpeter.

Kondratiev's intellectual legacy, however, extends far beyond the study of long-term cycles and occupies an important place in the broader field of economic dynamics. His

pioneering research on long waves brought him international recognition and reflected his conviction that the study of economic dynamics should serve the prognostic function of economic science. Although his ambitious project of uncovering the fundamental laws of economic dynamics remained unfinished due to his imprisonment in the 1930s, he continued his scholarly work even under these adverse conditions. During this period, he developed a model of the economic dynamics of a capitalist economy that anticipated later equilibrium and economic growth models.

Drawing on extensive empirical evidence, Kondratiev examined time series and changes in a wide range of economic indicators, both monetary and physical in nature. Using statistical methods, he sought to demonstrate the existence of long waves and interpreted them as phenomena rooted not only in the sphere of circulation but also in the sphere of production. He associated their underlying mechanisms with internal processes of capitalist development, particularly changes in the volume and allocation of available capital. Moreover, Kondratiev did not regard long waves merely as a quantitative phenomenon. His works of the 1920s provided some of the earliest sophisticated empirical evidence for the existence of long waves and represented one of the first systematic attempts to construct an appropriate theoretical framework. Through these contributions, Kondratiev laid the foundations for subsequent research on long-wave dynamics, especially in Western economic thought.

The article is an original historical and theoretical study based on the analysis of N. D. Kondratiev's primary works and relevant secondary literature. It employs the methods of description, interpretation, comparison, contextualization, and deduction, complemented by a historical-comparative approach. Particular attention is devoted to Kondratiev's theory of long waves, his conception of economic dynamics, and the significance of his ideas for subsequent research on business cycles, equilibrium, and economic growth.

1 The Contradictions of the Era and Kondratiev's Life Story

The turbulent fate and unrealized ambitions of N. D. Kondratiev were characteristic of many representatives of Russian, and later Soviet, non-Marxist economic thought in the early twentieth century. Kondratiev was twice convicted (1930, 1938) and later rehabilitated twice (1962, 1987). Born on March 4 (17), 1892, in the Kostroma Governorate, he studied at an agricultural and horticultural school before enrolling in the Faculty of Law at St. Petersburg University. His lifelong interest in agriculture and regional development was reflected in his extensive statistical, economic, and historical research on the Kostroma region.

His early works touched upon dynamic sociology and examined the relationship between material living conditions and cultural-ideological forms using a historical-comparative approach. Between 1915 and 1919, he worked at St. Petersburg University and, following the February Revolution, became actively involved in agrarian reform and food-supply administration. He briefly served as Deputy Minister of Food Supply in Kerensky's final Provisional Government.

From 1918 onward, Kondratiev worked mainly in Moscow, combining academic and research activities. A key stage of his career was his leadership of the Institute for Economic Cycle Research, which developed into a leading interdisciplinary center for statistical and macroeconomic analysis. Its primary objective was to establish scientific foundations for macroeconomic planning and forecasting.

During the 1920s, Kondratiev participated in long-term economic planning while simultaneously developing his theory of long waves. He rejected directive planning and advocated a genetic approach based on objective economic trends and developmental continuity. After his views fell out of favor, he was dismissed from the institute in 1928, arrested in 1930, and sentenced to eight years' imprisonment. Despite increasingly difficult conditions, he continued his research. According to more recent evidence, he was executed in 1938 following a retrial (Sirůček, 2015, et al.).

2 Pioneering Research into Economic Dynamics

Kondratiev's areas of scientific interest were broad and diverse. A complete bibliography of his works comprises 93 entries. Another 20 consist of works edited by Kondratiev and featuring his foreword. Additionally, 13 reviews and papers and 11 supplements are cited. Of both theoretical and practical significance are, for example, studies dealing with the methodology of planning and forecasting in the socialist economy, as well as issues of macroeconomic proportions and methods for achieving balanced growth. The central theme throughout his life remained the issue of agriculture (the organization, planning, and management of agricultural production, paths to the modernization of the Russian agricultural sector, etc.). His contributions to economic dynamics and business cycles brought him worldwide renown. Key texts from these areas are compiled in a representative anthology (Kondratiev, 1989).

Kondratiev is considered one of the founders of research into economic dynamics**.** He linked this research to the predictive function of economic science. He clearly recognized the important role of forecasting and prediction under socialism. A significant contribution is

represented, for example, by the paper *"On the Concepts of Economic Statics, Dynamics, and Business Cycles,*" prepared at the Institute of Economics of Moscow State University in March 1924 (Kondratiev, 1989). Here, for the first time, he formulates the principles of a new research direction—the theory of economic dynamics—defines basic concepts, and points out the unity and differences between static and dynamic approaches to the analysis of economic phenomena. This includes highlighting the irreplaceable role of research *on "business cycles"* of varying lengths within a dynamic framework. Further issues (e.g., methodological ones) are elaborated upon in the essay *"The Problem of Prediction"* (Kondratiev, 1926b), (Kondratiev et al., 2002). The issues raised, including economic equilibrium, soon began to be presented as *"alien problems"* and subsequently disappeared from the research agenda of Soviet scientists for a long time. This was also due to J. V. Stalin's speech in December 1929, in which he ridiculed the theory of equilibrium in the context of the struggle against *the "right deviation"* within the party. It was N. D. Kondratiev who elaborated on the dynamic aspects of this concept.

N. D. Kondratiev bases his research plan on the distinction between two qualitatively different groups of economic processes: *"recurring" processes* and evolutionary *"processes that do not recur*,*"* in which the gradual development of productive forces is manifested. *"Recurrent"* processes can be regularly cyclical. Within a dynamic framework, he distinguished between cyclical and trend aspects of growth. He intended to begin his research with an analysis *of "recurrent processes"* and then move on to questions of trend. The next stage was to be represented by forecasting the basic trends of development.

As part of his study of *"recurring"* processes, he distinguished between fluctuations in economic activity of varying durations. In accordance with his research plan, following his work on long-term cycles, N. D. Kondratiev intended to focus his attention next on issues related to trends. However, he was unable to carry out this plan, as he had been imprisoned in Suzdal since 1932. From the letters he wrote to his wife, it is evident that he nevertheless devoted himself to work on the theory of trends in 1934. He further planned studies on *"large"* and *"small"* cycles and crises, a work focused on general methodological problems, and, finally, a treatise on the statistical theory of socio-economic genetics, or development.

The fate of the manuscript of the study on trends is unknown. However, he attaches a thesis to the letter (dated September 5, 1934) describing a model of the economic dynamics of a capitalist economy. He goes as far as developing models of equilibrium and growth. He provides an outline of what is essentially a neoclassical macroeconomic growth model, in which national income is determined by production functions and the shares of wages and profits, respectively, using marginal productivity. The outline of the model's foundations contains

several equations expressing the dynamics of factors of production and basic incomes. N. D. Kondratiev essentially constructed a single-sector growth model usable, for example, for the analysis and forecasting of the long-term dynamics of macroeconomic indicators (Kondratiev, 1989) In Western literature, similarly conceived growth models did not appear until about twenty years later (R. M. Solow and T. W. Swann in 1956), and in Soviet literature, not until a quarter-century later (L. V. Kantorovich in 1959). Even when compared to contemporary models, the originality of N. D. Kondratiev's approach stands out. In it, the dynamics of exogenous variables are determined not by an exponential or other uniformly increasing time function, but by a logistic *"S"* curve, in which a phase of slower growth is replaced by a phase of rapid growth and vice versa. Thus, Kondratiev's model assumes a significant unevenness in scientific and technological progress, which has a fundamental influence on the nature of market economy development. The idea of long waves is also implicitly incorporated into the model.

3 "Major business cycles"

References to long-term fluctuations in economic variables can be found as early as the 19th century, with the first explicit mention dating from 1847 (H. Clarke). Most authors arrived at these fluctuations through analyses of medium-term fluctuations and crises. Fluctuations in the price level served as the impetus for research into long-term fluctuations. Later works, beginning with Kondratiev, also document long-term fluctuations using data on industrial production, and subsequently on GDP growth or trends (Van Duijn, 1989).

Kondratiev's first sketch dates from 1922—the article *"The World Economy and Its Cycles During and After the War*" (Kondratiev, 1922). His final contribution on the topic of long waves is the paper *"The Dynamics of Prices of Industrial and Agricultural Goods: On the Question of the Theory of Relative Dynamics and Business Cycles*" (Kondratiev, 1928). It also analyzes changes in the structure of economies over the course of a long wave. However, this study also somewhat reformulates the theory proposed in the 1926 work. It concludes that long waves in the prices of agricultural and industrial products coincide with long waves in overall economic activity.

Some of Kondratiev's studies were soon translated and published in Germany and the United States (Kondratiev, 1925, 1926a, 1935). N. D. Kondratiev, true to his statistical focus, significantly expanded the foundation for empirical research in this field and put forward a number of new hypotheses regarding the mechanism and course of long-term fluctuations. He

later linked what came to be known as Kondratiev waves not only to price fluctuations but also suggested deeper connections with processes of capital accumulation, rates of production growth, interest rate dynamics, and innovation. His contributions from the late 1930s were primarily followed up by J. A. Schumpeter, who, with his idea of the clustering of innovations, laid another cornerstone of theories of long-wave fluctuations (Sirůček, 1999, 2015).

N. D. Kondratiev distinguishes between seasonal fluctuations (lasting less than a year); fluctuations lasting three and a half years; *"commercial-industrial" cycles*, i.e., so-called *"short cycles"* (7–11 years), and *"long business cycles"* (long waves) lasting 48–55 (60) years. *"Small cycles"* are examined in the text (Kondratiev, 1922), which focuses on the cycle culminating in the crisis of 1920–21. It also contains hints of the relationship between the general and the particular within the theory of cycles. This is elaborated upon in the essay (Kondratiev, 1923).

In his unfulfilled work plan*, it* was precisely *the* identification of *"long business cycles" that* brought him the greatest renown*. Through his* studies of long waves, N. D. Kondratiev laid the foundations for this research, particularly in the West. Kondratiev processed empirical data on time series and changes in economic indicators and, using statistical methods, demonstrated the existence of long waves. He conceived of these not only as a phenomenon of the sphere of circulation but also of production. Kondratiev emphasizes the regular cyclical nature of long waves and links them to internal causes. His work demonstrates a broad theoretical scope with an emphasis on statistical empiricism and the theory of statistics. He bases the concept of long waves primarily on observations of price trends (including trends in interest rates and wages) throughout the 19th century, supplementing these with several other shorter price series (trends in foreign trade, bank deposits, etc.). What Kondratiev lacked most, however, was the tracking of the temporal development of a synthetic indicator of activity or growth (such as GDP).

Kondratiev identifies *"two and a half major business cycles"* as long-term cycles of growth and decline in economic activity. He roughly dates these as: 1790–1851, 1844–96, and places the beginning of the third wave around 1890. The definition of the initial long waves became the basis for chronology for many of his successors as well. J. A. Schumpeter (Schumpeter, 1939) interprets and names Kondratiev's dating as follows: the so-called Kondratiev *"industrial" wave* with an upswing from 1787/93 to 1810/17 and a downswing from 1810/17 to 1844/51, the so-called Kondratiev *"bourgeois" cycle* from 1844/51 to 1870/75 and from 1870/75 to 1890/96, and *the* so-called Kondratiev *"neo-mercantilist" cycle* with an upswing from 1890/96 to 1913/20.

Despite variations among countries, Kondratiev regarded the cycles as *"international"* and linked the transitions between them to fundamental technological changes associated with

inventions and discoveries. Each long wave exhibits two phases: an ascending and a descending phase, which also influence the course of medium-term cycles. In historical development, cyclical and structural factors intertwine, making the cycle unique. Kondratiev sought to create a universal concept of cycles applicable to forecasting the development of the Soviet economy. He concludes that long-term fluctuations exhibit a regular, cyclical character. He identifies a complex of socio-economic processes characterized by long-term periodicity and suggests internal interdependencies among them. Along with this, he develops A. Marshall's idea regarding the nature of economic equilibrium and formulates a general approach to explaining cycles of varying lengths. And he begins to study the mechanism of long-term fluctuations in the economy. He considered *the "turnover rate"* of basic long-term capital goods, the accumulation of free loan capital, and scientific and technological progress to be the fundamental elements.

Kondratiev does not capture the dynamics of development solely on the basis of statistical methods and theoretical curves. His analysis made it possible to formulate important empirical regularities in the course of long-term cycles. These document the occurrence of inventions, the incorporation of new territories into international economic relations, changes in gold production and money circulation, the occurrence of social upheavals (wars and revolutions) during the long wave, characteristics of the agricultural sector's development, and also highlight the connections between long waves and medium-term cycles. His reflections also address the necessary technological changes preceding the onset of the wave's growth phase. He does not view technological changes as a static state but rather conceives of them as endogenous processes. He already distinguishes between inventions and innovations and emphasizes that innovations can be applied on a mass scale only under suitable conditions. N. D. Kondratiev already accepts nearly all the building blocks of the endogenous theory of long waves. He recognized the importance of innovations (even though he did not yet directly link the wave mechanism to them) and also delved into the timing of fundamental innovations, etc. He regarded processes associated with fixed capital—whose wear and tear, expansion, and renewal occur in bursts—as the material basis of long cycles. However, N. D. Kondratiev has not yet developed a convincing, consistent, and more widely accepted explanation of the internal causes of long K-waves, or a model of their mechanism (Sirůček, 2015, et al.).

N. D. Kondratiev bases his theoretical model on the cyclical nature of the investment process and the capital required. During the approximately twenty years preceding the start of a long-term upward phase, there is a revival in innovation, which is then put into practice during the upswing. The turning points of long waves coincide with significant changes in international

economic relations and monetary circulation, among other things. In his attempt to formulate a theory of long waves, he refers to long-term *"investment cycles"*—associated with the acquisition of basic capital assets, which require massive investments and a long time to construct. By the end of the expansion phase, savings are no longer sufficient, or rather, accumulation has become too costly to meet the needs of renewing basic capital assets. This leads to a reversal of the long-term cycle, accompanied by a decline in prices and interest rates. During the downward phase of the long wave, savings and accumulation then grow and gradually lead to an economic recovery. In this sense, N. D. Kondratiev returns to the explanation of the traditional medium-term cycle offered by his teacher and predecessor, M. I. Tugan-Baranovsky (Sirůček, 2015, 2017, etc.).

Conclusion

Although Kondratiev developed his theory of long waves more than a century ago, many of his insights remain highly relevant to contemporary economics. His emphasis on long-term development, technological change, capital formation, and structural transformation anticipated themes that continue to shape economic research. In an era marked by digitalization, artificial intelligence, the green transition, and geopolitical uncertainty, the study of long-run economic dynamics has gained renewed significance.

Kondratiev's work highlights the importance of looking beyond short-term business fluctuations and considering the broader forces that shape economic development. His perspective emphasizes the interaction of innovation, investment, institutional change, and socio-economic transformation in determining long-term growth trajectories. In particular, his distinction between inventions and their large-scale economic application foreshadows modern theories of innovation diffusion and technological paradigms.

At the same time, Kondratiev's legacy underscores the continuing challenge of explaining how technological, financial, and institutional changes generate long-term economic dynamics. Although no universally accepted theory of long waves exists, many contemporary approaches in evolutionary economics, innovation studies, and theories of structural change continue to address questions that he first posed. Moreover, Kondratiev's conclusions have not remained without criticism. A notable critical assessment of both the statistical foundations (Louçã, F.,1999) and theoretical interpretation of long cycles was provided by (Garvy, 1943), whose review illustrates the methodological controversies that have accompanied the long-wave debate for decades.

Kondratiev's contribution should therefore be viewed not only as the foundation of long-wave theory but also as an important source of inspiration for modern research into economic dynamics. His ideas remain valuable for understanding current economic transformations and assessing possible pathways of future development.

Acknowledgment

This article is provided as one of the outputs of the Faculty of Business Administration IP 300040 'Competitiveness' research project.

References

Garvy, G. (1943). Kondratieff's theory of long cycles. The Review of Economic Statistics, 25(4), 203–220.

Kondratiev, N. D. (1922). Mirovoe khoziaistvo i ego kon"iunktury vo vremia i posle voiny [The world economy and its conjunctures during and after the war]. Gosudarstvennoe Izdatel'stvo.

Kondratiev, N. D. (1923). Spornye voprosy mirovogo khoziaistva i krizisa: Otvet nashim kritikam. Sotsialisticheskoe Khoziaistvo, (4–5), 50–80.

Kondratiev, N. D. (1925). The static and the dynamic view of economics. The Quarterly Journal of Economics, 39(4), 575–583.

Kondratiev, N. D. (1926a). Die langen Wellen der Konjunktur. Archiv für Sozialwissenschaft und Sozialpolitik, 56(3), 573–609.

Kondratiev, N. D. (1926b). Problema predvideniia. Voprosy Koniunktury, 2(1), 1–42.

Kondratiev, N. D. (1928). Dinamika tsen promyshlennykh i sel'skokhoziaistvennykh tovarov: K voprosu o teorii otnositel'noi dinamiki i kon"iunktury. Voprosy Koniunktury, 4(1), 1–85.

Kondratiev, N. D. (1935). The long waves in economic life. The Review of Economics and Statistics, 17(6), 105–115.

Kondratiev, N. D. (1989). Problemy ekonomicheskoi dinamiki. Ekonomika.

Kondratiev, N. D., Iakovets, I. V., & Abalkin, L. I. (Eds.). (2002). Bol'shie tsikly kon"iunktury i teoriia predvideniia: Izbrannye trudy. Ekonomika.

Louçã, F. (1999). Nikolai Kondratiev and the early consensus and dissensions about history and statistics. History of Political Economy, 31(1), 169–206. https://doi.org/10.1215/00182702-31-1-169

Schumpeter, J. A. (1939). Business cycles: A theoretical, historical, and statistical analysis of the capitalist process. McGraw-Hill.

Sirůček, P. (1998). N. D. Kondratěv – zakladatel moderních koncepcí dlouhých vln. Politická ekonomie, 46(4), 575–588.
Sirůček, P. (1999). Koncepce dlouhých vln J. A. Schumpetera. Politická ekonomie, 47(5), 643–667.
Sirůček, P. (2015). Dlouhé K-vlny (historie zkoumání, vývoj, výhledy) a rozpory soudobé globalizace. Díl I: O cyklech a dlouhých vlnách. Díl II: O globalizaci a dlouhých vlnách (2nd expanded ed.). Melandrium.
Sirůček, P. (2017). M. I. Tugan-Baranovskij – teoretik cyklů, krizí a socialismu. Alternativy, (2), 114–145.
Van Duijn, J. J. (1983). The long wave in economic life. George Allen & Unwin.

Contact

Pavel Sirůček
Prague University of Economics and Business, Faculty of Business Administration,
Department of Managerial Economics
W. Churchill Sq. 1938/4, 130 67 Prague 3, Czech Republic
sirucek@vse.cz

Zuzana Džbánková
Prague University of Economics and Business, Faculty of Business Administration,
Department of Managerial Economics
W. Churchill Sq. 1938/4, 130 67 Prague 3, Czech Republic
dzbank@vse.cz