Introduction.

Long-Wave Dynamics Research in Historical and Theoretical Aspects

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The fifth issue of the Yearbook 'Kondratieff Waves' has the subtitle 'Historical and Theoretical Aspects'. Its papers cover some interesting aspects of long-wave dynamics both in historical trends and theoretical researches. The Yearbook consists of three sections.

Section I (Theoretical Aspects) includes two articles devoted to the correlation between the long waves and much longer cycles, *i.e.* the Industrial and the Cybernetic revolutions.

It starts with the article by **Andrea Komlosy** 'Entanglements of Catching-up: Rethinking "Industrial Revolution" from a Global Perspective'. The main objective of this contribution is delinking the historiography about the Industrial Revolution in Western Europe both from a predominantly internal and a Western/Eurocentric analysis perspective. This requires questioning long-established narratives, confronting and re-interpreting them in a way that they do not privilege the regions that introduced the factory system first. Methodologically, this is realized by assessing industrial development not from a (western) forerunner's but from a multiple catching-up perspective.

Until today, catching-up attempts, successful or unsuccessful, have been attributed to agrarian, not industrially under or poorly developed regions/countries, striving to achieve industrial development, which were labelled 'progress'. Broadening the notion of catching-up requires including into the comparison the industrialized nations themselves, looking for global preconditions for their modernization.

This approach also allows considering developing nations'/regions' attempts to adapt or copy Western achievements in technology and productivity on the same conceptual premises in later periods. Catching-up is a permanent, continuous process, inter-linking advanced and less-advanced economies in the process of competitive challenge, leading to innovation on the one hand, and adaptive response on the other, embedded into spatial and technological rearrangements. Industrial history thus can be understood as a process of permanent adaptions, allowing previously less competitive actors to advance temporarily, until the advance pushes others towards adaptive measurements in order to close the gap or to restore imbalances at a new level.

The article by **Leonid E. Grinin** and **Anton L. Grinin** 'The Dynamics of Kondratieff Waves in the Light of the Theory of Production Revolutions' continues the theme raised in the previous issue of the Yearbook. This article attempts to clarify and develop some important aspects of the theory of long cycles (K-waves). For this purpose, the Kondratieff waves theory is considered in comparison with the theory of production revolutions which analyzes the regularities of the major technological breakthroughs in history. Both theories analyze the processes of cyclic nature related to the innovative technological development of the World-System. The authors have identified a significant correlation between the duration of the Kondratieff waves and their phases, on the one hand, and the phases of the production principles, on the other. The article consistently describes the features of each Kondratieff wave (and their phases) as stages of the world economic and technological process. At the same time, a number of features of certain Kondratieff waves and their phases, which are insufficiently explained by the theory of long cycles, become more comprehensible using the conclusions of the theory of production principles. Based on the comparison of both theories, the authors provide some forecasts concerning the development of the fifth and the assumed sixth K-wave for the next 40–50 years.

Section II. Historical Aspects consists of three papers connected with the history of the USA; technological activity since the Middle Ages and some little-known aspects of the history of long-wave dynamics research.

According to **Brian J. L. Berry** ('Seven Long Waves in America's History') the synthesis of research on colonial America by Earle (1992) and independent America by Berry (1991) results in identification of the seven long Kondratieff waves that have unfolded since initial settlement in the early 17th century and the 'Great Recession' of the first decade of the 21st century. Earle's three colonial long waves have the same timing as those of industrializing and industrial America, documented by Berry.

Leonid E. Grinin, Anton L. Grinin, and Andrey V. Korotayev in their article 'On Some Aspects of the History of Long-Wave Dynamics Research' suppose that among researchers of long waves there is a common belief that Nikolai Kondratieff discovered long cycles (waves) of conjuncture. Actually, this is not the case. This paper discusses this issue in detail. It deals with not so much the study of current status of long-wave dynamics research as some aspects of the history of these studies because they are understudied and poorly systematized. There is still no systematic description of their initial periods of given research. This article does not claim to be systematic in describing these aspects but it does attempt to clarify certain points, as well as to show what is wrong with some common statements. In contrast to the conscientious misconception that Kondratieff discovered long waves, sometimes there are opposite statements, for example there is an opinion that Nikolai Kondratieff did not introduce anything new (and what he introduced was wrong) and borrowed the idea of long waves from others, first of all from his teacher Mikhail Tugan-Baranovsky. As far as this misconception is 'conscientious', the authors will show it in this paper.

One should add an explanation to this article. It is largely a reaction to the article by A. S. Smirnov 'What Reality is Behind the "Kondratieff Waves"? Real Long Cycles' (Smirnov 2014). In this article he tries to prove that N. D. Kondratieff's theory derives from the works by M. I. Tugan-Baranovsky, primarily from his book *Paper Money and Metal* (1917). According to Smirnov, in this work Tugan-Baranovsky put forward an erroneous hypothesis about the correspondence of large cycles to the enlarged model of Juglar cycles, and for Kondratieff it became the foundation for his research of long cycles, to which he allegedly adjusted all his statistical research. Smirnov analyzes two models (schemes) of Juglar cycles and tries to show that these models cannot be applied to large cycles without gross distortions. He pays considerable attention to proving his own idea: large waves of conjuncture were peculiar to the 19th century, when the agrarian and industrial economy emerged. And each wave was caused by its own factor. The upward wave of 1789–1814 was caused by the Napoleonic Wars, the downward wave of 1815–1849 by the Industrial Revolution, the upward wave of 1850–1873 by the discovery of the largest gold reserves; and the downward wave of 1874–1896 by the industrialization of transport and the fall in the price of agricultural products. The large waves of conjuncture inherent in the 19th century are not universal, but unique. The main conceptual idea of Smirnov is that large waves of conjuncture of the 19th century are closely related to the real long cycles, which consist of three Juglar cycles, and these 'real long cycles' continue in the 20th and in the 21st century. Three-stage long cycles which last not about 40–60 years as Kondratieff's, but

only 20–30 years (*i.e.* equal to one phase of Kondratieff cycle) consist of three middle cycles, each of which plays a strongly functional role in the development of the long cycle. The first one is the growth cycle (where, according to the author, monetary instruments play a special role), followed by the innovation cycle (as development opportunities are already exhausted during the growth cycle). The innovation cycle is followed by the shift cycle which is closely linked to political changes. And there is an alternation of cycles. The author attempts to trace this alternation of more than two hundred years. Smirnov's own approaches to underresearched topics could be welcomed, if not for the gross distortions, falsification of facts, the attempts to accuse Kondratieff of something that did not happen in reality, improper criticism of his opponents, as well as a number of other things unacceptable in science. Smirnov's article did not simply aim to refute the existence of Kondratieff waves. In fact, the concept of long waves is still a hypothesis and might be criticized. Besides, rigorous scientific criticism would only benefit it. But Smirnov not only very sharply criticized N. D. Kondratieff's ideas, but directly accused him of dishonest methods, in particular, of fabricating long cycles, and also attributed to him borrowing the model of long cycles from his teacher Mikhail Tugan-Baranovsky. In Smirnov's interpretation it looked like defamation of Kondratieff in different ways (*e.g.*, for plagiarism, dishonesty, and even cowardice, since Kondratieff seemed to borrow the model, but did not dare to apply it to long cycles, *etc.*). The author also scolded all the adherents of Kondratieff.

Leonid E. Grinin, Anton L. Grinin, and Andrey V. Korotayev in their contribution 'The Technological Activity and Competition in the Middle Ages and Modern History: A Quantitative Analysis' present a quantitative analysis of innovative activity and competition in technological sphere in the Middle Ages and Modern Period (till the end of the 20th century). The authors consider the innovative competition in two aspects. The first section of the paper shows the growth of the number of innovations over half-century intervals in Europe and Asia. As is widely accepted at present, by the early 2nd millennium CE Europe lagged far behind the main eastern countries not only in terms of development of the productive forces but in respect of many relevant parameters. According to some data, Europe failed to outrun China (as regards scientific-technological growth rates) not only in the 12th or 13th, but even in the 14th century. On the other hand, the authors show a rather vigorous acceleration of those rates in Europe since the 12th century with one more such acceleration in the 13th century (when Medieval Europe produced its first paradigm changing inventions – initially, the invention of the spectacles and the mechanical clock). In the 15th century Europe definitely outpaced Asia.

After such historical breakthrough, it is very important to trace how the leadership has changed in this respect within Europe. The second and the following sections of the paper are devoted to this aspect. The authors consider the dynamics of technological inventions in Europe from the 15th to the 19th centuries. The analysis of the technological innovation dynamics shows that firstly, the British lead began to show up only in the second half of the 17th century; before Britain had clearly lagged behind Italy and Germany. Thus, during the two initial centuries of the Industrial Revolution Britain absorbed the achievements of European societies, and only then was it succeeded to start its own innovative climb.

Secondly, though the authors observe the British evident leadership in the technological innovation from the second half of the 17th century to the first half of the 19th century, for a greater part of that period, the overall innovation activity of 'the rest of the West' was higher than that of Britain. The primacy of Britain in the field of technological invention was absolute only during a relatively short period in the second half of the 18th century and the early 19th century, *i.e.* the period of the final phase of the Industrial Revolution.

Thirdly, by the first half of the 19th century the British endogenous technological growth rate virtually stagnated against the background of a very fast increase of those rates in France, Germany and the USA, as a result of which those countries caught up with Britain in a rather significant way.

Fourthly, in the second half of the 19th century Britain finally lost its technological lead, as in the late 19th century the number of major inventions made in the USA, Germany, and France exceeded the number of British inventions.

Section III. Reviews, Notes, and Reflections contains two reviews-reflections. The first one written by **Antony Harper** analyzes a recent book 'Islamism, Arab Spring, and the Future of Democracy' by Leonid E. Grinin, Andrey V. Korotayev, and Arno Tausch (Springer, 2019). The second one (by **Claude Diebolt**) 'Trend, Cycles and Chance' is about the book *Trend, Zyklus und Zufall. Bestimmungsgründe und Verlaufsformen langfristiger Wachstumsschwankungen* (2002) written by Rainer Metz. It rehabilitates Metz's somewhat forgotten milestone in the quantitative history literature on economic cycles and represents an indispensable standard work for anyone who wants to work in this field.

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