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REGULAR ARTICLE

The interpretation of the cyclical history of capitalism. A comparison between the neo-Schumpeterian and social structure of accumulation (SSA) approaches in light of the long wave theory

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Abstract
Long waves research is currently dominated by two main approaches: a "neo-Schumpeterian" and a "social structure of accumulation" paradigm. While the former fits into *evolutionary economics*, the latter is rooted within Marxian and Keynesian macroeconomics. Although each research school continues with its own approach, without knowing what the other school has learned, a similarity between the two is inevitable, since long wave (or cycles) theory is a common framework for research. This makes both theories well-suited to help in understanding the factors underlying the financial and economic crises of capitalism. The primary purpose of this paper is to compare their respective accounts in this field, from a theoretical and analytical perspective, concluding that, despite the different premises and approaches of both schools, the resulting periodizations of capitalism elaborated by each theory are quite similar.

Keywords Capitalism · Economic crises · Long waves · Evolutionary economics · Social structure of accumulation

JEL classification N10 · O43 · P10

1 Introduction

The long wave theory (hereinafter LWT) emerged from the classical approach, particularly with Marx, who provided fertile ground for its appearance. However, it was Kondratieff who amassed the first substantial empirical evidence of the long-wave

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phenomenon in 1925 and, thus, since Schumpeter (1939 [1964], p.144), the LWT has become known as the Kondratieff long cycle theory.

Based at least partially on the main idea in the seminal paper of Kondratieff that "… the capitalistic social order is not of a simple and linear but rather of a complex and cyclical character…" (Kondratieff and Stolper 1926 [1935], p.105), Schumpeter developed a four-phase model of the cycle in *Business Cycles* (1939 [1964]). These phases are: prosperity, recession, depression, and revival – referring to prosperity and revival as the positive (or A-period) phases of the cycle and to recession and depression as the negative (or B-period) phases (Schumpeter 1939 [1964], p.126). His intention was to chart a specific pattern of cyclical movements of economic performance, but he acknowledged that it was only an approximation (Kuznets 1940, p.265). He then presented his model, on a three-cycle schema basis (formed by a Kondratieff-Juglar-Kitchin cycle combination, with periods of 45–60, 7–11, and 3–5 years respectively; see Fig. 1), "… in order to simplify description and to construct an ideal schema with which to compare observations" (Schumpeter 1939 [1964], pages 173–174), thereby justifying the way it describes successive business cycles dating back to the last quarter of the eighteenth century in the three countries with which he deals (United States, Great Britain and Germany).

Schumpeter's intention was to prove the close connection between business cycles and the general process of the evolution of the capitalist economy, according to the relations between these three types of cycles identified in his theoretical scheme and empirical findings. As far as long waves are concerned, he distinguished – as did Kondratieff- three successive cycles over the entire period studied: the first Kondratieff (*Industrial Revolution Kondratieff*), from 1787 to 1842; the second Kondratieff (*Bourgeois Kondratieff*), from 1843 to 1897; and the third Kondratieff (*Neo-Mercantilist Kondratieff*), from 1897 to 1939 (*Business Cycles* publication year). The cycles, with their respective positive and negative phases, were characterized by the cyclical disturbances reflected in the alternating rising and declining stages, with an approximate total duration of 50 years (48–60 years according to Kondratieff, in Kondratieff and Stolper 1926 [1935], p.112).

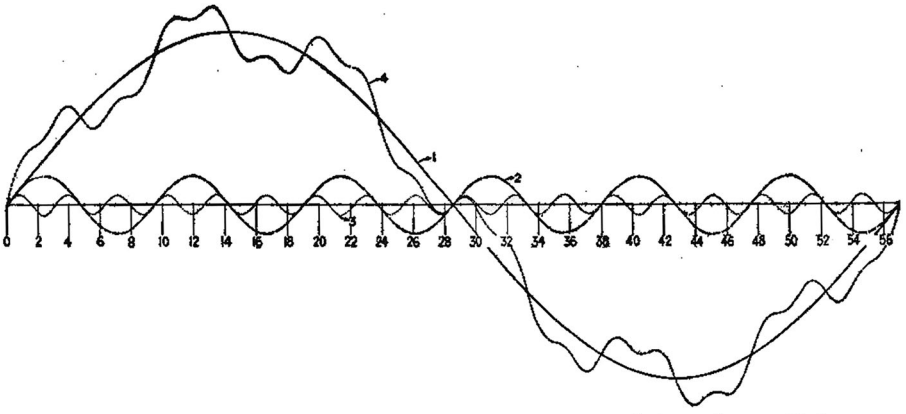


CHART I.—Curve 1, long cycle; curve 2, intermediate cycle; curve 3, short cycle; sum of 1–3.

Fig. 1 The Schumpeter theoretical model on a three-cycle schema basis. Source: Schumpeter (1939 [1964], 175)

For both Kondratieff and Schumpeter, the cycle is essentially a quantitative concept. All its characteristics (duration, amplitude, phases, etc.) can be conceived only as measurable aspects, and can only be properly measured with the help of quantitative data. Furthermore, to establish the existence of cycles requires a demonstration that fluctuations recur in the movements of several significant aspects of economic life (production and employment in a range of industries, prices of different groups of goods, interest rates, volumes of trade, flows of credit, wages, volume of total output, etc.). Both Kondratieff and Schumpeter's own statistical analyses refer largely to all of these types of variables, the long term swings of which are driven by technical change. However, this does not mean that observation of cycles on the basis of qualitative information is neither possible nor valuable. Whatever quantities reflect cyclical changes, some of these changes can be derived from qualitative records caused by external factors. The study of such qualitative data in conjunction with statistics is indispensable for a close analysis. This enables the LWT to account for empirical data in a more coherent manner. Moreover, this seemingly paradoxical approach is basic for the development, as Schumpeter attempted, of a theory of economic evolution that differs from the static equilibrium theory developed by Walras and others, and in the subsequent academic discussions has served as an epistemological benchmark for the relationship between economic dynamics and economic history, including qualitative institutional changes in historical time (or evolution). (See Freeman and Louça 2001, ch. 1; Fagerberg 2003, p.135.)

The long wave cycle has been subject to intensive research by many scientists along similar lines (see Goldstein 1988; Freeman 1996; Louça and Reijnders 1999; Freeman and Louça 2001; Fagerberg 2003; Devezas et al. 2005; Ledenyov and Ledenyov 2013; Korotayev and Grinin 2014; Grinin et al. 2014, Grinin et al. 2016). Previous studies by long wave scholars have focused, as discussed below, on different variables according to the paradigmatic framework of each school of research, highlighting both the particular variable and a theoretical role for that variable. In a compilation work, Goldstein (1988, ch.8) pieced together 55 time series that comprise the six classes of variables most commonly treated by long waves scholars until the late twentieth century. These variables are prices, production, innovation and invention, capital investment, trade and real wages and working-class behavior. Another data-related consideration is that the majority of long wave studies in the pasts have restricted their analyses to industrial times.

In addition to focusing on different variables, scholars have also used a range of methodologies to study long waves. Although almost all empirical studies actually use one or more of them, Goldstein only highlights six basic methodologies: *visual inspection of time series*, used to establish historical dating of upswing and downswing periods; *moving averages*, used to bring out underlying long wave movements in long time series; *growth rates*, calculated to compare between upswing and downswing phases, showing alternating behavior in successive phases; *trend deviations*, used to show long-term movements in an underlying secular trend; long waves, analyzed in terms of the *shorter business cycles* they contain; *spectral analysis* and related statistical techniques, using sophisticated statistical routines to search for regular fixed periodicities.

It would be an arduous and complex task to provide a detailed account of the numerous studies carried out by the authors belonging to the different schools, each

with their respective variables, methodologies and approaches, but this is not the purpose of this work. It will be enough to point out, nevertheless, the existence of a goal in common for most of them, although achieved in different ways. This goal is to identify or validate the dates of long wave phases.

Goldstein (1988, ch.4) compared the dating schemes obtained by 33 long wave scholars and demonstrated a strong consensus on a single basic dating of long wave phases, concluding that estimating growth rates is the most common measure used. However, given the wide variety of theoretical models to determine the underlying form of long waves, five different conceptions can be distinguished: (1) a stationary series of up and down phases (of unequal lengths), (2) a rising secular trend with alternate rising and stagnating phases, (3) a long wave defined in a more complicated secular trend (exponential, S curve, and so forth), (4) a long wave defined as a sine wave (with time-invariant periodicity), and (5) a long wave defined as successive S growth curves. What these models all have in common is that the growth rates between turning points (defined by mean-standardized slopes) are higher in upswing than in downswing phases.

This variety also explains why there has been so much confusion about the definitions of "cycles" or "waves". There are two ways to define the cycles (Goldstein 1988, p.175 ff.): in terms of "periodicity" or as "repeating sequences". "Periodicity" implies that the interval of time that defines the cycle is fixed in length, while in "repeating sequences", the time interval varies. The regular periodicities of the physical world enable a variety of measurement and statistical analysis techniques that are only appropriate in cycles defined by fixed periodicities. However, periodicity is not suitable for the social world, because, as Kondratieff argued, "A strict periodicity in social and economic phenomena does not exist at all"[1] (Kondratieff and Stolper 1926 [1935], p.112), and claimed that the "regularity" of long waves should not refer to periodicity but rather to "the regularity of their repetition in time" and to the international synchrony of different economic series.

This fine line leads us to consider that social cycles may also be measured as long waves, since periodicity is only the superficial aspect of the cycle. The essence of a cycle is a (sometimes unknown) inner dynamic that gives rise to repetition in such a way that, when ups and downs in a number of time series variables correlate throughout a worldwide political-economic system, it is safe to conclude that there is a deeper systemic dynamic at work, not just a scattering of random ups and downs.

Therefore, in contrast to the periodicity approaches, which have had little success when using a mechanistic definition of cycles as fixed periodicities and statistical techniques associated to such definitions, Goldstein, following other methodologies based on the reconceptualization of social cycles in terms of sequences, defines long waves as a simple repeating sequence of two alternating phases, highlighting growth rates as the feature that distinguishes expansion from stagnation phase periods. Thus, the move away from periodicity to repeating sequences means defining a long wave as a unique, historically defined set of alternating phases eventually measured by growth rates.

[1] Which explains that "The length of the long cycles fluctuates between 48 and 60 years, i.e., 25%…" (Kondratieff and Stolper 1926 [1935], p.112).

A similar way to address the nature and methodological background used to find empirical evidence of the existence of long waves (or *structural cycles*) is also provided by Freeman and Louça (2001), Devezas and Corredine (2001, page 11) and Devezas et al. (2005, pages 914–916). In line with them, what are called long waves are instead phases of capitalist development, that is, structural cycles, and as such have unique and unrepeatable characteristics. Structural cycles are correlated with clusters of radical innovations that originate a new techno-economic environment and drag within it not only new technologies and industries, but also new ways of life, new occupations and new forms of organization, not only in business but also in politics and social order.

The two approaches analyzed in this article are currently oriented from this perspective, which focuses on recurrent and largely predictable sequences, rather than on fixed and exactly measurable periodicities. Since the end of the 1980s, a series of contributions have emerged that focus on the systemic aspects of innovation-diffusion and their relationship to social, institutional and political factors (especially Tylecote 1992; Freeman 1996; Freeman 1996; Louça and Reijnders 1999; Freeman and Louça 2001; Fagerberg 2003, pages 141-ff.; Devezas et al. 2005, p.918; Pérez 2009). For neo-Schumpeterians, evolutionary processes are characterized by strong regularities (Dosi 1988) and the notion of innovation is seen "as all encompassing, covering not only scientific and technological innovation, but including also all institutional, organizational, social and political dimensions" (Hanusch and Pyka 2007, p.280). On the other hand, the Social Structure of Accumulation school studies social systems from a comprehensive rather than a partial perspective and looks at social contradictions in a holistic rather than a one-sided way, explaining the formation of long economic cycles as well as the evolution of the capitalist systems of different countries at different stages (Ma, Kotz and McDonough 2017).

As shown in the following section, a considerable number of explanations for the observed Kondratieff wave patterns in terms of sequences have been proposed. The students of Kondratieff cycles have identified new additional long-waves from the post-World War I period up to the present. These long waves and their phases are summarized on Tables 1 and 2. In addition, as Kondratieff waves tend to be considered as an important component of the world-system social and economic dynamics, one would also expect to detect them within the major world macroeconomic indicators; first, with respect to the world GDP dynamics. In this regard, Korotayev and Grinin (2014) very recently estimated the statistical significance of the Kondratieff waves in world GDP dynamics during the period of 1870 to 2007. The periodization of such waves and those of the tables is quite similar (see Table 3). However, as Thompson (1990, p.21) argues: "Finding corroborating evidence… for the existence of long waves should never be accepted as a terminal goal. Rather, it should be regarded as an invitation to begin specifying the large number of possible relationships between and among technological waves and a wide variety of political, economic, and social phenomena…". This is the real purpose of the two approaches discussed in this paper.

In light of the above, we could conclude that, although different scholars have provided different definitions, most would agree on a definition of long waves (or Kondratieff cycles) based on alternating phases of rapid expansion (for which the term *upswing* is often used) and stagnation (often called *downswing*) in the world economy. These economic phases are not uniform in length or quality. The long wave, which is repeated roughly every 50 years, is synchronous across the major core countries,

Table 1 Long waves and their phases identified by Kondratieff

Long wave number	Long wave phase	Dates of the beginning	Dates of the end
One	A: upswing	'The end of the 1780s or beginning of the 1790s'	1810–1817
	B: downswing	1810–1817	1844–1851
Two	A: upswing	1844–1851	1870–1875
	B: downswing	1870–1875	1890–1896
Three	A: upswing	1890–1896	1914–1920
	B: downswing	1914–1920	

Source: Korotayev and Grinin (2014, p.25) and Grinin, Korotayev and Tausch (2016, p.25)

indicating that the alternating phases are a systemic-level phenomenon (e.g., Goldstein 1988, ch. 1; Thompson 1990, pages 217–221; O'Hara 2012). Likewise, for the purpose of this paper, the terms *long cycle, long wave, Kondratieff cycle*, *Kondratieff wave* (or also called *K-wave*) will be used interchangeably.

Since the primary aim of this article is to compare the neo-Schumpeterian and Social Structure of Accumulation approaches, this brief introduction to the LWT has served to clarify the common background upon which both schools have built their respective theoretical frameworks to account for the interpretation of the cyclical history of the capitalism. Given the abundant literature on the LWT in recent decades, the current situation of the long wave debate is addressed in section two of this paper. In section three, we attempt to identify similarities and differences between the two main paradigms within the long waves framework and, in section four, the interpretation of the cyclical history of capitalism from both perspectives is discussed and analyzed. The article ends with conclusions.

2 Starting point: The current situation of the long wave debate

As mentioned above, long wave scholars have focused their studies on the paradigmatic framework of each research school. In this section, the nature of these schools and their evolution is addressed. The period of the long wave debate from the time of Nikolai Kondratieff in the 1920s until the trailing off of interest in long waves in the

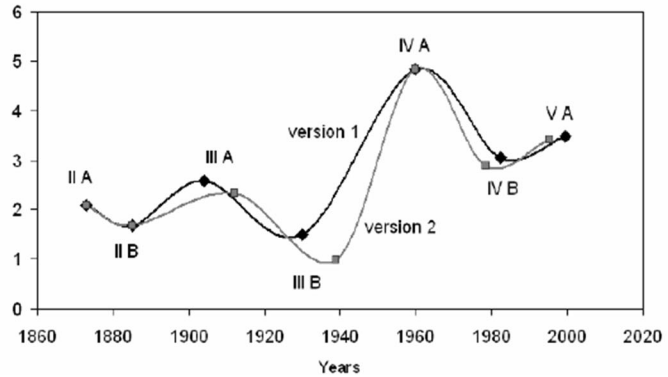
Table 2 "Post-Kondratieff" long waves and their phases

Long wave number	Long wave phase	Dates of the beginning	Dates of the end
Three	A: upswing	1890–1896	1914–1920
	B: downswing	From 1914 to 1928/29	1939–1950
Four	A: upswing	1939–1950	1968–1977
	B: downswing	1968–1974	1984–1991
Five	A: upswing	1984–1991	2008–2010?
	B: downswing	2008–2010?	?

Source: Korotayev and Grinin (2014, p.26) and Grinin, Korotayev and Tausch (2016, p.26)

Table 3 Average annual world GDP growth rates (%) during phases A and B of Kondratieff waves, 1871–2007

Kondratieff wave number	*Phase*	*Years*		*Average annual World GDP growth rates (%) during respective phase*	
		Version 1	*Version 2*	*Version 1*	*Version 2*
II	End of Phase A	1871–1875	1871–1875	2,09	2,09
II	B	1876–1894	1876–1894	1,68	1,68
III	A	1895–1913	1895–1929	2,57	2,34
III	B	1914–1946	1930–1946	1,50	0,98
IV	A	1947–1973	1947–1973	4,84	4,84
IV	B	1974–1991	1974–1983	3,05	2,88
V	A	1992–2007	1984–2007	3,49	3,42



Source: Korotayev and Grinin (2014, p.39) and Grinin, Korotayev and Tausch (2016, p.38)

1950s constitutes what Goldstein (1988, p. 21) calls "the first round of the debate". It then died down in the 1950s and 1960s (an expansion phase in the world economy), but came to life again with the second round in the 1970s and 1980s (a stagnation phase). The cyclical view of socioeconomic change seems to gain support during stagnant phases of economic growth.

The first round of the long wave debate was dominated by four theories, namely, the *capital investment theory*, the *capitalist crisis theory*, the *innovation theory* and the *war theory*, associated respectively with Nikolai Kondratieff, Leon Trotsky, Joseph Schumpeter and a group of mostly European scholars (Åkerman, Silberling, Bernstein, Simiand, Marjolin and Dupriez, amongst others). After the 1950s, the war school no longer played a role in the economic debate. However, each of the three remaining schools was to plant the seed of research tradition over the subsequent decades, shaping the lines of the current debate on LWT.

Figure 2 shows the evolution of the long wave debate up to the mid-1980s. At around these dates, the debate had coalesced into three research schools (shown by dotted boxes), descended from the three approaches mentioned above (see Goldstein 1988, pages 23–25).

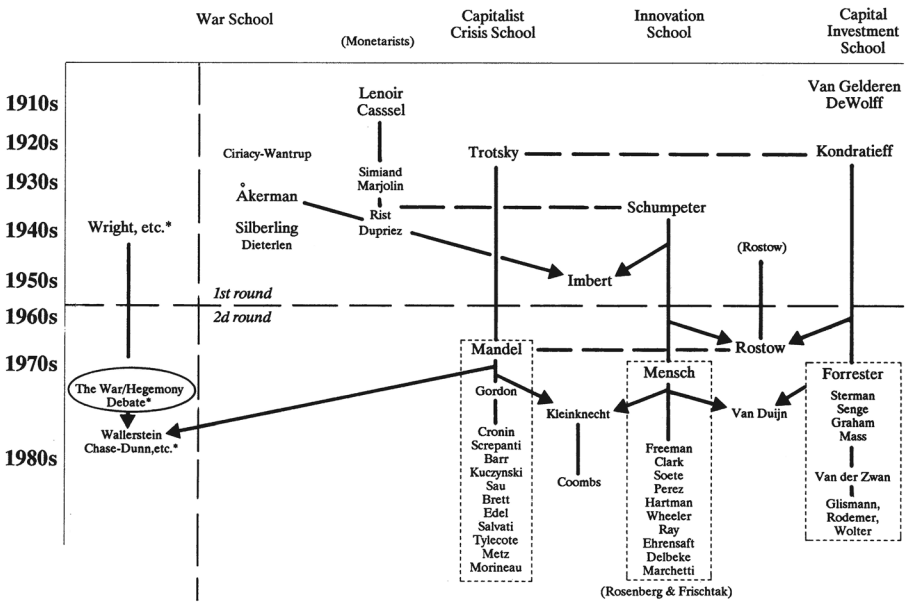


Fig. 2 Structure of the long wave debate. Source: Goldstein (1988, 41)

In the last decades of the twentieth century and the beginning of the twenty-first, the "capitalist crisis" school was led by the Belgian Ernest Mandel. Jay Forrester and his team of System Dynamics modellers at MIT dominated the "capital investment" school. The "innovation" school was structured around Gerhard Mensch in West Germany and Christopher Freeman in Sussex, England. The synthetic work of Dutch scholar Jacob van Duijn and the Marxist-innovation synthesis of Alfred Kleinknecht in West Germany (both *hybrid* theories, according to Goldstein 1988, p. 40) connect the innovation school with both the capital investment and the capitalist crisis schools. Each research school continues today with its own framework, but only understands what other research schools have learned with difficulty, impeding the accumulation of knowledge in the long wave field. However, although there are still substantial differences in views of the long wave process, "a fruitful convergence of ideas seems to emerge." (Kleinknecht et al. 1992, p. vii).

Since the 1990s, as Di Matteo, Goodwin and Vercelli (1989, pages v-vi) point out, long wave research has been dominated by two main directions: a "neo-Schumpeterian" and a "social structure of accumulation" (hereinafter SSA) paradigm. They could form, in Goldstein's terms, the third round of the debate. The former emerged from the Schumpeter renaissance that has taken place since the 1970s. Prominent representatives of this trend are, besides Gerhard Mensch and Christopher Freeman, Richard Nelson, Bengt-Åke Lundvall, Giovanni Dosi, John Clark, Luc Soete and the Venezuelan scholar Carlota Perez, amongst others. The second is advocated by David Gordon and his co-authors from the Marxian school (see Fig. 2) and has links with the French "regulation" school (hereinafter RA).[2]

[2] In fact, Bob Jessop lists the Social Structure of Accumulation Framework as one of his seven Regulation Approach schools (see Jessop and Sum 2006, pages 13–57), an assumption that Ma et al. (2017) do not share.

It seemed for some time that these two approaches were competing, but it is now becoming increasingly clear that both have common links that make them somewhat complementary. One of these links is the emphasis on the role of profit rates in the long waves process. Authors such as Gordon emphasize the importance of the "social structure of accumulation" as a determinant of profit rates, while Schumpeterian scholars focus on the interplay between innovation and profits. Both agree that the rate of profit is a central determinant in the accumulation process. If they are right and if economic growth follows a long wave path, then a long wave pattern should be found in several profit rate indicators. These processes have been empirically researched from different approaches by a number of authors, such as Poletayev, Shaikh, Fontvieille, Reati, Silver, Kuczynski and others[3] (see Kleinknecht 1992, p.6), and, most recently, the works of Dumenil and Levy (1993), Moseley (1997), Brenner (1998), Shaikh (1999), Goldstein (1999), Li and Hanieh (2006), Li et al. (2007), the model of which is going to be used as a benchmark for our comparative analysis in section four.

However, Perez does not mention the striking similarity between her theory and that of David Gordon. She argues that her model is "consistent" with Forrester's capital investment theory excess capital capacity occurring in the old technological style, as well as with Mensch's, Van Duijn's, and Freeman, Clark and Soete's innovation approaches (see Goldstein 1988, p.53). On the other hand, another point of concern within both the neo-Schumpeterian and the SSA approaches is related to the diffusion of major innovations in clusters. Thus, Tylecote (1984, p.705) elaborates on Freeman's theory of the diffusion of innovations, paralleling Perez, from a Marxist perspective.

Key variables of each approach concerning a long wave pattern are discussed in the next section. As seen, neo-Schumpeterians focus basically on innovation and invention, while the SSA approach is based on the rate of profit and accumulation. Likewise, both approaches also pay special attention to the social and institutional framework in which the long wave process is developed. In this respect, Gordon et al. (1982) refer to *interdependency* to describe the relationship between both realms, whereas Perez (1983) prefers to use the term *complementarity*.

3 'Neo-Schumpeterian' vs. 'social structure of accumulation' paradigms within the long waves framework

3.1 Neo-Schumpeterian approach

The neo-Schumpeterians attempt to understand innovation and to identify its regularities, which provides an understanding of the relationship between technical and organizational change, as well as economic performance and the mutual relationships between technology, the economy and the institutional context. For this school, there is a reciprocal association between innovation and long term economic fluctuations, viewing long cycles as the result of the introduction and diffusion of major innovations (see, e.g., Freeman et al. 1982, p.65; Dosi 1988; Freeman 1996). From this standpoint, which was essentially that of Schumpeter, the *new technology systems* are "clusters" of innovations, as Mensch (1979) claimed, associated with a technological web, with the

[3] For the methodological question about the long-wave phenomenon, see Freeman and Louça (2001).

growth of new industries and services involving distinct new groupings of firms with their own "subculture" and distinct technology, and with new patterns of consumer behavior (Freeman et al. 1982, p.64). Schumpeter stated that each Kondratieff long cycle was based on a specific cluster of innovations favorable to economic growth (see Freeman et al. 1982, p.68). However, the adoption of many new innovations will also depend on social and institutional changes, allowing a new technological paradigm to be disseminated more rapidly.

There is a wide range of positions under the neo-Schumpeterian label, and the assumed relationships between technical change and long-term fluctuations differ in many important aspects from Schumpeter's original account. However, although Mensch is the first central figure in this group, Tylecote (1984, p.705) states that as far as technological progress is concerned, the positions of Freeman et al. (1982) and Perez (1983) are the most solid in both empirical and theoretical terms. To illustrate the main guidelines of this approach, the case of Carlota Perez should be mentioned, a relevant representative of the neo-Schumpeterian school, whose accounts resemblance those of the SSA framework (hereinafter SSAF). Tylecote claims in this regard "This is a most elegant synthesis of the best of the Marxist and Schumpeterian traditions, …" (Tylecote 1992, p.19).

In a seminal paper in 1983, Carlota Perez proposed that the capitalist system be seen as a single, very complex structure consisting in two main subsystems: on the one hand, a techno-economic subsystem and, on the other, a social and institutional subsystem. Long waves involve both subsystems and can be seen as "successive phases in the evolution of the total system" or "successive modes of development" (Perez 1983, p.360). Each phase in this evolution is marked by a technological style based "on a constellation of interrelated innovations" (Perez 1983, p.361). Thus, long waves represent distinct successive modes of development, responding to distinct successive technological styles. However, although the neo-Schumpeterians identify modes of development as stretching from trough to trough of each Kondratieff wave, they propose that technological styles evolve roughly from the peak of one long wave to the peak of the next. In addition, since each mode of development would be formed in response to a specific technological style, this "is understood as a kind of paradigm for the most efficient organization of production" (Perez 1983, p.360).

The particular historical form of such a paradigm would evolve from certain key technological developments showing a strong feedback interaction between the economic, social and institutional spheres, which generates a dynamic complementarity centered on its corresponding technological style. In this way, the upswing of the long wave would be sustained and stimulated by such complementarity up to the point where the underlying technological style approaches the limits of its potential. To save this, a new technological style emerges in the productive sphere to which the prevailing social and institutional framework is no longer suited. The new dynamics introduced in the system produce more and more disruption until the downswing of the long wave is visible, eventually leading to a crisis of the whole system.

But structural crisis is not only a process of "creative destruction" or "abnormal liquidation" in the economic, but also in the socio-institutional, sphere. In fact, "the crisis forces the restructuring of the socio-institutional framework with innovations along lines that are complementary to the newly attained technological style… The

final form the structure will take, from the wide range of the possible, and the timespan within which the transformation is effected to permit a new expansionary phase will, however, ultimately depend on the interest, actions, lucidity and relative strength of the social forces at play." (Perez 1983, p.360).

Although Perez starts from a "Schumpeterian view" of innovation in the long wave, she sees long waves as not a strictly economic phenomenon,[4] but rather the manifestation of the behavior of the total socioeconomic and institutional system. This focus, which goes beyond the strictly Schumpeterian view, is probably the major common point between both the "neo-Schumpeterian" and the "social structure of accumulation" approaches, which makes them complementary.

3.2 The social structure of accumulation framework (SSAF)

As Harland Prechel (2011, p.542) point out, the relationship between social structure and capitalist growth and development has been a central concern in sociology since authors such as Marx, Weber and Polanyi. In accordance with this trend, in the 1970s and 1980s, several macroeconomists (i.e., David Gordon, Richard Edwards, Michael Reich and Samuel Bowles), drawing from theories developed by Marx, neo-Marxists, Kondratieff, Schumpeter and Keynes, began to elaborate the SSA theory to examine the relationship between long cycles of capitalist growth and development and the social structures of accumulation.

At the end of the 1970s, in the context of the Marxian general theory of capitalist stages, which has its origins in the works of Hilferding, Bukharin and Lenin (see, e.g., McDonough 2015, p.60), David Gordon (1978, 1980) published two articles linking it to LWT, but the SSA approach achieved its definitive form shortly thereafter with the publication of Gordon, Edwards and Reich's *Segmented Work, Divided Workers* (1982). Their interest in long waves stems from the hypothesis that each long wave in capitalist economies is associated with a different SSA. These SSAs are defining successive stages of capitalist development. In this sense, long waves and SSAs are interdependent, being defined one in terms of another. The variations of rates of capital accumulation over long periods cause the long waves in socioeconomic activity. A steady, sustained accumulation of capital causes a long period of economic growth, whereas the slowing down of accumulation causes stagnation and depression. The long waves are largely the result of the success or failure of SSA to provide capitalist accumulation, creating the conditions for profitability, reinvestment and growth.

The SSA school relates long waves to stages of capitalist development, capital-labor relations occupying the central role. SSA theory argues that the inherent problems of the capitalist system can be attenuated through the construction of sets of institutions that mitigate and channel class conflict and stabilize capitalists' long-run expectations. Every set of institutions constitutes one social structure of accumulation; they are conceived of broadly and can be economic, political, ideological or cultural, "thus claiming to avoid what was seen as an overly materialist and mechanistic Marxism of the past" (Kotz 2016, p.4). This set of "institutions … are mutually compatible and

[4] Whereas Schumpeter had assumed that social and institutional conditions are exogenous to the economic system, Perez proposes that capitalism also contains a social and institutional subsystem.

generally supportive of each other as well as supportive of the accumulation process. Thus, each SSA constitutes a relatively unified structure." (McDonough 2011, p.1240).

As it was first formulated, SSA theory was, above all, an investigation of the qualitative distinctions that defined different stages of capitalism, with a particular focus on the transformative processes that led from one SSA to another (see Reich 1997, p.2). The SSA macroeconomists propose that capitalism goes through stages that are repeated over time in a recurring sequence, with each stage representing a unique solution to the problem of how to accumulate capital. The recurring behavior implies each stage goes through three phases. An SSA is created in the *exploration phase* of each stage, with a structure that consists of all the institutions that impinge upon the capital accumulation process. In the *consolidation phase* of each accumulation stage, the SSA allows a period of major economic expansion. This way, when a social structure of accumulation "is in place", as McDonough (2011, p.1240) says, many of the determinants of the profit rate are secured and long-run expectations of profitability are stabilized. But eventually, internal contradictions lead to a period of economic crisis, which undermines the accumulation process. In this period, the institutions are destabilized, profits and profit expectations fall, and investment rates decline. The SSA ceases to underpin accumulation and the economy enters into a *decay phase*, accompanied by a long period of stagnation, during which the next SSA is explored. This new structure then allows another period of economic expansion until, in turn, it is undermined by contradictions.

To reach a stabilized SSA again, which could restore the process of capital accumulation, a successful set of new institutions is required. However, the construction of this SSA requires a long period of time, because the period of stagnation is also lengthy. Since different classes and social forces at play come increasingly more into conflict, new initiatives are often tentative and may be blocked, until eventually, "one political-economic program is able to defeat its rivals or an historic compromise might be reached". In this way, "a new SSA is constructed and more rapid accumulation begins again" (McDonough 2011, p.1241; also, Gordon et al. 1982; Kotz 1987; Bowles et al. 1990; Kotz et al. 1994).

Briefly, as Gordon, Weisskopf and Bowles (1987, p.48) point out, the functions of the constituent institutions of a given SSA are both daunting and fundamental. Their health and vitality substantially determine whether or not capitalists expect the profit rate to settle stably at a sufficiently attractive level to justify investment over alternative uses and also whether or not the right balance is achieved between profitability and effective demand.

3.3 Similarities and differences

Even though each research school continues today with its own framework, without knowing what the other school has learned,[5] a substantial similarity between the neo-Schumpeterian and SSAF approaches can be observed. Suffice to compare the two previous subsections to ascertain it. Unlike original long wave scholars, who did not give institutional changes a central role, both schools emphasize the importance of the

[5] This matter has been brought to my attention by both neo-Schumpeterians as well as SSA researchers in correspondence with representatives of both schools.

social and institutional framework on the accumulation process and agree with the existence of different upswing and downswing phases in such process. This could mean that the LWT reflects the general trend of their claims, but its influence has only a limited impact. There are also certain differences that must be clarified.

The neo-Schumpeterians place innovation at the center of the debate, retaining a decisive link between the evolution of technology and the evolution of the economic system. For this approach, the main source of fluctuation is the pattern of investment that, in turn, depends on oscillations of expected profitability. The latter is heavily affected by technical innovation as well as population growth, consumer tastes, etc. Innovation constitutes the source of a new range of profit opportunities, capable of generating an upswing during the long cycle. Therefore, major periods of expansion are associated with the introduction and diffusion of important inventions, whereas periods of profound depression are periods of adjustment from one technological regime to another. Schumpeter (1939 [1964], p.62) defines innovation "as the setting up of a new production function" and it is expressly regarded as an *internal* factor, because the use of existing production factors for new purposes is a purely economic process. However, Mandel (1975, p.143; 1980 [1995], pp.18–19), as a pioneer of the SSA approach,[6] asserts that Schumpeter's theory of the long waves was dependent on an arbitrary deus ex machina of waves of entrepreneurial energy and argued that the key turning points towards new upswings in the economy (i.e., upsurges in the average rate of profit) were brought about by exogenous extra-economic factors.[7] These factors unleash dynamic processes that can then be explained by the inner logic of the capitalist laws of motion.

The Marxian tradition in economics has made an important contribution to the long wave debate in its emphasis on the significance of the general rate of profit and the tendencies that may lead the rate to fall. This tendency may well justify the downswing, but not the upswing itself. For the very same reason, Marxists do not accept a type of theory of long cycles in economic development, in which there is a built-in mechanism through which an expansive long cycle leads to a stagnating cycle, which then leads automatically to another expansive long cycle, and so on (see Mandel 1980 [1995], p.16). There is no automatic inner logic of capitalism that can lead from a depressive long wave to an expansive long wave, but outside factors are indispensable for this purpose. Therefore, a common feature of the SSAF, as opposed to the neo-Schumpeterians, is the belief that the rate of accumulation is not essentially determined by the rate of technical progress but depends essentially on the institutional configuration of society. Thus, Reich (1997, p.5) claims that SSAF prefers a social or institutional analysis to a technological one, connoting the importance of institutions and emphasizing that technological change in itself is not determining. SSAF authors believe that the effects of technical change, especially upon the changing organization of work, are mediated heavily by social institutions.

Furthermore, since upswing depends on different types of institutional factors in each historical period, they accept the existence of long term fluctuations, but deny that they have a cyclical nature in the "periodicity" sense (according to the "cycle" definitions discussed in the Introduction). The notion of long cycles or long waves

[6] Mandel "would be influential in forming the basis for the second wave of Marxian stage theory", to which the SSAF belongs (see McDonough 2007, p.1236).

[7] "It is at this point that we attribute an important role to technological revolutions,...". (Mandel 1980, p.19).

has thereby lost ground to a conception of periods of alternating growth and stagnation in the history of capitalism. The length of these periods is not determined in advance, since historical contingency implies an irregular periodicity. Therefore, as in the above-mentioned Mandel sense, they do not follow on from one another with the strict logic that a cycle theory would demand (see Kotz et al. 1994, pp.75–76; McDonough 2007, p.1239).

SSAF falls within the second wave of the Marxian stage theorizing that emerged at the end of the post-World War II expansion, which is represented by Ernest Mandel's LWT, the SSAF and the RA (McDonough 2015, p.60). Stage theory undertakes an intermediate level of analysis in the sense that it identifies periods intermediate in length between the conjuncture and overall capitalist history (see McDonough 2015, p.61). This alternative analysis implies that capitalism survives through its variations across time, the original vision of which was founded in the French Regulation school (McDonough 2015, p.57). For the latter, if from a centuries-long perspective, the modes of production succeed each other and are underpinned on different social relations, as the Marxian theory points out, but it is no less true that these social relations can evolve within each mode of production. SSA theory therefore disagrees with the Marxian argument of the final collapse of capitalism, by focusing on its ability to revive and renew itself following prolonged periods of relative stagnation or crisis. This perspective enables SSA theory to account for the distinct stages of capitalism, as well as for the long cycles that have accompanied its development.

From this perspective, the "regime of accumulation" in RA and "social structure of accumulation" in SSAF are very close concepts[8] but, as has already been pointed out, are also near to "mode of development" concept in the neo-Schumpeterian approach (O'Hara 1994). Thus, the analysis of the evolution of capitalism through its undulating behavior across the different stages is a common concern of all the schools and this rationale in a certain sense makes them complementary. Accordingly, the main difference is the theoretical background from which they have evolved. While the SSAF perspective is rooted within Marxian and Keynesian macroeconomic insights (Reich 1997, p.4), the neo-Schumpeterian approach advocates an *evolutionary* point of view (Hanusch and Pyka 2007; Kattel et al. 2009, pages 1–18). In addition, this overview involves more specific implications. On the one hand, the analyses of both schools are different. While neo-Schumpeterians focus above all on micro and meso levels (firms, industries, sectors and regional clusters), the SSAF analysis is macrolevel, i.e., refers to the overall economy (or nation). On the other hand, the differences in approaches have resulted in what it could be called a "reversal of causalities", so that, while for the SSAF, as mentioned, long waves are largely the result of SSAs, which provide a favorable environment for capital accumulation by ensuring relatively high and predictable profit rates (e.g., Mandel 1975, 1980; Gordon 1980; Boswell 1987; O'Hara 2012), for neo-Schumpeterians, conversely, the institutional context is a consequence of the social and economic changes created by the long wave and unleashed by technical progress (e.g., Schumpeter 1939; Mensch 1979; Hartman and Wheeler

[8] "The SSA is roughly analogous to some combination of the regulation theory terms 'regime of accumulation' and 'mode of regulation'." (McDonough et al. 2010, p.5). See, in this respect, Boyer and Saillard 1995; Aglietta 1997.

1979; Bousquet 1980; Kleinknecht 1981; Freeman et al. 1982; Perez 1983, 2002; Kogane 1988).

4 The interpretation of the cyclical history of the capitalism from the neo-Schumpeterian and SSAF perspectives

4.1 Carlota Perez: The evolutionary point of view

In 2002, Carlota Perez published *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages*, a more original and seminal contribution than the article published in 1983 (see Freeman, in Perez 2002, p.*x*). In this book, she argues that her focus fits into *evolutionary economics* (Perez 2002, p.150), since the analysis is underpinned on the dynamic regularities and the recurring sequences in the internal functioning of the capitalist system, which covers both technology and institutions.

From a neo-Schumpeterian perspective, Perez explores the dynamics of the world historical process and the close interaction between technological, economic and political change. According to her approach, technologies evolve by revolutions, resulting in great upsurges of wealth-creating potential, as they are assimilated by the economic and social system, given the functional separation of financial and production capital. Perez shows that, historically, technological revolutions arrive with remarkable regularity and that economies react to them in predictable phases. Her main contention is that the "full fruits of the technological revolutions that occur about every 50 years are only widely reaped with a time-lag. Two or three decades of turbulent adaptation and assimilation elapse from the moment when the set of new technologies … make[s] their first impact to the beginning of the 'golden age' or 'era of good feeling' based on them" (Perez 2002, p.*xvii*).

This contention clarifies why she does not use the terms "waves" or "cycles" in her later writings, but rather "great surges" of development (Perez 2015). Perez follows the whole trajectory of each technological revolution from its irruption to its full diffusion and final maturity, when it is, in turn, replaced. Thus, Kondratieff's rising halves of waves represents, in fact, just the deployment period in Perez' paradigm (the decades after the turning point), which start about two decades earlier than Kondratieff waves (see Kattel et al. 2009, pages 6–7). Accordingly, "The regularities observed in these surges cannot be reduced to behaviors of aggregate economic variables" (Pérez 2009, p.780, fn. 2) and, therefore, her work does not concentrate on the statistical measurement of the rate of economic growth but on the patterns of diffusion of each set of revolutionary technologies and its assimilation by the economy and society (Perez 2015). At the same time, it explains why the use of mathematical modeling in economics is decidedly not shared by evolutionary economists, as the latter cannot handle real-world complexity (Perez 2016, p.209), and also, as seen below, why she does not use a sinusoidal model to describe the great surges, as Kondratieff, Schumpeter and Kuznets do in the cycles case, but rather a model as that of Mensch, in which the surges overlap each other.

The influence of the great technological surges, the diffusion of which has transformed the world five times over the past two centuries, begins in the core countries of

the world system and spreads ever stronger worldwide (see Table 4). Perez points out, just as Schumpeter did, that the early upsurge of a new technology (which is identified as the *"big-bang"*) marks the beginning of a period of explosive growth resulting in a great deal of turbulence and uncertainty in the economy. This process of propagation of new technologies, which Perez calls the "installation period" (divided into two phases: "irruption" and "frenzy"), may give way, subsequently, to a period of more harmonious economic growth, as political and social changes are consolidated, and many firms grow accustomed to the new technology and it therefore becomes everyday "common sense". This new period (called "deployment period" and again divided into two phases: "synergy" and "maturity") can be a time of relatively stable and prosperous development based on a successful coupling between technology and the institutional framework (i.e., "mode of development"). Moreover, fairly high levels of employment may well be attained in many countries during "deployment". For this reason, people think of deployment as a "golden age" or *"belle époque"*. However, in the maturity phase of the deployment period, diminishing returns set in for the (now) older and mature technologies. The fall in rates of profit leads to a new "installation period", as attention switches to the next generation of radical innovations (see Freeman, in Perez 2002, pages *x ff.*; Pérez 2009, p.781).

This whole process is depicted in Fig. 3, where the evolution of a great surge through several phases can be observed. These successive great surges evolve according to the "metamorphosis" model proposed by Mensch (1979), as distinct from the "wave model" of Kondratieff, Kuznets or Schumpeter (see Fig. 4). From "Mensch's model" and its comparison with the "wave model", valuable conclusions can be drawn. First, Perez explains her model of great surges from a Menschian model, where phase overlaps between successive surges can be observed, given the coexistence of the final phase of the previous surge with the incipient present one. However, as noted above, she stresses the term "great surge", as *long waves* are not business cycles, but a much broader systemic phenomenon in which social and political factors play a key role, and, on the same basis, rejects the emphasis on economic measurement as opposed to the qualitative understanding of the complex strains and forces involved in the process of assimilation of change (Perez 2002, p.60).

Second, nonetheless, Fig. 4 shows the "comparability" of both models, in such a way that, as in *The Rosetta Stone*, a rationale match can be obtained *grosso modo* between the different phases of each one. Therefore, phases of *depression*, *recovery*, *prosperity* and *recession* in the "wave model" match, respectively, those of *irruption*, *frenzy*, *synergy* and *maturity* in the "Perez' (Metamorphosis) model", meaning that the upswings in the Kondratieff waves generally correspond to the deployment periods in the Perez model and, equally, downswing to installation (including the *turning points*, see Table 6; also, Freeman and Louça 2001, p.148; Devezas et al. 2005, pages 918–919). This correlation may identify the current socioeconomic moment from both perspectives and, in this respect, according to the "wave model", it could be said that the historical trajectory of the capitalist economy is just going through the contraction phase of the fifth Kondratieff or, similarly, the turning point of the fifth great surge according to the Perez model.

Indeed, Perez points out the approximate dates of each great surge of development across the history of capitalism and claims that we are just now at the turning point of the present surge. If she initially set 2001 as the year in which this period begins (Perez

Table 4 Industries and infrastructures of each technological revolution

Technological revolution	New technologies and new or redefined industries	New or redefined infrastructures
FIRST: From 1771 The '*Industrial Revolution*' Britain	Mechanized cotton industry Wrought iron Machinery	Canals and waterways Turnpike roads Water power (highly improved water wheels)
SECOND: From 1829 Age of Steam and Railways In Britain and spreading to continent and USA	Steam engines and machinery (made if iron; fulled by coal) Iron and coal mining (now playing a central role in growth)* Railway construction Rolling stock production Steam power for many industries (including textiles)	Railways (Use of steam engine) Universal postal service Telegraph (mainly nationally along railway lines) Great ports, great depots and worldwide sailing ships City gas
THIRD: From 1875 Age of *Steel, Electricity and Heavy Engineering* USA and Germany overtaking Britain	Cheap steel (especially Bessemer) Full development of steam engine for steel ships Heavy chemistry and civil engineering Electrical equipment industry Copper and cables Canned and bottled food Paper and packaging	Worldwide shipping in rapid steel steamships (use of Suez Canal) Worldwide railways (use of cheap steel rails and bolts in standard sizes). Great bridges and tunnels Worldwide Telegraph Telephone (mainly nationally) Electrical networks (for illumination and industrial use)
FOURTH: From 1908 Age of *Oil, the Automobile and Mass Production* In USA and spreading to Europe	Mass-produced automobiles Cheap oil and oil fules Petrochemicals (synthetics) Internal combustion engine for automobiles, transport, tractors, airplanes, war tanks and electricity Home electrical appliances Radio and Television Refrigerated and frozen foods	Networks of roads, highways, ports and airports Networks of oil ducts Universak electricity (industry and homes) Worldwide analog telecommunications (telephone, telex and cablegram) wire and wireless National broadcasting networks
FIFTH: From 1971 *Age of Information and Telecommunications* In USA, spreading to Europe and Asia	The information revolution: Cheap microelectronics. Computers, software Telecommunications Control instruments Computer-aided biotechonology and new materials	World digital telecommunications (cable, fiber optics, radio and satellite) Internet/Electronic mail and other e-services Multiple source, flexible use, electricity networks High-speed physical transport links (by land, air and water) Global 'narrow-casting' networks

Source: Perez (2002, 14)

*These traditional industries acquire a new role and a new dynamism when serving as the material and the fuel of the world of railways and machinery

2002), she now places it between 2001 and 2007–08, after the outbreak of the global financial crisis (see Fig. 5 and also Perez 2012, p.5; 2013, p.11; 2015; 2016, p.195; 2017, p.16). This is consistent with the development of the frenzy phase in the fifth great surge, which does not end in a single great crash, as in 1929, but is spread over

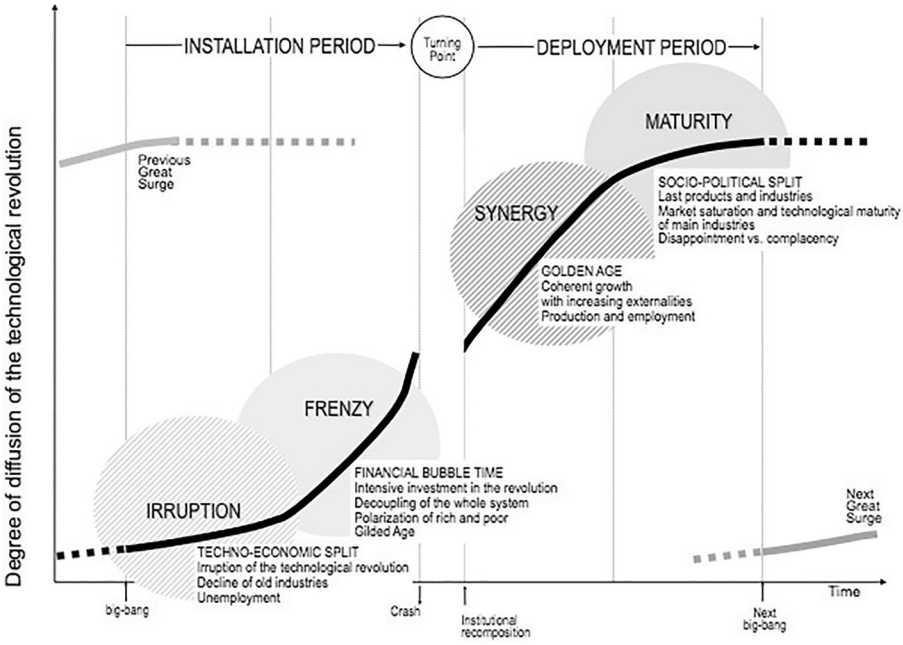


Fig. 3 Recurring phases of each great surge in core-countries. Source: Perez (2002, 48)

time by the bursting of a double bubble that led to the 'credit crunch' in 2008 (see Pérez 2009; 2012). The turning point represents the fundamental change to move the system from the frenzy mode, based on financial criteria, to a synergy mode, based on the logic of production. As Pérez (2002, p.52) explains, such a process "can take any amount of time, from a few months to several years," since the structural tensions created by the frenzy phase can be overcome only through institutional restructuring.[9]

It should be noted that, in the LWT, an exact date is not as important as the period itself. However, it can provide guidance to estimate the length of the period covered by a Kondratieff wave. If, as already mentioned, technological styles evolve roughly from the peak of one long wave to the peak of the next and modes of development stretch from trough to trough, it could be stated, on the aforementioned comparability basis, that the current mode of development of the fifth Kondratieff began around the end of the 1980s or the early 1990s (see Table 6). This is important to analyze the current socio-economic situation from a SSAF perspective, since the "mode of development" and "social structure of accumulation" (and "regime of accumulation" and "mode of regulation" in RA) are very close concepts.

4.2 The SSAF perspective

As does Carlota Perez, SSAF also draws on an institutional/evolutionary insight (McDonough 2011, p.1234), since economic processes are necessarily embedded in

[9] A detailed current crisis explanation from neo-Schumpeterian perspective can be found in Perez, Pérez 2009; 2012.

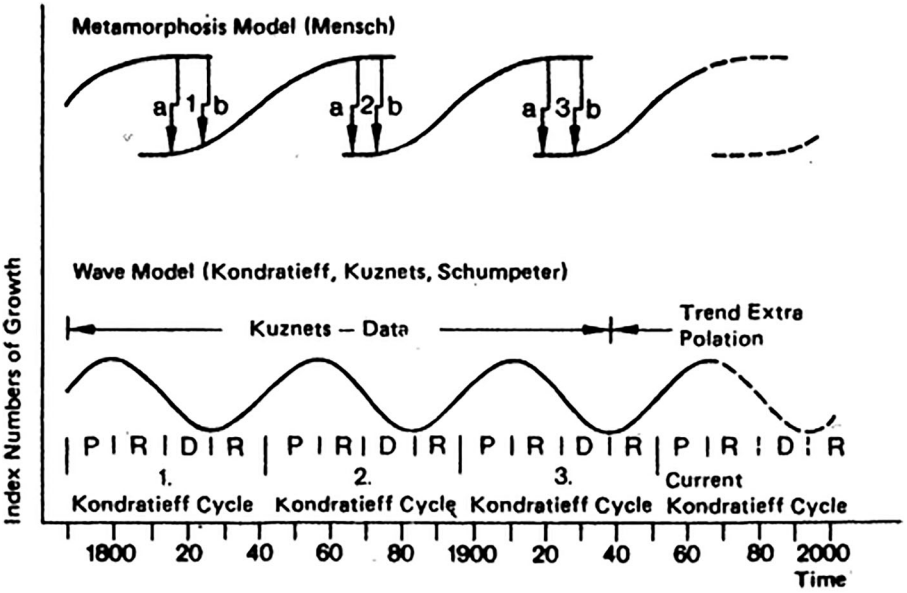


Fig. 4 Mensch metamorphosis model. Source: Mensch (1979, 73)

broader sets of social institutions and these institutions change over time. Thus, according to Reich (1997, p.2), hypotheses concerning periodization attached to different political and economic forces should emerge from an institutional analysis and not simply from econometric inquiries.

The SSA theory is an analysis of the stages of capitalism that has a long and distinguished background in the Marxist theoretical tradition, starting with Marx himself, but analyzes the evolution from stage to stage within the capitalist era, rather than the evolution of class society from one mode of production to another. Each new stage of capitalism is characterized by a new SSA, which does not conform to any pre-established general law, but is a historically unique entity constituted by the coherence of the institutions of which it is comprised. Nevertheless, the consolidation and decay of each capitalist social structure define alternating periods of expansion and crisis throughout its history.

There are differences in SSA literature concerning the precise nature and time path of the different SSAs throughout history. However, McDonough, Reich and Kotz (2010, pages 3–4) present one common account that illustrates this dynamic process,[10] as shown in Table 5.

Although there has been debate regarding whether neoliberalism constituted an independent SSA, there is a general agreement that, since the mid-1980s or early 1990s, a new SSA, commonly called *global neoliberalism*, was consolidated (Lippit

[10] The process refers only to the history of the United States, although, despite the fact that the founders of this framework have frequently claimed no applicability beyond the US for their particular institutional analyses, it has been unclear whether or not it can be applied at larger, more global scales (see, e.g., Lippit 2010, p.45; McDonough 2010a, pages 35–36). From the Marxian stage theory tradition, Gordon does apply the framework to the global economy (see Gordon 1980, 1988). Moreover, the SSA school is often lumped with long-wave and regulationist theories with international claims.

Table 5 SSAs in American history

	Competitive [1865–1898]	Crisis	Monopoly [1898–1945]	Crisis	Postwar [1945–1982]	Crisis	Global Neoliberalism [1982–2008]
Capital Capital	Competition	Prices Decrease	Oligopoly	Demand Decrease	Oligopoly	Popular Unrest Rises Stagflation	Transnational Capitalist Class
Capital Labor	Craft Unions		Weak Unions		Strong Unions		Nationally Divided, Weakened Working Class
State	Laissez Faire Infrastructure	Wages Increase	Mildly Regulatory	Financial Fragility	Keynesian Welfare State		Schumpeterian Workfare State Transnational State Apparatus
Ideology	Classical Liberalism	Excess Capacity Increase Profits Decline	Corporatism		Cold War Liberalism	International Competition Increases	Neoliberalism Competitiveness
International	Trade Investment		Imperialism		US International Dominance		Russia, China Structural Adjustment Programs

Source: McDonough (2011, 1243)

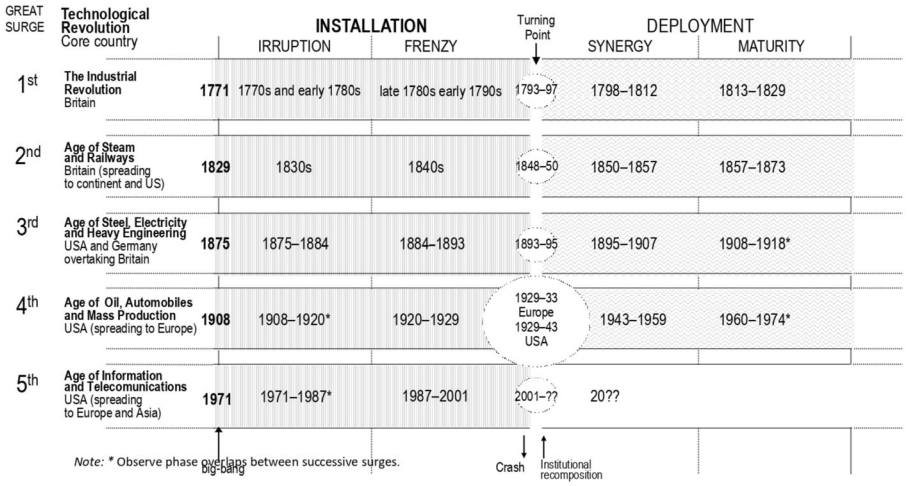


Fig. 5 Approximate dates of the installation and deployment periods of each great surge of development. Source: Perez (2002, 57)

1997; Hossein-Zadeh and Gabb 2000; Wolfson 2003; Kotz and McDonough 2010; McDonough 2010a). The neoliberal SSA is characterized by *financialization*, favoring the mobility of capital and social conditions legitimized and partially driven by the neoliberal ideology, based on a vision of unfettered markets (see McDonough 2010b, pages 443–448). However, structural contradictions and subsequent overinvestment and overproduction set the stage for its economic collapse (Kotz 2015). Currently, therefore, there seems to be a consensus that 2007–2008 marked the end of the "upswing" or "consolidation" phase and, according to Carlota Perez (Pérez 2009; 2012, pages 10 and 12–13; 2013, p.11; 2015; 2016, p.195; 2017, p.16; Perez and Marín 2015), we have since entered a "turning point" period.

From the SSAF perspective, Kotz (2013) has point out that the current crisis that began in 2008 is the result of unsustainable trends produced by the neoliberal SSA, which led to a crash that ended its ability effectively to promote capital accumulation. All neoliberal SSA institutions produced favorable conditions for the creation of surplus value, but, at the same time, created a problem for its realization. For Kotz, during the neoliberal era, the capitalists increased productive capacity to serve the rising consumer demand, maintained by rising debt and despite stagnating wages, even above what was needed to satisfy final demand. Once the last asset bubble burst, productive capacity suddenly turned out to be highly excessive. The financial collapse in 2008 made the financial sector no longer able to continue promoting large asset bubbles, thus halting the entire accumulation process.[11]

Kotz concludes, as claimed by both SSA and RA literature, that, although every SSA and every SSA crisis is unique, it is also possible to suggest the form of the structural crisis depending on the type of SSA, namely, a "regulated SSA" or a "liberal SSA". Each of these SSAs consist of two phases (Kotz 2015, p.6): "phase 1"

[11] A detailed current crisis explanation of the Financialized Capitalism from a SSAF perspective can be found in Lapavitsas (2009); Kotz (2009, 2015) and Ma et al. (2017).

Table 6 Long waves, great surges and stages of capitalism

	Long Waves (Li, Xiao and Zhu)	Long Waves (Kondratieff, Schumpeter and Korotaiev and Grinin)	Social Structures of Accumulation	Great Surges
Late nineteenth Century Long Waves (II Kondratieff wave)	Expansion: Profit Rate 1850s-1871[a] Accumulation 1850s-1874[a]	A: Upswing 1844/51–1870/75	Competitive Capitalism 1860s-1898	2nd Surge: Deployment period 1850–1873
	Contraction: Profit Rate 1870s-1897 Accumulation 1870s-1896	B: Downswing 1870/75–1890/96		3rd Surge: Installation period 1875–1893 Turning Point (1893–1895) Deployment period 1895–1918
Early twentieth Century Long Waves (III Kondratieff wave)	Expansion: Profit Rate 1898–1917 Accumulation 1897–1906	A: Upswing 1890/96–1914/20	Corporate Capitalism (Monopoly) 1898–1939 Phase 2: 1929–1937	
	Contraction: Profit Rate 1918–1939 Accumulation 1907–1934	B: Downswing 1914/29–1939/50		4th Surge: Installation period 1908–1929 Turning Point (1929–1943) Deployment period 1943–1974
Mid-twentieth Century Long Waves (IV Kondratieff wave)	Expansion: Profit Rate 1940–1969 Accumulation 1935–1974	A: Upswing 1939/50–1968/77	Regulated Capitalism (Postwar) 1939–1982 Phase 1: 1948–1973 Phase 2: 1973–1979	
	Contraction: Profit Rate 1970–1983 Accumulation 1975–1991	B: Downswing 1968/74–1984/91		5th Surge: Installation period 1971–2001/08 Turning Point (2001/08–20??) Deployment period 20?? A sustainable global knowledge society boom?
Late 20th / Early twenty-first Century Long Waves (V Kondratieff wave)	Expansion: Profit Rate 1984–1998? Accumulation 1992–2004?	A: Upswing 1984/91–2008/2010?	Transnational Capitalism (Global Neoliberalism) 1982–2008? Phase 1: 1979–2007 Phase 2: 2007–2014?	
	Contraction: -?	B: Downswing 2008/2010? -?		

Long waves in the first column are from Li, Xiao and Zhu (2007, p.44). Those of the second, since the III K-wave, come from a compilation by Korotaiev and Grinin (2014, p.26) based on the following authors: Mandel 1980; Dickson 1983; van Duijn 1983; Wallerstein 1984; Goldstein 1988; Modelski and Thompson 1996; Bobrovnikov 2004; Pantin and Lapkin 2006; Ayres 2006; Linstone, 2006; Tausch, 2006; Thompson, 2007; Jourdon, 2008; Lynch 2004; Akaev, 2010; Akaev and Sadovnichy, 2010; Akaev et al. 2011. The periodization of successive social structures of accumulation is from Bowles, Edwards, and Roosevelt (2005, p.161) and since *Regulated Capitalism* also from McDonough (2010a, pages 3–4). Phases 1 y 2 since the III to the V Kondratieff wave are from Kotz (2015, p.6). The periodization by surges is from Perez (2002, p. 57; 2009, p. 782; 2016, p.195; 2017, p.16)

Source: own elaboration, based on Li, Xiao and Zhu (2007, p.44)

[a] Peak years of the UK late nineteenth century long waves

(*consolidated phase*), during which the SSA effectively promotes accumulation, and "phase 2" (*decay phase*), in which the SSA is an obstacle (see Table 6). Thus, he says that there have been two liberal SSAs in the United States since the start of the twentieth century, the first in the 1920s and the current one, which ended in a realization crisis, while the crisis of the regulated SSA, stretching from 1948 to 1973–79, was caused by a decline in the rate of profit. Likewise, Lippit (2010) suggests that the institutional arrangements in consolidation periods are not uniform but affected by historical contingencies that produce two models of growth and development: one, a free-market approach where capital dominates (1920–1932, 1980–2001), and the other, regulated SSAs where social institutions place greater constraints on capital (1900–1916, 1947–1973). A similar insight is also provided by Ma et al. (2017, p.130), as capital-labor relations take the form of capitalist domination of labor in a liberal SSA and of compromise between capital and labor in a regulated SSA. In this sense, it is interesting to observe that these latter periods (1900–1916, 1947–1973) coincide with deployment periods in the Perez model, while the earlier ones (1920–1932, 1980–2001) coincide with frenzy phases (see Perez 2002, pp.146–147). Therefore, besides alternative periods of expansion and crisis in each capitalist stage (or long wave; or SSA), both schools also appear to agree that these evolve by alternating liberal and regulated cycles.

In conclusion and summarizing, Table 6 shows a comparison of the periods of the history of capitalism based on the different approaches analyzed in this article. Long waves are placed in the first two columns of the table; the SSAF Stages are in the third column and Carlota Perez's Great Surges are placed in the fourth. The first, taken from Li et al. (2007, p.44), displays long waves measured by profit rates and rates of accumulation, which are the key variables that SSA scholars generally use. In the second column, the post-Kondratieff waves come from 17 authors belonging to different schools included in a compilation by Korotaiev and Grinin (2014, p.26). The periodization of successive SSAs in the third column is from Bowles et al. (2005, p. 161); McDonough et al. (2010, pages 3–4) and Kotz (2015, p.6).

Observation provides valuable conclusions. First, and most important, despite the different premises and approaches of both schools, the resulting periodization of capitalism elaborated by each is quite similar. Second, the best way to compare the periodization carried out by both approaches is through the long waves in the first two columns. As shown, upswing periods coincide with both the deployment periods and the consolidation phases ("phases 1") in the Perez and SSAF models, respectively, while the downswing periods should do so with the installation periods according to Perez and the decay and exploration phases ("phases 2") in the SSA approach. The latter seems to happen to quite a great extent, except during the last of Perez's Great Surge, which could be due to the fifth Kondratieff being from a "liberal SSA",[12] where the final moments of upswings coincide with frenzy phase, as mentioned above. This imbalance would entail, in turn, the upswing of the next sixth Kondratieff matching the deployment period of Perez's fifth Great Surge.

[12] In fact, some authors, such as O'Hara (2006), argue that this period was more correctly viewed as one of continuing crisis of the postwar SSA rather than the opening of a new social structure of accumulation (see McDonough 2010a, pages 34 ff.).

However, this is an issue to be confirmed, since the irregularity in the length or quality of stages depends of each type of cycle.

5 Conclusions

In this paper, we have attempted to provide a detailed analysis of the differences and similarities between the neo-Schumpeterian and SSAF approaches as a basis to demonstrate that the resulting periodizations of capitalism elaborated by each approach are quite similar. Although both approaches are underpinned by a broader and more complex theoretical background than simply the LWT, such theory provides a common thread between both schools. However, as Devezas and Corredine (2001, p. 11) state, the fact that "1998 marked a turning point in the discussion of long waves, when... rhetoric gave way to valuation principles expressed as mathematical formulations", could explain the relative distancing of both approaches with respect to LWT since then (see, e.g., Perez 2002, p.23, fn. 30). This is basically because, as mentioned above, they emphasize the qualitative aspects of socioeconomic processes, beyond economic measurements (Perez 2002, p.60; Perez 2016, p.209) and econometric inquiries (Reich 1997, p.2). Nevertheless, although there are many authors from both sides, such as Freeman and Louça (2001, pages 150–151), who express dissatisfaction with the "long-wave" metaphor, they continue to use the expression because it has become the established framework for the discussion of long-term structural change. Similarly, the long-wave metaphor is also useful for the comparison of both approaches.

Reati and Toporowski (2009, p.147) claim that LWT is able to explain the long-term development of capitalist economies and "that, at the present stage of development of economic thought, is in our view the most valuable [theory] to understand the present situation and, consequently, offers the best guidance for economic policy". According to these authors, it could be said that two recurrent phenomena justify the concept of a "wave": (1) the quasi-cyclical pattern of long-waves to form successive stages of capitalism development, i.e. structural change, that, as such, have unique characteristics, and (2) the structural crises of adjustment. These issues are addressed by both approaches.

Both theories (and RA linked with SSAF), which utilize an institutionalist method (O'Hara 1994), set out to explain a long-term pattern of capital accumulation by analyzing the relationship between this process and the sets of social institutions that condition or regulate it. Both schools view capitalism as moving through a series of stages, each characterized by a specific form of the accumulation process and, despite the peculiarities and the unrepeatable nature of each, it is possible to single out some common causes for the upswings and the subsequent turning points that the process has experienced throughout the history of capitalism. Accordingly, the driving forces and mechanisms behind this stable causal structure provide the theoretical framework for analyzing the economic development of capitalism (Reati and Toporowski 2009, p.154). Both theories also assume that stages end in a long-term structural crisis that involves a significant reduction in the rate of accumulation, as a result of the failure of adjustment in the set of regulatory institutions to continue successfully to fulfill the conditions of

accumulation. Only when a more successful institutional renewal consolidates will the crisis end and the whole process will restart again, in a new stage. Once more, the similarity between both approaches is evident, although the considerable mutual ignorance between the two is quite astonishing.

There are differences between the two schools. Apart from different origins from which they emerged, the main difference is that the SSA school does not share what certain authors consider a technological and economic determinism of the Schumpeterian approach without a broader linkage to the social and political institutions, placing great emphasis on the social conflicts resulting from the contradictions accumulated during the long expansion as one of the main causes of the upper turning point of the wave (Rosier and Dockès 1983; Screpanti 1984; Kotz et al. 1994, p.4; O'Hara 1994, p.496).[13] However, for the reasons mentioned above, it could be said that both theories are well suited to help understand the factors underlying the financial and economic crisis of global capitalism that broke out in 2007–2008.

Accordingly, as Kattel et al. (2009, pp.1–2) point out, the "Perez' framework predicted that the turning point for the current ICT-led techno-economic paradigm… [that] started as a bursting of the dot-com bubble in 2000, ended in 2008 as a full-blown global financial crisis". Similarly, as also mentioned, SSAF authors identify these dates approximately as those of the neoliberal SSA crisis. This is therefore the turning point and thus one should conclude with Kattel et al. that "we are confronting the need for sweeping institutional changes to bring forth a golden age based on the global spread of the growth potential of the current paradigm based on information technology". Nevertheless, as McDonough et al. (2010, pp.13–14) argue, several own and known features of this SSA present problems for all forms of restructuring and are likely to prolong conflict over institutional innovation and consequently the period of crisis. Indeed, authors such as Freeman (2001) already warned of the risks of a failure of the "new economy", O'Hara (2002; 2003; 2006) explained that a new long wave upswing has not emerged in the United States because appropriate institutional adaptations are still lacking and, in fine, Wolfson (2003, p.61) concluded that a new, regulationist SSA would soon replace the neoliberal structure. The recent events, e.g. Brexit, the election of Trump as the president of the United States, the Le Pen phenomenon in France, the breakdown of the traditional political party system in Western countries, the increasing numbers of citizens who show a very worrying lack of interest in the European institutions as a result of neoliberal policies, the migrant and refugee crisis, the neo-fascism and the xenophobia boom, ISIS terrorism or climate

[13] "Technological and economic determinism" are concepts used by Kotz et al. (1994) (also O'Hara 1994). Maybe it would be more appropriate to use the term "determinative", as does Reich (1997, p.5). In fact, there are authors who claim that Perez' framework is underpinned on a technological basis, without being deterministic (e.g. Kattel et al. 2009, p.2). In this respect, Freman and Louça (2001, p.vii) argue: "The argument [organized around the concept of 'long waves'] is not one of technological determinism. In the long wave theory..., the effective development and the implementation of the particular technologies... require an appropriate and supportive structure of institutions, a point of view that goes back at least as far as Marx, and was early developed in its present form by Carlota Perez." And later, they state: "This does not mean... 'technological determinism'. Technical change is itself partly the outcome of social, political, and cultural influences." (Freeman and Louça 2001, p.151).

change and nature's decline, may be harbingers of Wolfson's prediction that neoliberalism is already coming home to roost. According to Perez (2012, 2015, 2016 and 2017), we are now in the equivalent of the 1930s, the time between installation and a future deployment or golden age of the ICT revolution.

Furthermore, such a change towards a new golden age is highly unlikely to take place solely as a response to economic considerations, because, amongst other things, the financialization of the economy and its implications were the outcome of social and political conflict amongst labor groups, consumer groups, and capitalist class fractions. A change of such magnitude may only come as a response to an effective popular movement that demands it, given that it has been absent, of course, from the minds of *the establishment* that provoked the institutional apparatus of this neoliberal SSA (see Perez, Pérez 2009, p. 800–804; Perez 2016, pages 210–214). However, according to McDonough, building such a movement on the legacy of the long period of retrenchment and labor weakness will most likely be an arduous and lengthy task. As mentioned, for both the neo-Schumpeterian and SSAF approaches, the final form of the structure, within which the transformation takes place to allow for a new expansionary or consolidated phase will, however, ultimately depend on the relative strength of the social and political forces at play. In this context, crises constitute the essential environment in which struggles amongst these forces develop and, in any case, turning points such as the current one are historic occasions on which capitalism can be reconfigured in order to save itself from itself.

This position, which is certainly that of Perez (2016, 210–214) and would have been that of the late Freeman, is not likely to be shared by the SSAF authors, as their main long term focus is on radical social change that ultimately replaces capitalism with a gradual unfolding of a democratic, egalitarian and sustainable socialism (McDonough 2015, p.57). However, as mentioned above, they are aware of the ability of capitalism to revive and renew itself and, in this regard, their chief concern at present is how to live with it and get in on with the policy-making action to ensure that they will move in progressive directions aimed at the survival possibility of alternatives to a neoliberal model in the face of globalization or at least preserve whatever desirable economic arrangements that are already in place.

Compliance with ethical standards

Conflict of interest The author declares that he has no conflict of interest.

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