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Kondratiev, Marx and the Long Cycle

by

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Abstract

This paper begins with a critical presentation of Kondratiev's (1926) seminal paper on the question of the existence as well as his theoretical explanation of long cyclical fluctuations of the level of economic activity. Furthermore we argue that a coherent explanation of long-run fluctuations can be based upon Marx's argument in *Capital III*, whereby the falling long-run tendency of the rate of profit leads to a stagnant *mass of net profits*, which are associated with the onset of economic crisis. The paper concludes with a discussion of the similarities or differences and of the relative merits or weaknesses of Kondratiev's and Marx's views with respect to their visions of the long term evolution of the capitalist system.

JEL Classification: B10, B14, B24, E32

Key Words: Long cycles, falling rate of profit, economic crisis

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1. Introduction

Long cycles are long-run oscillations of economic conjuncture with an approximate duration of 45-55 years, whereby the phase of expansion lasts almost as long as the phase of depression. They are associated with the Russian economist Nikolai Dmitrievich Kondratiev (1892-1938) who was the first to study them thoroughly and to present rich empirical proof on their functioning. Acknowledging this fact another great scholar of economic fluctuations, Joseph Alois Schumpeter, labeled the long cycle as the Kondratiev cycle.[1] Kondratiev mentions that he arrived at the hypothesis concerning the existence of the long cycle during 1919-1921. In 1920 Kondratiev founded and became director of the Institute of Conjuncture in Moscow, an organization devoted to the study of economic fluctuations and to the submitting of policy proposals based on conjuncture forecasts. His first work specifically devoted to the subject of long cycles was the "Long Cycles of Economic Life" (1925). It was from this article that Kondratiev became known to the western world, firstly though an *abridged* German version that appeared in the "Archiv fur Sozialwissenschaft und Sozialpolitik" in 1926 and secondly through a translation of the *German* version in the "Review of Economics and Statistics" in 1935.[2] In this paper Kondratiev presented his empirical findings on long cycle research, concluding by the statement that *"on the basis of the available data, the existence of long waves* (cycles) *of cyclical character is very probable"* (Kondratiev, 1935, p. 115) However despite a rich exposition of statistical and historical data this paper did not contain a *theoretical* explanation of the long cycle. This drawback was amended by Kondratiev in the following year (1926) when he read an expanded version of the 1925 paper before the Institute of Economics of the Russian Association of Social Sciences Research, which included a first approximation towards a theoretical explanation of the long cycle.[3]The expanded version became available in an English translation for the first

[1] A name often employed to describe the long cycle is the "long wave". However Kondratiev himself used the term cycle since he believed that long-run fluctuations are of a periodic nature and he reserved the term wave to refer to the two parts of the cycle. Therefore each cycle comprises of two waves. (Barnett, 1998b). In the remainder of the text we employ the terminology used by Kondratiev.

[2] It was in the English speaking version that the term long cycle was wrongly translated as long wave (Escudier, 1990).

[3] Kondratiev was removed from the directorship of the Institute of conjuncture in 1928 and was imprisoned in 1930 on unfounded allegations of him being a member of an illegal (non-existent) anti-Soviet party. One can only form hypotheses as to how his theory of the long cycle could have been evolved. For a comprehensive discussion of Kondratiev's life and works see Barnett (1998a).

time only in 1984 and of course shed new light to Kondratiev's argument about the long cycle.

In this article we will discuss Kondratiev's paper of 1926 in connection with a long cyclic interpretation of economic life, which as shown by Shaikh (1992) can be found in the third volume of Marx's "Capital" in Chapter 15 where Marx discusses the repercussions of the law of the falling tendency of the profit rate on the movement of the mass of profit. The remainder of this article is organized as follows. In the second part we review Kondratiev's paper of 1926. In the third part we present the basic tenets of Marx's law of the tendential fall of the profit rate and discuss its association with long run fluctuations on the mass of profit. In the final section we discuss the relationship between the two interpretations of long run fluctuations and critically evaluate their main strengths and weaknesses.

2. Kondratiev's empirical findings and theoretical reasoning

In his 1926 paper on long cycles Kondratiev presented and discussed data on various economic series, which comprised of three groups:

(a) Value series, which included average wholesale price indices (England, France, USA), bond prices and rates (England, France), nominal wages (for agricultural and cotton industry workers in England) and deposits of private savings banks (France).

(b) Real series, which included, in per capita terms, extraction of coal (England), production of cast iron (England), production of lead (England) and consumption of coal (France).

(c) Composite series, *i.e.* economic variables that are affected both by value and real factors, which included, again in per capita terms, foreign trade turnover for England and France.

With the exception of the wholesale price level series, on the unprocessed projection of which long cyclic oscillations were obvious even for the unsympathetic observer[4] the detection of long cycles on the other variables was performed through statistical processing, due to the fact that their unprocessed projection revealed secular

[4] Indeed it was this evident, *i.e. in unprocessed form*, movement of the price level that prompted Kondratiev to study long cyclic fluctuations in the first place.

tendencies, usually of an evolutionary nature. Kondratiev used least squares techniques to fit theoretical curves to the empirical series and then calculated the corresponding deviations between the two series sets and smoothed them using 9 year moving averages in order to eliminate the effects of medium length (Juglar) cycles, which were assumed to have a range of 7-11 years. It was on the basis of the smoothed deviations series, which reflected the alternation of acceleration and deceleration in growth of the (generally upward) trends of the variables studied, that Kondratiev was able to detect long run oscillations of economic life since the turning points of the cycles in the deviation series corresponded quite satisfactorily with those in the unprocessed price level series.

Noting that the accurate time determination of the turning points of the long cycles was impossible due to reasons such as the non-uniform movement of economic variables and the lack of complete synchronization in the evolutionary trajectories of the main capitalist economies, Kondratiev proposed the following periodisation of the long cycles providing 5-7 year ranges for the turning points[5]:

(A) (i) Rising wave of the first cycle: from the end of 1780's-beginning of the 1790's until 1810-1817

(ii) Declining wave of the first cycle: from 1810-1817 until 1844-1851

(B) (i) Rising wave of the second cycle: from 1844-1851 until 1870-1875

(ii) Declining wave of the second cycle: from 1870-1875 until 1890-1896

(C) (i) Rising wave of the third cycle: from 1890-1896 to 1914-1920

(ii) Probable declining wave of the third cycle: from 1914-1920

Having presented empirical corroboration for his theoretical proposition, Kondratiev proceeded by attempting to link numerical evidence with empirical data of a historical nature. He thus proposed that the two and a half long cycles in the economic history of capitalism, from the dawn of the Industrial Revolution to the mid 1920's, were characterized by the recurrent occurrence of the following features in the socio-economic sphere:

(a) Prior to the start or even at the start of a long oscillation, *i.e*. around the lower turning point of the cycle, the stagnated economic life is rejuvenated by the operation of three factors:

[5] For a detailed discussion of the setting of turning points by Kondratiev see Barnett (1998a).

(i) Technical inventions are widely applied (diffused) in the depressed economy, thereby becoming clustered innovations, with far reaching effects in terms of industrial capacity and profitability trends. It is very important to note here that Kondratiev sharply distinguishes between the temporal "sampling" distributions of technical inventions on the one hand and of the materially-economically "useful" form they take as diffused innovations on the other. It is the latter distribution that has an economic sense. Indeed from the point of view of economic theory, even the possibility of a distribution of technical inventions is perhaps a matter of indifference. Kondratiev however stated his belief that even technical inventions were not random but they themselves depended on the requirements of practical -hence economic- activity as well as on the previous accumulation of scientific knowledge. What is crucial however in this aspect of the analysis is that according to Kondratiev *the economic application of technological evolution is endogenous to the rhythm of the long wave.*

(ii) The world market is expanded through the deeper involvement of new countries in capitalist transactions. This expansion can occur either in a "quantitative" sense, when new regions are absorbed by capitalism, usually because of their rich natural supplies in raw materials or in the "qualitative" sense when an already established player assumes a strengthened and more crucial role in the world economy. Kondratiev characteristically mentions USA, which entered the world market as an independent capitalist state during the beginning of the first long cycle and assumed a strengthened and more imperative position during the 1840's just before the upswing of the second long cycle.

(iii) The production of gold increases. Kondratiev views gold as the money commodity. This means that an increase in the productivity of the gold mining industry lowers the value of gold and *may* form a prerequisite for a rise in the price level. As a commodity, albeit a special one since it is itself the embodiment of value, it has a value associated with its cost of production, a cost which is reflected in the price level. Therefore Kondratiev notes that one should expect gold mining to rise significantly at the time when its value relative to the bulk of the other commodities increases significantly. In temporal terms this occurs around the lower turning of the long cycle when the

price level is at its lowest. Indeed as it is also noted by Villar (1976, p.321) the 19th century saw a profound increase in gold mining during the lower turning points of the two long cycles associated with this century, *i.e.* in 1848-1851 with the discoveries of gold in California and Australia and in 1890-1896 with the discoveries of gold in South Africa and in the Far North of America.

(b) During the rising wave of the long cycle, social upheavals such as wars and revolutions are more numerous *relative* to the declining wave of the long cycle. While Kondratiev presented comprehensive tables of historical data ranging from USA's independence in 1776 to the end of WWI to back his claim empirically, he also attempted to theorize his position in a Marx-related manner by stating that social upheavals are a function of economic conditions, and that the economic intensity of the rising wave expressed in the form of "economic fights for markets and raw materials" prepares the ground for social explosions. Therefore socio-political "unrests" are not random but tend to be more densely distributed along the upswing part of the cycle.[6]

(c) The agricultural sector of the economy is particularly depressed during the declining wave of the long cycle. This depression is indicated by the steeper fall of the agricultural price level relative to the industrial price level on the one hand and by the fall in the value of ground rents on the other.

(d) Medium length cycles (Juglar cycles) are threaded on the long cycle. During the rising wave of the long cycle the upswing part of the Juglars is significantly lengthier than the downswing part and the same holds true for the downswing part of the Juglar relatively to its upswing component during the declining wave of the long cycle.

After discussing his empirical findings Kondratiev moved on to a *tentative* theoretical explanation of the long cycle. He supported the view that the wave like

[6] Kondratiev used *precise* boundaries to allocate his historical data to the two waves of each cycle. These boundaries were based on points of inflection in the price level data. His reasoning was that price movements are the best indicators of changes in conjuncture, although he did note that they are not completely accurate.

fluctuations of the various economic elements indicate that their movement takes place around a certain equilibrium level, which although it cannot be observed in reality it nevertheless acts as a gravitational center around which the fluctuations of economic life occur. Kondratiev also connected the relationship between the equilibrium of the economy and the oscillations around it to the oscillations of the market prices around prices of production and of individual rates of profit around average levels of profit, providing a link of his whole argument with classical and Marxist political economy. Stating that wave like fluctuations are one part of the dynamics of a capitalist economy, the other being the evolutionary nature of these dynamics, he claimed that *during* this evolutionary process the equilibrium level itself changes and is therefore movable. Taking into account the time dimension, and dwelling upon an idea of Alfred Marshal, Kondratiev proposed that there existed three orders of equilibrium. A short run equilibrium where supply is a fixed quantity, a medium run equilibrium where the reserves of the main capital items are fixed but their production rates vary and a long run equilibrium where the reserves of main capital items themselves vary. It was around the last equilibrium level, "third order equilibrium" as Kondratiev defined it, that long oscillations were to take place.

Kondratiev utilized Marx's assertion that "the material basis for the crises or the medium-length cycles which recur every ten years is the material deterioration, replacement and extension of the host of manufacturing tools in the form of machines with an average life of ten years" and extended the temporal scope of this Marxian argument to cover long cycles by putting in place of "manufacturing tools" the main fixed capital items. "Thus it maybe asserted that the material basis for long cycles is the deterioration of, replacement and extension of the main capital goods with long production times and vast production costs. *The replacement and extension of the stock of these items is not a smooth process but a discontinuous one, which also finds expression in long cycles of conjuncture*" (Kondratiev, 1998, p.56).

This replacement and extension of fixed capital reserves, which according to Kondratiev's first empirical principle begins to occur around the lower turning point of the cycle is the starting point for his tentative explanation of the long oscillation. During the ensuing upswing the quest for raw materials necessary to support fixed capital expansion increases, while also new regions enter into the world market. On the economic level the increased investment in large scale business schemes, increases the demand for capital to such an extent that the curve of current investment

gets very close to the curve of accumulation of (monetary) capital, *i.e*. savings, and eventually crosses it thus tending to raise the interest rate and making (loanable) capital more expensive. On the socio-political level the general growth of productive forces and the accompanying search for raw materials are expressed in an intensification of social upheavals in the form of wars and revolutions, causing thus a further weakening in the rate of accumulation.[7]

Eventually large-scale investment declines and as a consequence interest rate growth stops while investment schemes are abandoned. As the depression evolves the price level and the interest rate will fall, although the latter will assume a slower downward course than prices. Propensity to save will increase beginning with those population groups that have a fixed income and gain from the falling price level while also rentiers will contribute to this direction due to the slower reduction of the interest rate. The steeper fall of the agricultural price index relative to the industrial one will also facilitate savings accumulation at the hands of banks and large industrial concerns. Thus hand in hand with the upward trend of the propensity to save, loanable capital will grow. Furthermore this pool of loanable capital will be "cheap" since the interest rate would have fallen significantly, a fall strengthened also by the increased inflow of gold, whose production accelerates due to the favorable conjuncture of a low pricing level. Although, Kondratiev is not particularly explicit, nevertheless it might be deduced that these developments, that is, the devaluation of fixed capital in combination with a falling rate of interest would be tantamount to the restoration of profitability, thereby creating the necessary preconditions for long-term capital investment and allowing the cycle to run its course anew.

3. Marx's law of the falling tendency of the rate of profit and the theory of long run crisis[8]

The starting point of Marx's analysis is the very nature of capitalist production, which is production aiming at the acquisition of the largest possible profit and at the expansion of productive activity as a purpose in itself. In order to achieve

[7] Kondratiev considers wars as unproductive consumption, which has a negative effect on the social savings rate.

[8] The presentation of the law of the falling tendency of the rate of profit is based on Shaikh (1978, 1992), Maniatis, Tsaliki and Tsoulfidis (1999) and Tsoulfidis (2003, 2006).

these goals the capitalist has to wage war in two fronts. In the first front he fights against labor in order to hold wages to the minimum level possible and to increase productivity. There is no doubt that capital tries to exhaust every possibility of lengthening the working day and of intensifying the working process, yet at every historical conjuncture there exist physical and legal limits[9] that hold back, at least to a certain extent, the social effects of capitalist greed. Given these limits therefore, the most effective way to increase profits is to reorganize the whole labor process through a more refined specialization and routinisation of the workers' functions in the production field. The subdivision of the working process decreases the wage by devaluating the worker and also creates the necessary prerequisites for the substitution of labor for machinery.

In the second front each capital competes with other capitals through the continuous reduction of the average cost and price of commodities. Those businesses that succeed in this aim are able to reduce their sales price below the average price that rules in their sector and to initially increase their market share. The ideal situation for the victorious capitals would be of course to reduce their sales price even below the average cost of the other capitals with which they compete, so as to marginalize them and ultimately lead them to bankruptcy.

This reduction of the average cost of production is achieved mainly through the mechanization and the consequent automatization of production characterized by the greater use of constant capital (buildings, machinery, raw materials) in place of variable capital (labor). In the first and third volume of *Capital* Marx clarifies that these changes in the production sphere aim at the rationalization of the productive process, the increase in the productivity of labor and consequently the reduction of the unit cost below the average unit cost of the sector in order that the realization of extra profits becomes possible and the successful capitals secure a profit rate over and above the average profit rate of the economy.

The crucial point now in Marx's argument is that the processes of mechanization and productivity increase are accompanied by the *capitalization of production*. What this means in physical terms is that the ratio of constant capital per unit of net output, *K/Y*, rises and this results to an increase of this ratio in its expression in value terms, *C/L*, where $L=v+s$ (*v* stands for variable capital and *s* for

[9] Legal limits have been imposed upon capital mostly through working class struggles.

surplus value, the sum of the two terms is the Marxian value added). Marx calls the expression *C/L* the materialized composition of capital and its relationship to *K/Y* is given by the following equation:

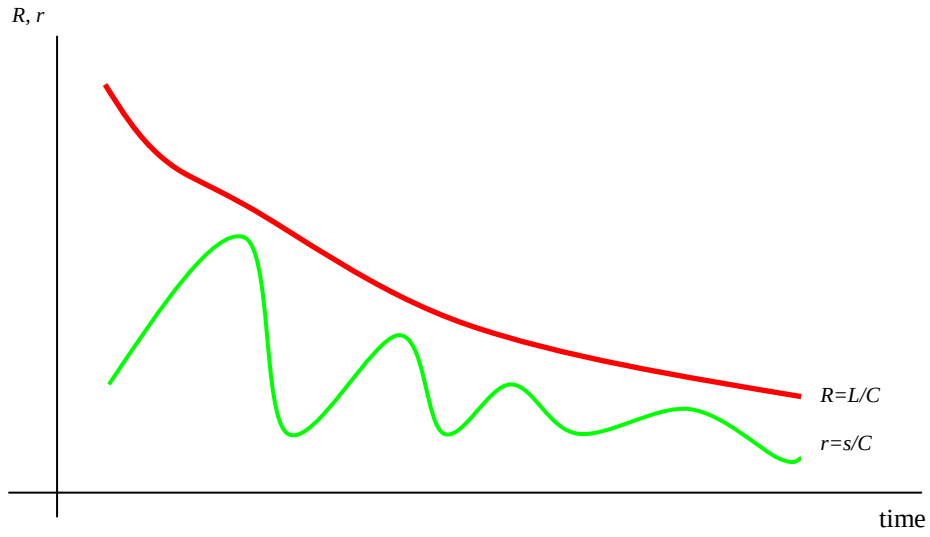
$$\frac{C}{L} = \frac{\lambda_K}{\lambda_Y}\frac{K}{Y}$$

where λ_K is the mean unit value of the means of production and λ_Y is the mean unit value of net output. Now since technological progress, which tends to lower the unit values of commodities, is diffused throughout the entire economy the ratio λ_K/λ_Y tends to be relatively stable and thus, the movement of *C*/*L* is essentially governed by the movement of *K*/*Y*. By the equation of the rate of profit *r* we obtain:

$$r = \frac{s}{C} = \frac{s}{L}\frac{L}{C} = \left(\frac{s/v}{1+s/v}\right)\frac{L}{C}$$

Regardless of how fast the rate of surplus value *s*/*v* rises, the term in the parenthesis will increase at a decreasing rate since in the limit its value will approach unity as *s*/*v* approaches infinity (which means that $v \to 0$). Meanwhile the ratio *L*/*C*, which is the inverse of the materialized composition of capital, represents virtually the maximum rate of profit, which is the value that the rate of profit obtains when $v \to 0$ and when *s* is thus maximized. This falling tendency implies that the general rate of profit (whose size depends upon the value of *v*) will take values, which will lie within a range with a decreasing upper limit. Therefore the general rate of profit will eventually start to fall, for it will be pressed by the intertemporal falling tendency of the maximum rate of profit. The relationship between the maximum and the general rates of profit is depicted graphically in Figure 1.

Figure1.The falling tendency of the maximum and actual rates of profit



The fall in the rate of profit does not necessarily imply economic depression as long as the rise in the mass of profit is sufficiently satisfactory. On the contrary a tendentially falling general rate of profit can be compatible with rapid economic expansion. However, Marx argues that the accumulated intertemporal influence of a falling rate of profit must eventually find its concrete expression in the outbreak of a crisis. We may now depict Marx's argument in terms of differential calculus in the following manner. If r stands for the rate of profit, s for the mass of profit and C for total capital stock, then we have:

$$r = s/C \text{ or } s = r\,C$$

Taking the total differential of the above relationship we obtain:

$$\mathrm{d}s = r\,\mathrm{d}C + C\,\mathrm{d}r$$

Dividing both parts of the equation by dC we get:

$$\mathrm{d}s/\mathrm{d}C = r + C(\mathrm{d}r/\mathrm{d}C)$$

and by factoring out the rate of profit we arrive at:

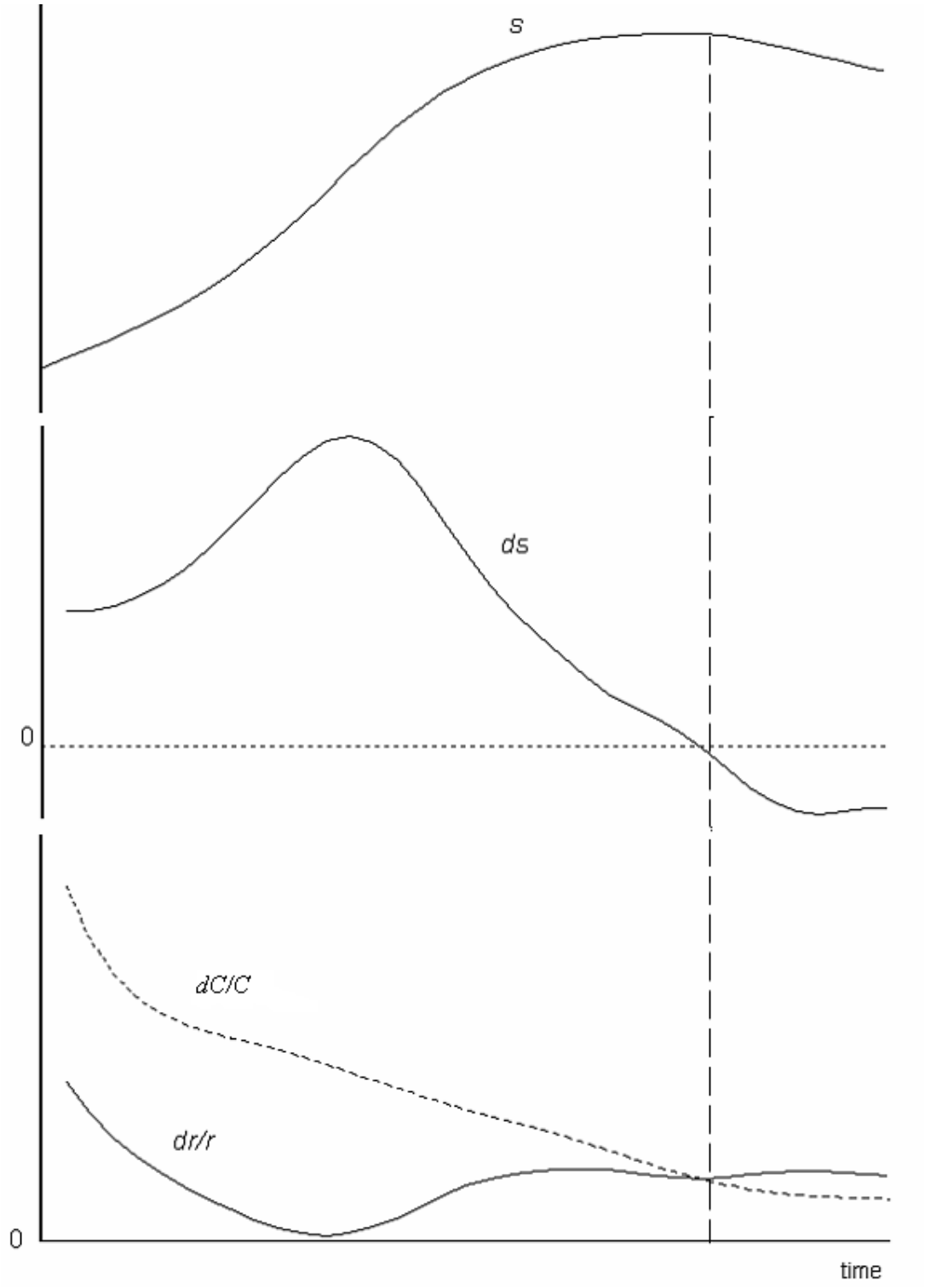
$$\frac{\mathrm{d}s}{\mathrm{d}C} = r\left(1+\frac{\mathrm{d}r}{\mathrm{d}C}\frac{C}{r}\right)$$

The term ds/dC indicates the change in profits per unit of capital invested, while the term (dr/dC)(C/r) is the elasticity of the profit rate, that is the percentage change of the profit rate induced by a percentage change in the capital stock. It is evident that the change in the mass of profit with regards to the change of the capital stock equals zero when the elasticity of the profit rate is equal to minus one. This occurs at the

point where profits are maximized, that is at the point where a percentage change of the capital stock by one unit leads to an equivalent change of profits towards the opposite direction. It is at this point, *the point of absolute overaccumulation* as Marx calls it, that the motive of capitalists for new investments weakens to the point of extinction, since the change in the rate of profit by every new investment is counterbalanced by the investment's cost. The ultimate effect of this process is stagnation in the mass of profits and the onset of crisis.

In Figure 2 below we present in a three-part graph the evolution of the relevant variables: the first depicts the evolution of the mass of real net profits, whereas the second illustrates the change of these profits, d*s*, which when it approximates zero results to a stagnation in the mass of profits. Finally the third part displays the growth of the rate of profit (d*r*/*r*) together with the growth rate of capital stock (d*C*/*C*) and the point of their intersection is associated with the crisis stage of the economy. It is important to point out that the graphs of Figure 2 are constructed on the basis of realistic functional forms of the mass of net real profits and real capital stock.

Figure 2. The evolution of profitability and capital accumulation



We must stress that this whole process takes place in a long run context and that it reflects the accumulating and intertemporal pressure of the falling tendency of the rate of profit. According to Marx the falling tendency of the rate of profit leads to the increase in the minimum necessary scale of capital that the individual capitalist

must possess in order to be able to run his business. This happens because for any given average rate of profit the mass of profit obtained by any individual capital is analogous to its size. At the point of stagnation of the mass of profits and the sharp fall in the rate of profit that accompanies it, competition would intensify. Marx notes that at times of normal capital accumulation, which in a long cycle perspective can be viewed as the time of the rising wave of conjuncture, competition does not tend to assume so fierce forms, since the capitalist class in general appropriates surplus value according to the equalization of the rate of profit and the size of the individual capitals. In short, during such a period "competition effects an operating fraternity of the capitalist class" (*Capital III*, p. 253). However at the point of absolute overaccumulation and beyond, members of the capitalist class virtually engage in a battle "among hostile brothers" (*ibid.*) since the question is no longer one of sharing profits but one of sharing losses. It therefore follows that the first victims of the crisis would be the smaller capitalists, since the "loss share" is determined by competition and moreover by positions already held at the onset of crisis. The losses of capital in general take both a material form, in the interruption of functioning of a significant part of fixed capital which lays idle and more crucially a value form, in the devaluation of large parts of fixed capital but also of commodity capital which can only achieve its monetary transformation in the sphere of circulation at the expense of a lower price than the one it would have obtained before the crisis.

As the crisis evolves the competitive process is intensified. On the one hand small capitals are largely appropriated by larger ones, "[o]n the other hand, the fall in prices and the competitive struggle would have driven every capitalist to lower the individual value of his total product below its general value by means of new machines, new and improved working methods, new combinations, i.e., to increase the productivity of a given quantity of labor, to lower the proportion of variable to constant capital, and thereby to release some laborers; in short, to create an artificial over-population. Ultimately, the depreciation of the elements of constant capital would itself tend to raise the rate of profit" (*Capital III*, p.254). This is an extremely interesting point because it illustrates that innovations, which according to Marx can be either technological or organizational or both, are mainly introduced during the crisis phase. Thus while one could suppose that innovations are, mainly, a feature of normal accumulation, which is a time period when prospects of business are favorable, Marx argues that they predominantly characterize the crisis phase of the

economy when the prospects of doom loom large for the individual capitalists, thus forcing them to either innovate or to perish. The material preconditions for the undertaking of innovations and for their possible success lie mainly in the following processes: (i) the devaluation of fixed capital, which on the one hand tends to increase the general rate of profit and on the other hand facilitates the aggressive appropriation of smaller capitals by relatively larger ones thus promoting the centralization of capital, (ii) the increase in unemployment and the subsequent decrease of variable capital which tends to increase the rate of surplus value and the rate of profit (iii) the increase of idle monetary capital during the crisis, in the possession of credit institutions, which lowers the interest rate while waiting for available investment opportunities.[10]

Once innovations make their emphatic presence in the economic scene, the innovating capitals will be able to make extra profits by taking advantage of the difference between the individual value of their commodities and the average value that holds for their respective sectors. However as the economy starts to recover—mainly due to the action undertaken by the innovating capitals—competition will assume again the form of the equalization of the rate of profit across industries and the new methods will be diffused in the economy through their adoption by the capitalist class and thus "[…] the same vicious circle would be described once more under expanded conditions of production, with an expanded market and increased productive forces" (*Capital III*, p. 255).

4. Concluding remarks

A coherent theory of the long cycle should provide adequate explanations of the transition from long run depression to long run expansion and *vice versa*, that is, of the turning points of the long cycle. It is the theoretical justification of the turning points, which highlights either the merits or the weaknesses (or both) of any long cycle argument. Turning points transition constitutes the foundation of any theoretical

[10] Note that points (i) and (ii) refer to the profit rate while point (iii) to the interest rate. For Marx the crucial variable that regulates the rates of growth and accumulation is the profit rate. The rate of interest is of secondary importance since in Marx's analysis there is no automatic link between investment and the interest rate. The benefit of a low interest rate from the point of view of an investment opportunity is that it raises the net profitability (the difference between the profit rate and the interest rate or the "profit of enterprise" as Marx calls it) of this investment for any given profit rate. Yet this does not imply an automatic undertaking of this investment.

structure of the long cycle. Therefore it is in this connection, *i.e.* in the alternation from one wave to the other, that the movement of the *fundamental* variable (fundamental for the theorist involved), which *governs* the long cycle is more determinatively operative.

Bearing this in mind we can proceed to the detection of this fundamental variable in the respective arguments in favor of long-run oscillations presented previously. Kondratiev's theoretical model resides on long-run alterations of over-investment and under-investment in basic capital constructions the transition between which is ruled by the movement of the *interest rate.* During the upswing phase the increase in large-scale investment raises the demand for capital to a point where the interest rate rises to a prohibitive level, thus obstructing any further investment activity, while during the downswing phase the massive accumulation of "cheap" loanable capital lowers the interest rate by such an extent that investment expectations again become favorable. Thus, although not clearly stated by Kondratiev, the evolution of investment and consequently of economic growth, is mainly governed by the movement of the interest rate.

Marx's fundamental variable on the other hand is the profit rate, which regulates the movement of the mass of profit, upon which the long run oscillations of the economy are reflected. Marx's merit in this respect is not only that he views the rate of profit as *the* main economic variable, which governs the rate of accumulation of an economy and which leads the economy to stagnation through its long run falling tendency (a point by the way shared by many eminent economists such as Smith, Ricardo, Walras, Keynes, Schumpeter and others), but that he also theorizes the relation between this falling tendency and the outbreak of crisis. The upper turning point of the cycle is explained by the intertemporal influence of the falling tendency of the profit rate, which is expressed in the stagnation of the profit mass, while the lower turning point is explained by the material conditions which tend to raise the general rate of profit and correspondingly the mass of profits.[11]

[11] Note that Marx's notion of the falling rate of profit, does indeed speak about a tendency. Thus conjunctural upward departures from the dominant tendency are by no means excluded. Furthermore another point may be due here. Schumpeter had claimed that every cycle of a lower order is threaded upon the dynamics of a cycle of a higher order. Thus for example the Juglar 7-11 years cycle is threaded upon the long cycle, a point also highlighted by Kondratiev in his fourth empirical point. In respect now to the Marxian argument it can be said that the dynamics of the long cycle are threaded upon the dynamics *of the falling maximum rate of profit*

We may say that while the movement of the interest rate is of course important as far as the rate of accumulation is concerned it nevertheless is of secondary and *derived* significance compared to the rate of profit, especially when the interpretation of such a large-scale economic oscillation as the long cycle is at stake. In this respect Kondratiev rather served his course poorly. Yet the main strength of his theoretical model was the endogenous interpretation of technological change in a clustered form as the carrier of economic expansion during the upswing. Kondratiev's distinction between technical inventions and their widespread application through diffusion during the upswing was also a fruitful concept, as was the idea that this process is reflected in the increased production of basic capital goods. However he did not possess in his theoretical armor an explanation of the diffusion mechanism. Marx on the other hand did and he utilized his theory of inter-industry competition to this direction by stating that the extra profits made by the innovating capitals will be eventually depleted by competition in the form of the equalization of the general profit rate, and the consequent adoption of the new more productive methods by the capitalist class in general.

Nevertheless endogeneity of technological change and its significance for economic growth remains a point of common acceptance between the two economists. The same can be also said with regards to the relationship between the price level and gold. Kondratiev's view of gold as the commodity, which represents the embodiment of value is similar to Marx's notion of gold as the money commodity. Both share an anti-quantity theory of money position. Increase in gold mining raises the price level according to Kondratiev due to the corresponding increase in the productivity of gold extraction and not due to an increase in the quantity of gold in circulation. Kondratiev's anti-quantity theory stance is even more evident when he makes the following statement while he is discussing the process of accumulation of cheap loanable capital: "With the increasing inflow of new gold the power of the pressure of accumulating cheap capital increases significantly and finally when the obstacles are surmounted, a new long rising wave begins" (Kondratiev 1998, p.59). Here Kondratiev associates the increase in the *quantity* of gold not with the increase in the general price level but with an increase in the cheapening of loanable capital thus with a *decrease in the interest rate*. These arguments are essentially similar to the Marxian theory of money whereby an increase in gold mining raises the price level due to the increase in productivity, since the unit value of gold falls, while an increase

in the quantity of gold (beyond the needs of circulation) has a *direct* effect on the interest rate and not on the price level.

Finally another obvious relation between Kondratiev and Marx is the idea that the sociopolitical superstructure is mainly a function of economic activity. Yet Kondratiev's assertion that upheavals in the socio economic sphere are mainly located in the rising wave of the cycle due to the intensive pace of economic life is quite shaky. As it was noted before in order to allocate his historical data on the subject of social unrest between the two waves of each cycle, Kondratiev used precise turning points based on price movements. However when discussing long cycles with regards to the general economic life he gave 5-7 year ranges for the turning points. If these time ranges were to be appointed to the declining wave of the cycle then the distribution of social upheavals would be quite evenly spread between the two waves of each cycle.[12] Furthermore theoretically the deterioration of the living standards of the working classes during the long downswing could well provide sufficient reason for social unrest. A fuller discussion of these issues however lies well beyond the scope of this paper.

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[12] This point was made by D.I. Oparin in the debate that took place after Kondratiev presented his paper to the Institute of Economics of the Russian Association of Social Sciences Research (Barnett 1998b).

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