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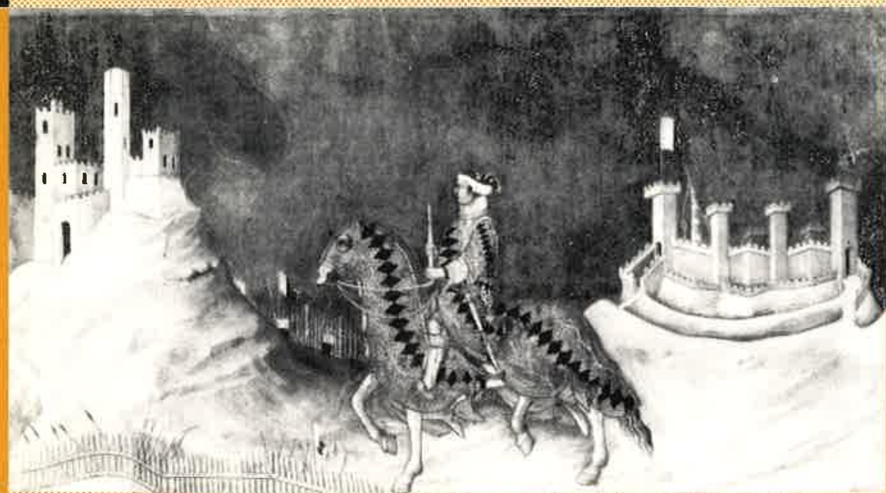
QUADERNI DELL'ISTITUTO DI ECONOMIA

Massimo Di Matteo

EARLY DISCUSSIONS ON LONG WAVES



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Massimo Di Matteo

EARLY DISCUSSIONS ON LONG WAVES

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Early discussions on long waves[1]

In June 1985 Richard Goodwin and myself participated in a major conference on long waves in Weimar organized by IIASA and the Academy of Sciences of the German Democratic Republic. On that occasion I met prof.Thomas Kuczynski who alerted me on the absence of translation in any western language of the book by Kondrat'ev and Oparin, Major Economic Cycles, published in Moscow in 1928. He kindly informed me that the book has two major features. On one hand we can find the first thorough discussion of the long waves hypothesis by a number of economists and statisticians, on the other we can find the first - and more refined - elaboration by Kondrat'ev of his theory of major cycles.

I was rather excited by the idea of reading it, though contrary to prof.Kuczinsky, I do not know russian. To make a long story short I have managed to get a complete translation of that book so that I would like to say something on its content. George Garvy's famous paper (1943) is a bit hurried not so much in his recollection of the debate as with Kondrat'ev's theory itself. Garvy however gives a summary of the russian debate that extends well beyond what is in the book I mentioned.

Let me remind you that the book is the proceedings of two meetings held respectively on February,6th and 13th,1926 at the Institute of Economics of the Russian Association of the Institutes for Scientific

[1].This is a revised version of a paper presented at the International Workshop on Social and Technological Factors in Long Term Fluctuations held in Siena, dec.16-18. 1986. It was written while I was an Academic Visitor at ICERD (Suntory-Toyota Foundation) at the London School of Economics and Political Sciences. Financial help from the Ministero della Pubblica Istruzione (fondi 40%) is gratefully acknowledged.

Research in the Social Sciences. Kondrat'ev presented his paper and a week later D.J.Oparin gave his rebuttal followed by rejoinders by Kondrat'ev and Oparin as well as by contributions presented by several soviet scholars.

The aim of my paper is twofold. First to give a detailed account of the working hypothesis put forward by Kondrat'ev to explain major cycles and to compare it with previous and contemporary explanations of cyclical phenomena. Secondly to offer a critical evaluation of the debate following Kondrat'ev's paper. As I will say later on I am not always in agreement with Garvy's theses. Being not a statistician I will not dwell upon the statistical aspect- which Garvy discussed at length- tough I will offer some remarks on that topic too.

I

Kondrat'ev's paper is well organized in three steps. The first is aimed at showing by means of a statistical analysis of some time series in prices and physical quantities that major cycles do exist in capitalistic economic systems. He also gives his views on the methodology which lies behind his analyses. In the second step he offers what he calls qualitative analysis,i.e. he does not limit himself to quantitative analysis of time series but he endeavoures to show that major cycles (or part of them) are regularly associated with other important phenomena both in the economic and in the social system. Finally in the third step he elaborates what he himself labels a working hypothesis to explain major cycles. This follows a discussion of why there could be a high probability of regarding these fluctuations as proper cycles, like the trade cycles or the Kitchin cycles.

1.1 I will be very brief on the first two steps for the good reason that, to a large extent, Kondrat'ev repeats what he has already said in his previous paper (see Kondrat'ev 1926). He examines several time series, for some of them eliminates the underlying trend by fitting a polynomial by means of the least squares procedure, and then builds a series by subtracting to the empirical the theoretical one and smoothing the resulting series with a nine year moving average to eliminate trade cycles. By this procedure he is able to show that major

cycles can be detected for commodity prices, the nominal rate of interest, the money wage, the value of exports and imports, the production of coal, pig iron, and steel. The countries examined include United Kingdom, France, Usa. He is prepared to admit that for some other physical series major cycles could not be detected but not all elements in the economic system conform to this pattern. This is contrary to Garvy's statement (1943,sec.3).

1.2 Coming now to the second step he notices the following four empirical regularities which- he is careful in pointing it out- have not to be regarded as the causes of major cycles themselves. The first is that radical changes show themselves up at the lower turning point and immediately before it. Among these he mentiones three, giving them a particular emphasis. Radical changes in the techniques used by firms are introduced at the lower turning point and at the beginning of the upswing, following a period of major inventions that takes place in the downswing where he maintains there is a "cluster" of inventions as opposed to innovations. The former cannot be successfully adopted before the downswing has completely worked itself out. Moreover at the lower turning point big changes in gold production take place. This happens as a result of the fall in commodity prices in the downswing that makes the production of gold much more profitable. The higher value of gold in terms of commodities stimulates the research of new mines and new techniques of extracting gold. The third phenomenon which Kondrat'ev takes into account is the insertion of new countries into the world market both as producers and as outlet markets. This phenomenon manifests itself in the upswing too or, to employ the author's terminology, in the rising wave of the major cycle.

The second kind of regularity concerns the widespread depression of the agriculture sector during the falling wave which expresses itself in various ways, namely a larger fall in agriculture prices than in manufactured commodities and a decline in agriculture rent.

The third regularity associated with major cycles is that trade cycles themselves are affected, i.e. the relative length of depressions and revivals is different according to which phase of the major cycles they happen to belong.

Finally the fourth regularity concerns the wide recurrence of wars, social revolutions, and disruption that accompany the end of the upswing.

1.3 The third step in the argument is meant to meet the objection that major cycles are mainly exogenous in character and therefore lack any periodicity. Kondrat'ev shows first that the variable periodicity of major cycles is less wide than the corresponding one in the case of trade cycles (both expressed in percentage of their respective periods). Secondly he endeavoures to show that all he mentions as joint features of major cycles cannot be regarded as exogenous factors but mainly as endogenous so that they cannot possibly be causes. Indeed he remarks that changes in the techniques of production and, to a large extent, in the inventive activity itself, are a byproduct of the working of the capitalistic system. Innovations can only occur when economic perspectives are good or are expected to be good in a very near future. Inventive activity is very much stimulated by the adverse conditions capitalists are experiencing during the downswings. Mutatis mutandis the same can be said for the stepping in of new countries into the world arena. They have been known for a long period of time but only when a rising wave surges they can profitably compete with other nations. We have earlier noticed the argument in favour of the endogeneity of gold supply and we need not repeat it here. Finally also wars and social revolutions are not looked at as occurrences falling from heaven or wholly politically motivated but as events deeply rooted in the economic struggle among nations for the conquest of markets for finished products and/or for raw materials. Therefore, having cleared the ground from other possible explanations, Kondrat'ev is forced to give his own.

II

2.1 The starting point of his explanation is an enlarged Marshallian framework. As is well known Marshall (1890,book V,chapt.V) ranks equilibria according to the time span involved. He constructs market, short run, and long run equilibria. In addition to that he also mentions a secular tendency depending on population growth and technical

progress. This framework can be given a logical or a chronological interpretation. In my opinion the first interpretation is sounder but Marshall himself oscillates between the two and tries to describe how the system evolves from one equilibrium position to another as time goes on.

Kondrat'ev adopts the second interpretation and elaborates somewhat on the very long run equilibrium. He labels it third order equilibrium since, in his recollections of Marshall, he mixes up short run with market equilibrium. He splits capital goods into two main categories, namely capital goods and basic capital goods. The latter being exemplified by large scale construction projects, big land improvements projects, formation and training of skilled labour, building of major railroads, construction of canals,etc. The most important feature of this kind of capital goods is both their longer lifetime and a longer construction period with respect to normal capital goods.

In the short run equilibrium the stock of capital goods is held constant and successively we move on to the long run equilibrium which is defined as that equilibrium where also the stock of capital goods is the result of a (optimal) choice. In the same way Kondrat'ev imagines that it is possible to define a third order equilibrium when we allow basic capital goods to change in response to changes in their expected profitability.

It is believed by Kondrat'ev that short run prices and quantities oscillate around long run normal prices and quantities. Therefore he expects fluctuations of the very long run prices and quantities around -I suspect- what would be a fourth order equilibrium which however he does not define. In most of the time series, as we said, he finds a trend and indeed he stresses several times that major cycles occur around a moving equilibrium and that every new cycle takes place under new concrete historical conditions and at a new level in the development of productive forces.

It may be of some interest to quote from the first edition of Marshall's Principles (see Marshall (1890),Book V,chapt. V,sec.8) where this vision of equilibria as a series of chinese boxes is neatly expressed:

> "And so while market prices oscillate about a position of market equilibrium which perhaps oscillates about a position of short period normal equilibrium,that position in

its turn may not remain stationary, but may move onwards in one direction,or may oscillate more slowly round a position of long period normal equilibrium; and that again in its turn may itself be liable to slow changes,possibly having an oscillation movement,the period of which ranges over many generations or over centuries."

Kondrat'ev's main purpose is therefore to see how moving from the second order equilibrium towards the third order the capitalistic system experiences major cycles. This conjecture can be strengthened by noting that over a major cycle the pattern of prices, nominal interest rate, and profits is similar to that shown over the trade cycle. This analogy is recognized in Bresciani Turroni's work (see Di Matteo 1987) but it is also implicit in Kondrat'ev's findings.

As the trade cycle depends on the wear and tear, replacement, and enlargement in the mass of instruments of production in the form of machines so the major cycle could depend on the wear and tear, replacement, and enlargement of basic capital goods. In order to appear an orthodox thinker Kondrat'ev quotes Marx in this respect (probably Capital,vol.2,chapt.9 though it is doubtful whether this is the main point in Marx's theory of the trade cycle as shown by Screpanti (1984)). We are now led to believe that the process come in spurts rather than smoothly and therefore we reached the core of the causal mechanism.

2.2 If it is true that basic capital goods have a very long period of construction and involve a considerable amount of resources then it seems obvious -Kondrat'ev argues- that to get this process started we need a set of conditions to be satisfied, mainly on the financial side of the economy. Two of them deserve special attention and at this point he appeals again to Marx's Capital (possibly vol.2, chapt.21, sec.1a).

First of all we need a stock condition, namely a very substantial amount of capital has to be free according to Kondrat'ev's terminology. In his reply to questions by Fal'kner and others about the exact meaning of free capital, he explains that by free he does not mean superfluous, for otherwise capital would be no longer a commodity, would have exhausted its economic role. Infact it is pretty clear that capital is always invested in one way or another. Free really stands for liquid and the conditions can be restated by saying that there is

an excess supply of liquid capital, the result of which is a very low level of the (money) rate of interest. Free capital is capital that can be easily mobilized for fixed investment. Kondrat'ev does not refer as a possible source of free capital to inventories as does Wicksell (1953) who speaks of free capital as well.

In addition to this stock condition Kondrat'ev thinks a flow condition is also necessary to produce the lower turning point, namely

"a rate of accumulation [of free capital is needed] such as its curve is higher than the curve of current investment".

In order to make sense this sentence ought to be understood as "savings exceed investments". This additional condition would prevent an early brake to the rising wave via a very rapid depletion of the accumulated stock of free capital.

Once these two conditions are met, and we will see in due course as they will spring from the downswing, the lower turning point follows, though Kondrat'ev states, quite correctly in my opinion, that the lower turning point is not an absolute necessity but only a high probable event. Though Kondrat'ev does not elaborate on this point the importance of a low rate of interest for rising the expected profitability of basic capital goods which require heavy investments and a long construction period needs not be emphasized.

It may be worth presenting some observations on the main features of the economy during the upswing. According to Kondrat'ev investment increases the demand for capital. Why? In order to produce basic capital goods more capital is needed than it would otherwise be the case. This can be easily grasped if one reflects on the general interdependence of the economic system. To produce a certain amount of a final commodity we need to produce wage goods (assuming a given subsistence wage), intermediate inputs, raw materials, and capital goods according to the state of technology. This of course is a finite amount of commodities, though in our case it may be quite large. It is also clear that the induced demand will spread over many years depending on all sorts of lags existing in the economy.

This should have been quite familiar to a student of Tugan Baranovskij who uses extensively the reproduction schemes of the second volume of Marx's Capital. This process can be transformed into a cumulative self reinforcing mechanism if we introduce appropriate expectations whose crucial role is not really highlighted, possibly because there was the presumption in those days that expectations are driven by current events.

2.3 Within this framework the upswing can be brought to an end either by the completion of the construction of the basic capital goods or because of changes in the financial conditions. In the first case we would have an almost identical explanation to Tugan Baranovskij's (1913,p.271) who writes:

> "Finally the new fixed capital is terminated: we have new factories, new houses, new railways,etc. Therefore new enterprises become rarer and rarer. The demand for all the goods that constitute the elements of fixed capital undergoes a reduction. The repartition of production fails to be proportional."

And before (p.263):

> "The accumulation of money capital proceeds without interruption; its transformation in productive capital, i.e. the absorption of capital by industry, is hindered. The presence of such an obstacle is beyond doubt."

The second explanation is actually Kondrat'ev's who states that after a while we witness that

> "In terms of its level the further the curve of that demand [for capital] extends, the more it begins to approach the level of the accumulation curve and even to exceed it. This engenders a trend towards rising the price of capital and the interest on it."

However the rise in the interest rate is not effective in immediately reversing the process unless it hits very high levels. This is so mainly because in general (as noted by Aftalion (1909)) projects not yet completed are carried out to completion. As a consequence one should have that the peak in economic activity lags behind the peak in interest rates.

During the depressing phase a cumulative deflation takes place and the pattern is roughly the reverse of the booming phase. Its main function is to rebuild the stock of free capital that has been deployed in the previous upswing. Wicksell (1953) was the first perhaps to praise explicitly the downswing for enabling us to get to the next upswing.

2.4 What does actually happen in the downswing ? The fall in investment which eventually occurs brings with it a reduction in economic activity and in prices. Let us concentrate on the supposed effects of falling prices. The main result -according to Kondrat'ev- is an increase in real incomes of those groups whose incomes are nearly fixed in money terms. Among these we can possibly include landlords, holders of consols, mortgages, debentures and other fixed interest securities, civil and military servants (but not shareholders and farmers). In other words all the creditors benefit whereas the debtors lose, though the above classification is slightly more comprehensive.

This view seems to have been a fairly accepted piece of wisdom at least since 1863 when Jevons, in one of his first studies of the effects of inflation, argues along similar lines. To have a complete picture however, one further step is worth stressing. Jevons again gives a clue when (dealing with inflation but the argument is symmetric) he writes (see Jevons (1884,chapt.IV,sec.28 of the 1863 essay)):

> "The greater part of expenditure of all individuals consists of payments for food, clothing (..) and with innumerable charges that increase pari passu with the depreciation of gold. If these charges are defrayed from out a fixed income, the increase in expenditure must either be met by cutting off former savings, by relinquishing former enjoyment or by exertion in providing new sources of income."

The implicit step is therefore that deflation does not lead to an increase in consumption which is instead more or less given.

All this is not shaken by the empirical evidence Kondrat'ev himself produces which shows that in fact the money rate of interest is falling together with prices. In his reply to Oparin Kondrat'ev argues that, if we take the money rate of interest as an indicator of the income enjoyed by asset holders, the empirical analysis shows that the real value of income rises since the fall in prices more than offsets the fall in the money rate of interest.

However the downswing is not completely symmetric with the upswing for two main reasons neither of which palys a role in Tugan Baranovskij's analysis. Therefore in my opinion Garvy (1943,sec.3), in stating that Kondrat'ev's theory is Tugan's plus the echo effect, is not faithfull to Kondrat'ev. Up to now I have never mentioned the echo effect since I am convinced that one can (and should) dispense with it in explaining cycles. The useful concept in this context is that of gross investment both for trade and major cycles. In the latter case however, according to Kondrat'ev, we cannot start renovating and enlarging the mass of basic capital goods unless a substantial amount of free capital has been previously accumulated. That's why we need a very long, profound deflation, much longer indeed than the corresponding period of the trade cycle. If the echo effect were really "the" major factor then, among other thinghs, one should suppose that the financial mechanism works within a period shorter than the average lifetime of the capital goods concerned.

To complete the comparison between Kondrat'ev's theory and Tugan's a brief resume of the latter's theory may prove useful. We will draw from his major work, Les crises industrielles en Angleterre, but it is understood that his Metallic and Paper Money (1917) [never translated into any western language] includes an elaboration of his cycle theory based on new monetary theory, according to Kowal(1974). His starting point is the well known rebuttal of the underconsumption explanation of the crises. Capitalism could eschew them provided the right proportion between consumption and investment were maintained. Since workers are like cattle it is always possible to expand along a balanced growth path if all the savings are reinvested (something like a von Neumann ray). However this possibility is not likely to happen for various reasons. The most important is the lack of coordination and planning which is an intrinsic feature of the capitalistic system based on the pursuit of profit by individual capitalists. The anarchy is made worse by the fact that the end of capitalism is not consumption (as it would be in a natural economy) but accumulation. Tugan notes that is much simpler to achieve the right proportion for a stationary than for a progressive economy. Finally the expanded credit system is an aggravating factor which exacerbates all the phenomena. The lack of proportionality is bound to trasform a partial crisis into a general one since the latter is the only way trough which correct proportionality can be regained (see Tugan Baranovskij (1913,p.222). The final step in the whole argument is designed to show the possibility that after a crisis a new upswing come into being. The answer lies in the financial mechanism which at the end of the downswing provides sufficient incentives to investment.

And in this provision a key role is played by classes other than workers and capitalists, which are the core of the system. The upswing is described much in the same terms as Kondrat'ev does and our critique about the lack of emphasis on expectations applies equally well. There is an interesting point when Tugan recollects the following passage written by H. Llewellyn-Smith in 1895 for the Third Report of the Select Committee on the Distress from Want of Employment:

> "The total volume of production in the country (I am speaking of volumes, not values (..)) appears to vary slightly from year to year over a period. (..) but even these slight changes are sufficient to throw into violent oscillations the trades connected with the manifacture of the instruments of production."

This comes near to an early recognition of the working of the accelerator principle. Finally as regards the upper turning point there is a degree of ambiguity in Tugan since he blames the lack of [free] capital as a cause of the financial and speculative crisis which precedes the industrial crisis (see Tugan (1913),p.266). Moreover he also speaks of the lack of free capital as a direct cause of the recession. But on the whole I think that the interpretation I gave above is more adherent to spirit of Tugan (for a different interpretation see Hansen (1951)). I think that when Kondrat'ev (in his answer to Fal'kner) stresses that his theory is not identical to Tugan's he refers mainly to the explanation of the upper turning point and to the greater emphasis Kondrat'ev gives to the cyclical pattern of savings reinforced by his considerations on the agricultural crisis. The latter factor is practically ignored by Tugan. The same can be said with respect to the peculiar pattern of the technical progress. Tugan on the contrary gives strong emphasis on the effects of speculation.

Let me go back to Kondrat'ev. Coming to the peculiar features of the downswing, the first one is the evolution of the agriculture sector and the second one is the pattern of the technical progress. Farmers experience heavy losses during the downswing since the prices of their products fall much more than the industrial prices opening a wedge between the two. Therefore, according to Kondrat'ev, there is a terms of trade effect that shifts income in favour of the industrial sector, both capitalists and workers. This again helps in accumulating free capital. In his reply to Oparin Kondrat'ev makes it clear that, though agricultural rent falls, the empirical evidence shows that this does not prevent farmers' real incomes from falling.

All in all in the descending wave of the major cycle net accumulation of free capital is fostered both by savings enhancement and by a low level of gross real investments. At the end of the phase the pressure towards the fall in the money rate of interest is strenghtened by the influx of gold production for reasons already made clear at the beginning of our presentation. We can now observe that the financial conditions we postulated to be present at the beginning of the upswing are themselves the result of the preceding downswing.

If (and this is the second feature) to this we add the favourable effect of the enlargement of technical possibilities that takes place in the period of falling prices (necessity mother of ingenuity) we have got necessary (and perhaps sufficient) conditions for a recovery.

2.5 We have now completed our reconstruction of the working hypothesis put forward by Kondrat'ev. I will add several observations beyond those scattered here and there in the previous pages. If the above argument by Kondrat'ev is correct we would expect the peaks and troughs in the accumulation of free capital to be later than the lower turning points and upper turning points respectively. At the same time we would expect the peaks in interest rate to be before the upper turning points and the troughs after the lower turning points.

However if we look at the evidence provided by Kondrat'ev himself we can see that the peaks and troughs in the accumulation of free capital are before, or simultaneous with, those of prices. At the same time we observe that the peaks in the interest rate are after the upper turning points and the troughs after the lower turning poins, with the exception of the lower turning point that occurred around 1848.

As far as the general argument is concerned it can be stressed that the rate of interest plays an important role at the two turning points but, during most part of the upswing and downswing, its influence is overcome by that of the price level. In other words expected rising prices are a powerful incentive to convert liquid assets into commodities (and conversely in the downswing).

On the whole Kondrat'ev's framework could be compared with what Wicksell ((1935), appendix to sec.9 of chapt.4) writes:

> "If the formation of real capital (..) is only based on the rise of price itself, i.e.is due to diminished consumption on the part of those person or classes of society with fixed money incomes, then the increased prosperity could scarcely be very great or enduring".

Wicksell was less prepared, if at all, to interpret long waves (which he recognized for the first time, see chapt.XI of <u>Interest and Prices</u>) as long term fluctuations in any other variable than prices. But his remarks are interesting because he acknowledges the existence of free capital at the lower turning point much in the same spirit as Kondrat'ev. His tentative explanation of the long waves however runs in the reverse, being the real factors the primum mobile responsible for fluctuations rather than the financial factors which are considered less important (for an historical case study of Wicksell's theory see Hughes (1968)).

A final suggestion comes to my mind after reviewing this debate. We can see in the theories of crisis and cycles a juxtaposition between savers and investors. There are those who give emphasis to the role and function of savers and those who stress the role and function of investors. To the first class belongs Pareto (on this see Di Matteo (1987)), to the second Schumpeter and Wicksell. Tugan is in the second too, especially if our interpretation about the upper turning point is correct, whereas Kondrat'ev's position is a middle of the road position.

I have already hinted at the fact that Kondrat'ev sees the task of economic theory as one of endogeneizing factors which have been treated as exogenous. Typical of this attitude is his lengthy discussion of the quantity theory of money where he emphasizes that the quantity of gold is endogenously determined by the convenience of the producers according to the movements in the price level. Also his arguments stress the economic determinants of inventions, of the entry of new countries in the capitalistic world system, and of social revolutions. He could be really a follower of Engels! However this was used against him by some of the critics who rather ironically for that period (1926) used against him Trotskij's arguments (see Day (1976)).

On the other hand his major critic, D.J.Oparin puts forward his theory of long term fluctuations in prices as a consequence of the working of the quantity theory of money in the version proposed by Cassel(1924).

So an unorthodox (harmonious) marxist was defeated by an economist follower of a neoclassical walrasian economist (Cassel)!
Kondrat'ev also shows a very balanced view of the use of quantitative and qualitative data for economic investigation. We have not to rely on quantitative data only nor one has to quit economic models in favour of detailed historical accounts only (i.e. a descriptive approach, or case study approach).
Finally it is worth recollecting that most of the recent theories of long waves draw on some aspects present not in the explanation originally proposed by Kondrat'ev but in the associated factors. Rostow relies on the different behaviour of agriculture and industrial sectors in order to explain long waves (for a development of Rostow's analysis see Di Matteo (1986)). The old french school follows the monetary approach. Mensch draws a distinction between inventions that show up in the downswing and innovation that are applied at the beginning of the upswing (for an exposition of long waves theories see van Duijn (1983)).

III

Coming now to the discussion that follows Kondrat'ev's presentation it may be convenient to group arguments into four parts. In the first methodological problems regarding time series analysis are examined. In the second we will see whether empirical results stand to the scrutiny pursued by Kondrat'ev's discussants. In the successive section I will examine some of the critiques to the tentative explanation put forward by Kondrat'ev. Finally some arguments about the philosophical and the political opinions supposed to be shared by Kondrat'ev are discussed.

3.1 One of the most important issue about time series analysis is the possibility that our manipulations of them will distort their features in a number of (often) unpredictable ways. After Slutsky's findings in 1927 (by the way he had been working at the Institute run by Kondrat'ev since 1926) we know that we can get cycles out of a purely random time series. In his opening remarks Slutsky (1937) describes the state of the problem with the following words:

> "The presence of waves of definite orders, the long waves embracing decades, shorter cycles from approximately five to ten years in length, and finally the very short waves, will always remain a fact begging for explanation. The approximate regularity of the periods is sometimes so distinctly apparent that it, also, cannot be passed by without notice."

The line followed by Slutsky however is not known at that time since no one of the discussants seems to be aware of that particular line of research.
What we now know is that however we eliminate the trend in a time series we are bound to distort its residuals (in what follows I rely on Kendall-Stuart-Ord (1983)). And also, we know, there is very little that we can do about it.
Things are more complicated when we come to moving averages which are used by Kondrat'ev to get rid of the trade cycle. In doing so we alter the amplitude of the fluctuations though, in this case, we can say something more precise about the way in which the modified time series is affected. It depends, among other things, on the relationship between the length of the trade cycle and the extent of the moving average. In particular if the extent of the moving average is slightly greater than the period of the oscillation the resulting difference from the trend may somewhat exaggerate the true oscillation (and viceversa). Quite rightly therefore Kondrat'ev chooses as the extent of the moving average the average period of the trade cycle. Now none of this arguments are put forward by his discussants who concentrate on minor or totally irrelevant points showing a lack of understanding the basic elements of the least squares method in smoothing.
Clearly the choice of the equation for the trend is somewhat arbitrary but a coefficient near zero will tell us when we can stop from using higher powers. In any case Kondrat'ev states that in most examples major cycles can be detected without any elaboration at all. Oparin claims that if one adds some new observations the trend will be dramatically altered. Now this seems unplausible and in any case it is clear that the trend should reflect the information available as much as possible. It may be that a particular period, like the one around the first world war, with his big inflation could be in a sense distorsive but I do not see any alternative to Kondrat'ev's procedure.

On the other hand Oparin thinks that the trend should be obtained by economic reasoning and not by statistical methods, i.e. should be rooted in the framework of economic theory. Following Cassel he tries to implement such a method but falls into heavy criticism by Kondrat'ev exactly on the ground that he is using -without realising it- an ultrasimplified statistical method of smoothing, i.e. picking up two points only of the time series rather than considering all points.
Finally a serious objection was brought about by Bogdanov, Pervusin and by Oparin as well, namely that, even if we can speak of major oscillations, very tentatively can we talk of cycles since, at the outmost, we have 2 cycles and a half. But Kondrat'ev is careful in stating that the probability of having cycles may be high and on that matter we have not progressed since.

3.2 Another major criticism (which is raised by most discussants) is that major cycles are found only in prices and value series but not in series reflecting quantities only. Kondrat'ev objects to that, but he cannot hide the fact that he himself does not find major cycles for some of the physical series, though in his reply to Fal'kenr he gives percentages of how in this case actual figures diverge from the trend. His line of defence is that, even in trade cycles, evidence about output movements is not overwhelming. This seems to be still a matter of controversy and, in spite of several papers on the subject, evidence is still mixed (see among others the papers by Bieshaar-Kleinknecht (1984) and by Greasley (1986)).
As far as the four regularities disentangled by Kondrat'ev are concerned, Oparin notices that innovations do cluster during the downswing of each trade cycle, irrespective of major cycles. And he also argues that it is odd that if innovations are being adopted in the upswing prices rise in the same period and not fall as one would expect owing to the rise in productivity of labour. The answer to that by Kondrat'ev is significantly surprising. He states that in the upswing old plants are being used along with new ones hinting at a countercyclical movement of labour productivity on the whole (a sort of Ricardian picture). He does not say anything however about real wages movements.

Finally wars and revolutions do not spread along in the upswings of major cycles but simply concentrate on the upper turning points. The latter seems a sensible position though evidence on strikes has been recently reviewed without substantial agreement by Gattei (1986) and Screpanti (1986).
The effects of gold production on prices is rather extensively discussed since most participants (including Oparin and Spektator) accuse Kondrat'ev of adhering to the quantity theory of money which being refuted by Marx is considered to be a major sin. (Did Marx accepted it for paper money as Kondrat'ev claims? The answer is still object of controversy: see D'Ercole (1980)). Moreover Oparin claims to have spotted a contradiction in Kondrat'ev's reasoning since the quantity theory of money requires a given value of output whereas Kondrat'ev is considering the latter as a variable. What however is not clear to Oparin is that the quantity theory of money requires the quantity of money to be an exogenous variable and this is refuted by Kondrat'ev who continously stresses that it is precisely variations in prices that produces variations in the quantity of gold produced and not the other way round.
Finally we have the fourth regularity, i.e. the depression of the agriculture over the downswing. Oparin maintains that there is no significant pattern in the ratio of agriculture to industrial prices. He however argues that falling prices will reduce the real income of farmers who are in their great majority debtors and therefore comes to a conclusion similar to Kondrat'ev's. That this point merits further elaboration is witnessed by the subsequent paper by Kondrat'ev (1928). By the way this line of thought, i.e. that the downswing of major cycles is accompanied (or even caused) by depression in agriculture has been pursued since by Timoshenko (1930), another student of Tugan Baranovskij, though a critical one. The latter, writing in America in the early thirties, hardly mentions Kondrat'ev (except for his statistical series) and quotes Pervushin instead who, by the way, is one of the participants to the debate we are reviewing.

3.3 Let us now come to the third section, namely the one concerning the tentative explanation of major cycles. As in any good discussion on cycles there are two parties, according to the endogeneity-exogeneity dilemma. As I have already stressed, Kondrat'ev is clearly on the side of the endogeneizers, whereas others, like Bogdanov, support Trotsky's analysis that each "cycle" has to be considered by its own, as a phase in capitalism history and explained according to major historical events (see Day (1976)). For those who think that some theoretical explanation is needed the point far more discussed is the concept of free capital. Oparin denies first that the index Kondrat'ev chooses as an evidence for the existence of free capital (i.e. the deposits in the private savings banks in France) shows major cycles. Secondly he argues that a fall in prices does not alter the quantity of money and therefore is unable to produce the effects of rising the supply of capital. Here there is glaring example of confusion between savings and hoarding on one hand and between real and nominal quantity of money on the other.

3.4 Coming now to the last set of questions about political and/or philosophical opinions the most important and repeated critique is that if you admit of major cycles you are to admit the eternity of capitalism. This is clearly a non sequitur as Kondrat'ev quickly shows. If major cycles are a feature of capitalism (and this is stressed by Kondrat'ev at the very beginning of his paper) they will end with the capitalism itself, if the latter has an end. It is illogical to argue that the association of major cycles to capitalism can ever transform the latter from a transient mode of production to an eternal one. Major cycles are a feature of capitalism but they are not a theory of it. This misconception -I cannot help from feeling- is the basic reason why the whole theory (and Kondrat'ev himself) has been so fiercely attacked. Indeed there is a discussant, i.e. the already mentioned Pervusin, who thinks that major cycles have been always with us, well before capitalism and he tries to connect them to developments in agriculture. On this matter Kondrat'ev refutes to state his opinion arguing that this would bring him too far. To accept Pervusin's approach it would have probably meant to subscribe to a vision where major cycles would have been preserved also in a socialist economy! (There is a book by Oparin, Business Cycles and Markets, published in 1928 where he seems to apply to socialist country the equilibrium schema he develops with refernce to capitalism and long cycles. It is

interesting to know that the copies in the British Library of both this book and of the book I have been reviewing have been presented to prof.Hayek whose theory, according to Hansen (1951), is similar to Tugan's.)

IV

I think therefore that reading Major Economic Cycles enables us to have a more thorough understanding of Kondrat'ev's explanation of major cycles, of his relationship with other writers in the field, namely Wicksell and Tugan, of the lack of valid arguments in the debate over the major cycles and (possibly) also of the true, underlying reasons for the outright rebuttal of Kondrat'ev's approach.

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