Long cycles, long waves and expansionary phases

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Abstract

The identification of long waves of capitalist development is an empirical observation shared by Marxist and non-Marxist historians and economists alike. Long waves are periods of capitalist development when the basic curve of production across a number of business cycles is either in an upward direction, or a downward one. During upward long waves, upswings in the business cycle are sharp, recessions, short lived and unsynchronised. Upward long waves see rising profitability, the expansion of production and the revolutionising of the productive base of capitalist production. During downward long waves, upswings are muted, recessions long and deep. Downward long waves refer to periods of depressed profitability, when capitalist accumulation is constrained. The existence of these long waves has profound effects on the politics, wars and the class struggle.

Although Marx an dEngels made some suggestive comments on long phases of capitalist expansion, it was at the beginning of the 20th century that Marxists in the Second International began a systematic discussion on the significance of the rapid development of world capitalism since the mid-1890s. During the 1920s within the Comintern this debate took the form of whether long cycle of capitalist development lasting about 50 years could be discerned from at least the early 19th century, consisting of downward and upwards phases approximately equal in length, and if so what were the causes of such long cycles. The leading proponent of the theory was the Russian Kondratiev who said such cycles were governed by rhythmic cycles whose duration were determined by the effect of major capital investments in large scale infrastructures and their wearing out. Leon Trotsky rejected the idea of long "cycles" with its implication that they had a regular periodicity related to internal mechanisms of capitalist accumulation, similar to the short-term business cycle. On the other hand, Trotsky accepted there were long phases of capitalist development which were marked by general tendencies to expansion, stagnation or decline, of uncertain duration, in which broad socio-economic events were responsible for inducing the shift from one phase to another. In the 1960s Ernest Mandel, leader of the Fourth International, rejected the idea of long "cycles" for the same reason as Trotsky but said "long waves" existed the downward phases of which were largely determined by endogenous factors (i.e. those internal to the process of capitalist accumulation) while the upturns were determined by exogenous factors (e.g. effects of wars, revolutions, massive expansion of the market). He argued that long waves were essentially characterised by major shifts in the average rate of profit and subsequently of accumulation. He posited some preconditions for a possible new wave of expansion beginning in the 1990s. This article assesses the key elements of the long phase of expansion in 1890s-1913, details the contribution to the theory of long waves by Trotsky and Mandel and explores Mandel's discussion on preconditions for an expansionary phase against subsequent social-economic developments. It suggests that a new phase can be discerned since end of recession in 1992/93 and predicts suggests some criteria for assessing its possible longevity. It concludes with some observations about the pattern of class struggle in the global south, imperialist countries and inter-imperialist rivalries.

Introduction

Prior to 1848, while capitalism existed in pockets, the world capitalist market was not of sufficient weight to create synchronised long waves. Following the revolutions of 1848 and the creation of a genuinely integrated world market, there was a period of upswing which constituted the first upward long wave.

"For England, the effects of this domination of the manufacturing capitalists were at first startling. Trade revived and extended to a degree unheard of even in this cradle of modern industry; the previous astounding creations of steam and machinery dwindled into nothing compared with the immense mass of productions of the twenty years from 1850 to 1870, with the overwhelming figures of exports and imports, of wealth accumulated in the hands of capitalists and of human working power concentrated in the large towns. The progress was indeed interrupted, as before, by a crisis every ten years, in 1857 as well as in 1866; but these revulsions were now considered as natural, inevitable events, which must be fatalistically submitted to, and which always set themselves right in the end."

Engels Preface to the English Edition of the Condition of the Working Class in England 1882

This upswing, which continued until around 1870 saw the tremendous advance of capitalism across the world, it was followed by a downward long wave known as the Great Depression.

The Second International

"There are times when development in all areas of the capitalist economy – in the field of technology, the financial markets, commerce, colonies, – has matured to the point where an extraordinary expansion of the world market must occur. World production as a whole will be raised to a new and more all-embracing level. At this point capital begins to enter upon a period of tempestuous advance." (Parvus, 1901)

As well as co-authoring the theory of permanent revolution with Leon Trotsky, Alexander Helphand (or Parvus as he was known) was the first Marxist in the Second International to notice that something marked out the capitalist world economy of the 1890s from the 1870s and 1880s.

The latter period was known popularly as the Great Depression; but what was it exactly that was depressed? As Eric Hobsbawm has noted:

"For though the trade cycle which forms the basic rhythm of a capitalist economy certainly generated some very acute depressions in the period from 1873 to the mid-1890s, world production, so far from stagnating, continued to rise dramatically. Between 1870 and 1890 iron output in the main five producing countries more than doubled, the production of steel, which now becomes the convenient index of industrialisation as a whole, multiplied twentyfold. International trade continued to grow impressively, though admittedly at a less dizzy rate than before."[1]

Forty years earlier Minsley noted:

"The cyclical progress of these years may be summarised somewhat in this wise; from 1870 to 1873 Europe was at the tail end of a long upward trend of rising prices and profits. Capital was still flowing into railway construction, industry was still expanding to meet these and other needs. Employers, bankers and farmers shared in the prosperity and Punch could publish cartoons of British miners drinking champagne. Then from June 1873 European markets collapsed and there followed nearly a quarter of a century when investment yields were low, price levels low. Per contra, the real wages of labour and the standard of living they made possible rose during this phase often known as the Great Depression. Unemployment rose in Britain during specially bad years, particularly in trades connected with the export of capital goods, but well over 90 per cent of the working force was employed at wages that rose by some 2 per cent a year from 1874 to 1900. The so-called Great depression was a depression of certain business prices and profits, especially severe in the heavy industries that had expanded rapidly during the previous period of buoyancy." [2]

The figures for GDP per capita increases in the downward phase and upward phase bear this out. For 1870-1895 global GDP growth was 1.4% a year and for 1895-1913 was 1.7% pa. The average annual compound growth for the leading 8 industrial countries between 1870-90 was 2.48 compared to succeeding long wave of 1890-1913 of 3.00. The gap for growth in international trade was more dramatic; 2.2% pa for the Great Depression and 3.7% pa for the two decades up to 1913. [3]

Rather what was at issue "was not production but its profitability" and "agriculture was the most spectacular victim of this decline in profits." [4]Why? In the decades of expansion after the 1848 revolutions agricultural output has expanded rapidly. But during the 1850s and 1860s domestic output was protected by high transport costs against foreign competition. This all changed in the 1870s and prices fell. In Britain, between 1873-96 prices dropped by 40 per cent. Consumers benefited and real wages rose as nominal wages fell less rapidly than general prices, but farmers and farm workers were hit hard – and these were still a substantial part of national economies at the time.

This generalised deflation cut the rate of profit across the board. "Even for capital goods the combination of new and improved capacity, more efficient use of product and changes in demand, could be drastic; the price of iron fell by 50 per cent between 1871/5 and 1894/8."[5]

The response to this declining profitability and deflation took several forms, the main ones of which were protectionism, reorganisation of capitalist production and imperialist expansion. Most industrial and industrialising nations in the Americas and Europe put up tariff barriers to imports of goods. Only Britain held fast to unrestricted free trade because of its global pre-eminence.

But protectionism's effects on global output were relatively mild and they did not effect the movement of capital or labour at all. "Consequently, it has been calculated that the global growth of production and commerce between 1880 and 1914 was distinctly higher than it had been during the decades of free trade."[6] Global manufacturing output was five times higher in 1913 than in 1870. So protectionism did not seriously hold up growth.

The most significant response to capitalism's declining profitability was "the combination of economic concentration and business rationalisation ... Both were attempts to widen profit margins…"[7]

The process of creating cartels and later mergers of capital took off in the depressionary phase as a way of firms warding off competitive pressure and keep their margins high.

"Scientific management" too was the child of the Great Depression. Frederick Taylor devised it in response to the crisis-hit US steel industry around 1880; it came to Europe in the 1890s. The whole factory floor was reorganised, and a new breed of managers removed the remaining autonomy from unskilled and semi-skilled workers on the shop floor in order to drive up productivity. The nature of the production line itself was utterly revamped in order to break down tasks into small repetitive segments, again improving productivity.

Imperialism was the third response, with the "scramble for Africa" in the 1880s being the most dramatic example of state-backed firms backed seeking to monopolise markets and raw materials. By colonising them. As Hobsbawm said: "it is quite undeniable that the pressure of capital in search of more profitable investment, … contributed to policies of expansion."[8]

Finally, a range of new technologies and major improvements to existing ones were brought on stream by the 1890s. Innovations associated with electricity and chemistry brought about new energy sources that were about to compete seriously with steam. But the revolutionising effects of these were probably no more important in the period up to 1913 than the updates and improvements to steam power and iron by the roll out of steel and turbines.

As a result of all these developments prices and profits shifted markedly from one period to another. After 1896 noticeable domestic price rises kicked in as cartels did their work; superprofits from abroad raised the average level of profits and prices.

As the 1890s progressed the rise in prices and profits attracted new investment and generated a new mass consumer market and new lines of employment and production. There was a massive growth in the tertiary sector of the economy as public and private office work took off and as the retail sector expanded massively. Consumer power was higher at the onset of this period and not eroded completely by cuts in wages after 1899. This is the era of higher purchase contracts, mass advertising, mass entertainment.[9]

International trade took off at the end of the 19th century; world merchant marine shipping – which remained more or less static between 1860-90 – between 1890 and 1914 almost doubled.[10]

The IMF has called this phase the first era of globalisation. Few bourgeois or Marxist economists dispute the periodisation or some key indicators that mark one phase out from the other. Of course, there is plenty of dispute about essential causes. But Marxists have argued that changes in underlying profitability are at the root of the changing dynamics.

The debate in the 1920s

This long expansionary wave was terminated rather abruptly by the outbreak of the first world war in 1914. The dislocation and decline of European capitalism after the war was general and steep. Only with the retreat of the revolutionary upsurges of 1918-20 did capitalism in Europe begin to regain a semblance of stability. The Comintern naturally debated the implications of this relative stabilisation for strategy and tactics at its Third Congress held 1921.

It was in this context and over the next two years that the discussion on long cycles was revived in the debates over political and economic perspectives. Trotsky was not unaware of the relative stabilisation but argued correctly that the key feature of the period economically was the continuing disequilibrium between Europe and the USA and the absence of a clear global hegemon.

Kondratiev in this period developed his idea of a long 50 year cycle of the international economy and argued that capitalism may be in the process of rediscovering its long term equilibrium after the effects of the war. Trotsky disagreed with the conjunctural assessment but also rejected the idea that there were long cycles which were governed by an internal rhythm based on long term capital infrastructural investments (eg shipping and railroads). He maintained one cannot internalise the external conditions behind the long historical periods. As a result there could be no automatic periodicity and suggested instead that capitalism's history could be divided into distinct epochs or historical periods with defining characteristics – both economically and poitically.

He argued that that the first world war had opened up a period of imperialism of decline. Moroever, "in the epoch of the levelling out in reverse – upswings can only be of a superficial and primarily speculative character, while the crises become more and more prolonged and deeper going." [11]

Two years later Trotsky returned to the same idea in a critique of Kondratiev. He argued that a study of the business cycle was important but they were not enough for "otherwise we would just have complex repetition not dynamic development." [12]

It was critical to study the general curve of development through the course of several business cycles:

"If the boom restores with a surplus the destruction or constriction during the preceding crisis, then capitalist development moves upward. If the crisis which signals destruction, or at all events contraction of the productive forces, surpasses in intensity the corresponding boom, then we get as a result a declining in economy. Finally, if the crisis and boom approximate each other in force, then we get a temporary and stagnating equilibrium in economy." [13]

For example, between 1874-94 there were 15 years of crisis or depression against six years of upsurge, whereas between 1895-1913 there were four years of crisis or depression against 15 years of upsurge.

The triumph of Stalinism, the onset of depression, counter-revolution and war put an end to the debate on long cycles. After the second world war academic interest also waned as the economy boomed. It was a member of the Fourth International who was to take up the discussion again in the 1960s an 1970s.

Mandel's contribution

In the mid-1960s Ernest Mandel predicted that the "long boom" after world war two would come to an end by the end of the decade. He argued that the tendency of the rate to profit to fall would predominate and overcome the factors that had given rise to the post-war expansion. He based his predictions on long wave theory, which suggests that there are "segments of the overall history of capitalism with definitely distinguishable features".[14]

These "segments" are not statistical averages of any 50-year period that one happens to randomly choose, but correspond to real historical periods (wars, revolutions and counter-revolutions, new discoveries). But nevertheless, the movement of prices, interest rates and so on will show a definite and different marked trend in each of the phases. Crucially, where non-Marxists seek to explain the driving force behind these trends in such factors as the effect of "bunched innovations" (Schumpter) or long term infrastructural capital investments (Kondratiev) for a Marxist long wave theory has to be a rate of profit theory. So for Mandel "the essential movements, those that determine the basic trends in the system, remain the fluctuations in the average rate of productive capital accumulation. "[15]

Mandel sought to improve Kondratiev's theory by taking on board Trotsky's criticisms of the "stylised" nature of the former's "long cycles" and drew a distinction between the causes giving rise to a downward phase of the long wave and those that lay behind a new upward expansionary phase. To explain the downturn phase one should look to essentially "endogenous" or internal factors; that is, the rising organic composition of capital ensures the TRPF impacts more and more on the accumulation process and the counter-veiling tendencies have less and less effect.

But a long expansionary phase cannot come about "automatically" from purely internal movements of capital, but rather it needs a system shock from major socio-economic events to restore the global conditions of profitable accumulation. Mandel refers to the effects of the 1848 revolutions in Europe in creating the basis for massively expanded internal markets in rising bourgeois nation states. I have referred earlier to the preconditions for the 1890s boom. The massive defeats inflicted upon the global working class in the 1930s and 1940s through counter-revolution and world war was the major socio-economic pre-condition for the long boom of the 1950s and 1960s.

As a result of this distinction the longevity of the downward, depressionary phase of the long wave cannot be predicted with any certainty. Hence Mandel avoids the charge of adopting Kondratiev's theory of cycles in which the periodicity of both parts of the long wave can be predicted in advance.

The "exogenous" factors combine to create an expansive long wave - "periods in which the forces counteracting the tendency of the average rate of profit to decline operate in a strong and synchronised way." [16]

Mandel expands in more detail on how these counter-veiling tendencies work:

"a sharp increase in the rate of surplus value, a sharp slowdown in the rate of increase of the organic composition of capital, sudden quickening in the turnover of capital, or a combination of all or several of these factors can explain a sudden upturn in the average rate of profit. In addition Marx indicated that among forces dampening the effects of the tendency of the rate of profit to decline are an increase in the mass of surplus value and a flow of capital into countries (and we should add sectors) where the average organic composition of capital is significantly lower than in the basic industrial branches of the industrialised capitalist countries."[17]

A sustained increase in the rate of profit eventually attracts reserves of money capital which is productively accumulated and which in turn keeps the average rate of growth above that for the cycles in the previous depressionary phase.

A long expansionary phase does not in the first instance mean a return to the rates of GDP or capital stock growth that was experienced in the 1951-70 period. Indeed, the per capita GDP figures marking out an expansionary phase from the preceding period are not that dramatic except in the case of the 1920-70 wave. Certainly a surge in international trade and foreign investment is more marked. But above all it is a restoration of the rate of profit that needs to be seen; Mandel at one point suggests an increase of 50 per cent over the average for the preceding period should be observable.[18]

The preconditions for a new expansionary phase.

In his original 1980 Marshall lectures Mandel discusses the possibility of a new period of accelerated expansion like that of 1893-1913 if not 1948-68. First the technical requirement is the "explosive increase in the rate of accumulation and therefore the average rate of profit and no less expansion in the markets for capitalist commodities".[19]

In the downward phase this would require "chronic mass unemployment, tendency in the long run to erode real wages and workers' self-confidence, militancy and level of organisation and to significantly increase the intensity of labour, leading to a sharp upward rises in the rate of surplus value; massive devalorisation of capital.." a "leap forward in the centralisation of capital", radical reduction in the costs of equipment, raw materials and energy, massive application of new technological innovation; a new revolutionary acceleration in the rate of turnover of capital."[20]

In the early 1980s Mandel tends to completely links the possibility of a major increase in the rate of surplus value to the automation of production. This he says would lead to a rise in mass unemployment and therefore a decline in the mass of surplus value such that it would render the increases in the rate of surplus value marginal – limiting the upturn in the rate of profit. Mandel says the service sector could simply not absorb the industrial unemployed. But the proof of the pudding is in the eating and he has been proven wrong about this. Job creation in the US and UK has largely been in the service sector (flexible, often part-time and low paid) and more than replaced the number of lost manufacturing jobs.[21]

Second, Mandel says that "a new powerful expansion in the market for commodities produced by imperialist countries would either require a leap forward in industrialisation (and welfare) in some key semi-colonial countries and areas of the world…or a qualitative increase in the degree of integration of the USSR and China into the international capitalist market, or a combination of both."

In 1980 he measures this "degree of integration" by the extent of trade between east and west and is not suggesting at this stage a return of these countries themselves to capitalism.[22]

Third, Mandel says, "To drive up the rate of profit to the extent necessary to change the whole economic climate, the capitalists must first decisively break the organisational strength and militancy of the working class in key industrialised countries.." (eg USA)

At the time Mandel suggests that such defeats imply 1930s-style fascism or bonapartism. The "social and human price" of a new phase of expansion from the 1990s would be "this time immeasurably more costly than it was in the 1930s and early 1940s" Why? Because the resistance of the working class would be greater and the existence of nuclear weapons threatened total destruction, according to Mandel.

In the US and UK major defeats did happen – in a full frontal manner in the 1980s in the UK and USA, and by slow attrition elsewhere in Europe. But by and large the radical curtailment of democratic freedoms and trade union rights – while provoking massive class battles, especially in Britain –took place within the framework of parliamentary democracy.

Finally, Mandel argues that "both a sharp increase in the rate of profit and a huge widening of the markets are necessary to bring about a long expansion. Normally, the capitalist way of securing the first condition conflicts with the capitalists way of assuring the second."

Again, what is implied in the overthrow of the degenerate workers' states, especially China is the ability to square the circle for some time ahead. With average labour costs at $0.90 an hour, yet with a mass market of hundreds of millions with a per capita income (PPP) of around $5000 and growing, China could provide a hugely exploitable labour force and a sizeable chunk of effective demand.

In two supplementary articles written in 12 years later in the early 1990s Mandel returns to the possibility of a "soft landing" to the present "long depression". There is a significant "softening" of his objections made in 1980. Rather he says simply that it cannot be ruled out: "we simply identify what is its basic precondition: a massive 'system shock' which combines a sharp rise in the rate of profit (including an ever sharper rise in the rate of surplus value) and a considerable broadening of the market. The latter could only occur, in the present world situation, through total integration of the former USSR and the People Republic of China into the capitalist world market. The former would necessitate a major defeat of the working class (not necessarily in the form of a fascist-like dictatorship) and a no less grave defeat of the third world liberation movement, in both cases at least in all the principle countries."[23]

In addition to repeating some of the other earlier preconditions for a new expansionary phase, to wit the lowering of the organic composition of capital, application of new techniques, increases in the turnover time of capital (transportation, information etc), he adds in addition, the restoration of the relative hegemony of the leading imperial power. He points out that Britain's hegemony was never so absolute as it was in 1848-73 and that it declined in next phase. But its relative hegemony was restored in 1897–1913. The same rise, fall and rise can be seen in the USA's hegemony between 1945-today.

The significance of this restoration of hegemony is that it endows the hegemon with the ability to push through the necessary institutional, and macroeconomic frameworks and policies that underpin global expansion. This can be seen in the 1990s with the replacement of the GATT with WTO in 1995, the appointment of Wohlfenson at the World Bank, the US-led purges in the UN. It can seen in the ability of the US to use the dollar's reserve currency status to get Asian banks to underpin the US defecit.

To summarise: many of Mandel's preconditions can be argued to be in place since the 1990s:

• significant defeats imposed on working class of North America and Europe during the course of the 1980s and 1990s, allowing for lowering of real wages, improvement in productivity and increase in the rate of surplus value.

• the restoration of capitalism in China, Russia and central Europe, doubling the global labour force open to exploitation by foreign and domestic capital, massively lowering the organic composition of capital and hence improving profitability. At the same time this restoration has expanded the market for commodities and services of made by imperialist MNCs.

• a great leap forward in the centralisation of capital through aggressive merger and acquisitions in the 1990s, giving global reach and economies of scale to major industries.

• restoration of US hegemony in the 1990s, enabling it to reconfigure multilateral institutions in a manner favourable to its economic policies.

• roll-out of new technologies since the mid-1990s (e.g. internet) which have developed new markets (e-commerce), allowed for relocation of key service and hi-tech industries, cut transaction costs and speeded up the turnover time of capital.

• all this has resulted in major improvement in the rate of profit, significantly above the level of 1973-92. Since the mid-1990s there has been a revival in level of accumulation but this to date has been limited by general tendency of neo-liberalism (especially in the USA) to disperse profits to capital and shareholders. This has meant that consumption rather than business investment has been main motor of demand in the 1990s, although the balance has shifted since 2000.

Wars, revolutions and social stability

We remain in the epoch of imperialism, an era of wars and revolutions. But is important to grasp the underlying dynamic of these events. Many (not all) of the political and inter-state conflicts of the last ten years have been a function of rapidly expanding capitalism; this would include repeated (often hidden) outbursts in China; the events in Ukraine and other CIS nations as a rapidly changing civil society comes up against (a la 1968) the archaic inherited political structures of the past. These are set to continue. Even the US wars against Iraq since the early 1990s are in part a function of the need for the US to control access to energy resources in a period of significant growth in demand in the USA.

New financial crises are inevitable, such as 1997/98 and 2001, as a function of the free and rapid movement of (especially short-term) capital, whether this takes the form of currency crises, stock market crashes or government budgetary problems.

But in addition to the convulsive effects of capitalist expansion on the capital importing countries we also have to recognise that the concomitant of this is a huge growth in imperialist superprofits in the last 10-15 years. This has also given them economic and political reserves with which to bribe the middle class and top layers of the working class and which lay behind the relatively slow tempo of development of attacks on the labour market and social welfare gains of the European working class. This global unevenness makes it impossible to speak of a global "pre-revolutionary period".

How long an expansion?

If we are to avoid predictions based on "stylised cycles" then we cannot simply take 1993 and project 25 or so years into the future. But one can outline some factors that could bring the phase to a halt sooner rather than later and others which may suggest it can yet be entrenched. There are significant disequilibria in this expansionary phase. The US expansion depends on rising domestic demand for consumption goods. This creates a growing deficit as imports surge. This is financed by Asian loan capital borrowed by the US government. If this appetite for US assets floundered the expansion could halt if the financial crisis gave way to a lasting downturn in investment and manufacturing not only in the USA but in Europe and Asia above all.

On the other hand, if there is an upsurge in US business investment to replace consumption boom that would signify a broadening and deepening of the expansion phase. In addition, Japan (the second largest economy) has clearly put the structural depression of the 1990s behind it and since 2000 has resumed growth based on rising capital investment. Further product and labour market reforms in Euroland would also lift profits and investment. If Japan and EU grows as expected in 2006 and the US, CIS/CEE and Asian recoveries are sustained this would be the first upward phase of a business cycle in which all major economies are firing on all cylinders at the same time since the mid-1980s. It would be prima facia evidence of a new expansionary phase.

But the future of the expansion phase depends on China and increasingly on India. Presently they account for no more than 8% of global output, but they are growing rapidly and have one-third of the world's population. China's industrial revolution fuels the expansion in the rest of Asia and increasingly Latin America. Its surplus profits are circulated as loan capital to the US to allow its deficit-financed expansion to continue. China underpins the dynamic component of European capital as exports of goods, services and capital increases there. China determines the global level of commodity prices, bond prices and – in an open world market – wage levels. India is in the forefront of hi-tech service and software industries, already has (unlike China) major global multinationals.

Eventually, the exhaustion of the reserve army of labour in China and India will put upward pressure on wages, leading to an increase in the organic composition of capital as machines replace expensive labour and puts a downward pressure on profits.[24]

How far are we from there? Most commentators suggest the reserve army of labour will not be exhausted until after 2015. Between now and then the business cycle will function but the down phases are likely to be pauses in growth. Conflicts will mature, especially between

US/Europe/Japan on the one hand and Russia/China on the other as all powers seek to monopolise and protect the material pre-requisites of their growth.

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Endnotes

[1] E Hobsbawm, The Age of Empire, p35. "Foreign investment in Latin America reached the dizziest heights in the 1880s."
[2] F H Minsley (ed), New Cambridge Modern History Vol XI, Mankind progress and worldwide problems, Cambridge 1962)
[3] Figures are taken from E Mandel, Long waves of capitalist development, pp3-4.
[4] Hobsbawm, op cit p36
[5] ibid p37
[6] ibid p43
[7] ibid
[8] ibid, p45
[9] In the long expansionary phase we get the widespread introduction of the telephone and telegraph, the car, mass use of the bicycle, the plane; and cinema becames part of modern life. Domestication of science increased with the vacuum cleaner (1908) and invention of aspirin (1899).
[10] Hobsbawm, p50. The engine of global growth was the central belt of industrialising and industrial countries, increasingly stretching round the temperate northern hemisphere. This "developed world" at this point covered 15 per cent of the planet and 40 per cent of the inhabitants; they made up 80 per cent of the world market.
[11] L Trotsky, First Five Years of the Communist International, Vol 1 p260
[12] L Trotsky, "The curve of capitalist development", 1923, in Problems of Everyday Life,
[13] ibid, p275
[14] E Mandel, op cit
[15] ibid, p8
[16] ibid, p12
[17] p11
[18] Following Mandel, long waves can be grouped into the following approximate periods. This schema has been amended to include transition periods at the outset of the upward long waves:

1850-1872	California gold rush, steam trade, manufacturing dominance
1873-1892	Trade slump, grab for Africa, rise of unions/SDP
1892-1900	Transition period
1900-1914	Colonial system, monopolies, finance capital, Taylorism
1914-1939	Revolutionary upheaval, fascism/nazism, impending world war
1945-1948	Transition period
1948-1973	WWII recovery, Micro-processors, durable consumer goods
1973-1992	Crises, Cold war, stalled development
1992-1995	Transition period
1995 - present	Globalisation, computers/internet, post-Stalinism

All of these periods were dominated either in the upward phase by the development and application of previously unused new technologies, the rapid advance of capitalism and growth of the world market, or in the downward phase by economic stagnation, declining profit rates and the concomitant revolutionary crises.

[19] ibid, p84

[20] ibid

[21] Mandel concurs with a 1980s *Economist* guesstimate of 5 million unemployed in the UK by 2000 when in reality it was little more than 1 million. But his guess for German unemployment was much nearer the mark, which accurately foreshadows the "stalled" character of neo-liberal deregulation in labour market and product market "reforms" in Germany's domestic economy.

[22] Mandel suggests that a qualitative increase in the market for capitalist goods in the workers states through increased trade implies a massive destabilising credit explosion. See p91.

[24] Mandel has written: "We can distinguish two phases in each expansionary long wave; a first one, in which 'extensive' industrialisation prevails, precisely because of the relatively low level of wages, and a second one in which as a result of the drying up of the industrial reserve army of labour (the realisation of 'full employment') there is a definite premium on the production of relative surplus value (ie on the increase in the productivity of labour in the consumer goods sector.)" p114