Conclusions To Part II: Recurrent Phenomena of the Long Waves of Capitalist Development

C.1 Introduction
In this chapter we return to some of the fundamental problems of the theory of ‘reasoned history’, which we raised in Part I. In Chapter 4, and in the Conclusions to Part I, we maintained that, to justify the use of the concept of ‘waves’ rather than simply ‘stages’ or ‘periods’ of historical evolution, it is necessary to distinguish recurrent phenomena in each period as well as the unique features of each technological revolution. In Chapters 5–9 we analysed some of these unique features, and in this final chapter of Part II we discuss some of the main recurrent features as they have emerged from the narrative account in this part. We also try to place these recurrent features of the changes in technology and in the economy in a wider institutional and social context, a context in which semi-autonomous political and cultural changes may sometimes predominate in determining the course of events.
We first of all distinguish some recurrent features of the successive industrial revolutions that we have analysed in Chapters 5–9, and then illustrate this recurrence with some further supporting evidence of social and political tendencies in each long wave: the growth of new large firms and the continuity of others, the incidence of strike movements, labour disputes and social unrest during various phases of the long wave, and the evolution of a new international regulatory regime in each wave.

In the Introduction to Part II, we listed several features of the successive industrial revolutions, particularly those identified by Carlota Perez (1983), which together might explain the recurrence of long waves in the economy and the social system. Foremost among these features was the periodic emergence and diffusion of a new constellation of technical and organizational innovations offering in each case exceptional super-profits of innovative entrepreneurship. These recurrent super-profits are the first feature we shall discuss in this chapter.

Both some of the sternest critics of capitalism (e.g. Marx) and some of its most ardent admirers (e.g. Hayek) have argued that one of its foremost characteristics has been its capacity to generate and to diffuse a torrent of technical innovations. Our theory has emphasized the interdependence and systemic features of these innovations, which means that they cannot simply be analysed as individual, discrete events, although, of course, micro-level (p.337) agents have been essential for their inception and diffusion. In Chapter 5 we outlined the exceptionally favourable confluence of cultural, political, economic, geographical, scientific, and social circumstances in eighteenth-century Britain which gave rise to that upsurge of technical and organizational innovations known ever since as the ‘Industrial Revolution’. In subsequent chapters we showed that other capitalist economies, and especially the United States, were able not only to achieve similar results but, as time went by, to outstrip Britain with new constellations of innovations.

Capitalist economies have been able to achieve these remarkable results, ‘surpassing the wonders of the Ancient World’, as Marx and Engels put it, by a combination of incentives and pressures affecting ultimately numerous firms and individuals. First of all, of course, a well-functioning
capitalist economy offers the possibility, but by no means the certainty, of profit from successful innovation, and sometimes very large profit. This profit may be accompanied by other rewards—status, privilege, political advancement, and fame. In our account we have shown that some of the most successful entrepreneurs in each technological revolution did indeed achieve extraordinarily large profits, although they did not necessarily seek the other advantages often sought by very wealthy individuals. Fame itself they could hardly avoid, and indeed this was a very important social mechanism for the diffusion of their innovations and for efforts to surpass them. Arkwright, Wedgwood, Hudson, Brunel, the Vanderbilts, Carnegie, Krupp, Rockefeller, Rathenau, Siemens, Diesel, Ford, Gates, and Murdoch are all examples of entrepreneurs and inventors who achieved both fame and fortune through their innovations, whether technical, organizational, or both. Their innovations were very different from one another—indeed, unique—but they had in common this extraordinary profitability.

A number of long wave theorists (Mandel 1980; Goodwin 1985; Poletayev 1987) have constructed models of the behaviour of the economic system based mainly on long-term fluctuations in the aggregate rate of profit. They argued quite plausibly that a fall in the rate of profit tends to occur after a long period of prosperity and expansion, partly because of the Schumpeterian processes of erosion of innovators' profits during diffusion and partly through wider pressures from rising costs of inputs. These tendencies for the rate of profit to fall at the peak of a long boom are among the main reasons explaining the upper turning point in the long wave and the onset of a prolonged downswing in which generally lower rates of profit prevail. We provide some evidence of such a change in the most recent period in Section C.2 (Figure C.9, p. 354). The statistics are very difficult to assemble, especially for the nineteenth century, but, such as they are, they do provide some support for this interpretation. We certainly do not wish to deny the plausibility of these models, but since our emphasis is mainly on structural change, and on divergent sectoral phenomena, we stress mainly the exceptionally large ‘super-profits’ that were realized through the exploitation of major radical innovations. These profits appear all the more remarkable if they were made during a period of...
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General decline in the rate of profit in the ‘downswing’ phase of the long wave. As Schumpeter insisted, they offered a strong signal to potential imitators.

The first distinguishing characteristic, therefore, of the long waves that we shall discuss in this chapter is the recurrent emergence and diffusion of a cluster of innovations which offered the clear-cut potential for immense profits, based on proven technical superiority to previous modes of production. Minor incremental improvements were, of course, occurring all the time, but the innovations that were at the heart of each wave that we analysed offered quite dramatic changes in productivity and profitability.

If there is substance in this theory, then we hypothesize that it might be supported not only by the examples we have cited in this second part of the book, but by other evidence on the growth of large firms associated with these exceptional innovations. The most profitable firms could plausibly be expected to grow faster than the average through an accumulation of profits and new investment. We therefore looked for such supporting evidence in the data on the changing population of the largest firms.

This information has already given rise to a debate on the so-called ‘continuity’ thesis. Some accounts have suggested that the population of the largest firms has been rather stable for a long time, and this would appear to contradict our theory. On the other hand, if our thesis has substance, then we would expect it to be supported by the periodic incursion of a cohort of new large firms into the top group. Section C.2 is therefore devoted to a critical discussion of the evidence for and against this ‘continuity’ theory.

A second case of recurrent phenomena which emerges from the account we presented in Chapters 5–9 is that of structural crises of adjustment. It seems fairly obvious that the diffusion of a constellation of major technical and organizational innovations through the economic and social system must cause profound changes in the structure, as well as in the occupation and skill profiles and management systems. Moreover, precisely because each constellation is unique, they will have very different effects in each technological revolution. The recurrent effect is a pervasive pattern of structural change, but the industries and occupations most
affected will be different in each case. Obviously also, the new industries will be quite different. All this means that increased structural unemployment is likely to be a major recurrent feature of each crisis of structural adjustment, along with many changes in the conditions of employment. A mismatch of the skill profile is likely to be widespread.

The statistics of unemployment for the nineteenth century are very poor, but we argued in Chapter 5 (Section 5.10) that there is strong evidence of very serious unemployment in the 1830s and 1840s in Britain, while David Wells (1890) and other economists commented on the widespread unemployment in most industrial countries in the 1880s and especially in those that were most advanced in the use of machinery (Section 6.6). There is also, of course, abundant statistical evidence of the heavy structural unemployment (p.339) in the 1920s and 1930s and again in the 1980s and 1990s (Section 8.10). Even in the 1920s boom in the United States, as Fearon (1987) and the NBER pointed out, there were sectors experiencing severe adjustment problems, such as coal, railways, and ship-building (Section 8.2).

It is hardly conceivable that structural changes of this magnitude could occur in an orderly and conflict-free manner, and it is obvious that the destruction of the livelihood of hundreds of thousands of people is bound to be a cause of acute social unrest. We have tried to show in earlier chapters that this has indeed been the case in each crisis of adjustment. Huge demonstrations and riots of unemployed workers were a widespread feature of the 1930–3 depression in both Europe and America. Even though social security legislation has lessened the hardships of the more recent period, these protests against redundancies were again a common phenomenon in the 1970s and 1980s.

There are also bound to be conflicts within the expanding industries and technologies over pay, status, and working conditions for various groups of workers and managers. We hypothesize therefore that the available statistics of strike days and the numbers of striking workers should provide evidence of the recurrent structural crises and their social consequences. Section C.3 is devoted to a discussion of the evidence on this topic. Finally, the crises of structural adjustment that we have postulated are a recurrent feature of long waves and inevitably give rise to many other social and
political conflicts and debates, in addition to those which we identify in Section C.3. Such extensive changes as mechanization, electrification, motorization, and computerization give rise to entirely new requirements for industrial standards, for education and training, for tariffs and trade protection (or free trade), for safety regulations, for environmental protection, and for intellectual property rights. We postulate therefore, like Carlota Perez (1983, 1985, 2000), the periodic reconfiguration of an entire regulatory regime for each successive structural crisis of adjustment. This has not been a main theme of the book, but it has been mentioned in the framework of the windows of opportunity generated by the emergence of new techno-economic paradigms, such as the age of electrification (Chapters 6 and 7). In that context, firms and national economies could acquire new positions, surfing the wave of technical, organizational, and social innovation and adapting their national regime of regulation accordingly.

Yet, although this is not a major theme of this book, convergence and divergence are more general trends in the economic evolution of the world economy, and a brief comment is necessary. According to the OECD data investigated by Hollanders et al. (1999), and considering a large sample of countries, a trend of general convergence is identified from 1960 until 1973, i.e. in the upswing of the fourth Kondratiev, whereas a mixed process of convergence and divergence occurred between 1973 and 1991. If the sample is reduced just to the OECD countries, a convergence trend dominates from 1900 until 1918, as well as in the 1950-73 period, the ‘golden years’ after the end of the Second World War. Changes in the regulatory regime, at both the national level and the international level, have a considerable effect on the process of international ‘catch-up’, i.e. convergence or divergence. The new international regime is the subject of our final comment in Section C.4.
C.2 Big Business in the Long Waves

Chandler and Daems (1980: 2–3) have argued that ‘by 1920 big business had already become the most influential non-government institution in all advanced industrial market economies’, and we would not dispute their contention. However, we do dispute some aspects of their analysis of the composition of the top echelon of big business. Basing our analysis on the ‘Fortune’ list of the largest firms in the United States and Chandler’s own research on this topic, we discuss the controversial question of ‘continuity’ in the top echelon of large firms. From the historical analysis in Chapters 5–9 and from a variety of other sources, we endeavour to show that a cohort of new large firms has joined the list periodically, basing themselves on the new technologies and industries of each long wave. Only a minority of the largest firms were able to remain at the top through several waves. Their relative endurance, and the meteoric rise of the new contenders with each revolution, both depend on the achievement of high levels of profitability and the accumulation of both tangible and intangible capital. Efforts to achieve large market shares and high profitability clearly have profound consequences on the social conflicts over the appropriate regimes of regulation, which are discussed in the following sections.

It is employers and their organizations that have generally been in the strongest position to shape and influence the new trajectories in technology and the relevant regimes of regulation. Trade unions and other working-class organizations have usually been in the position of responding to technical and organizational changes, rather than initiating or controlling them. This is not to say that any group, organization, or class has a clear idea of how a particular technology will evolve. As we tried to show in Chapters 5–9, uncertainty characterizes the evolution of any new constellation of innovations, and the ultimate outcome is not quite what anyone specifically intended in the early days. On the contrary, expectations and the balance of forces are constantly changing as a result of new developments in technology and science, as well as in the evolution of social and political systems and of culture in society more generally.

(p.341) As we explained in the Introduction to Part II, we are concerned in this book with the evolution of recognizably capitalist economies. We have not commented on those societies in which, between 1917 and the 1990s, attempts
were made to establish a different type of economic system. We believe that they too were very strongly influenced by technological and political developments in the capitalist world and by the evolution of the global economy. In fact, long wave theories were also developed within these countries, but we shall not deal with them here. Our concern has been with those economic systems that have been based predominantly on private ownership and accumulation of wealth through the profitability of enterprises. These capitalist economies have had particularly strong pressures and incentives to innovate, since the survival and growth of most enterprises depended on their profitability. We have confined our analysis mainly to the leading industrial countries, since circumstances were often very different elsewhere. It is this persistence of capitalist institutions that, in our view, explains the recurrence of various social phenomena, even with very different new constellations of technologies.

However, the persistence of some features of capitalist economies, such as private ownership and the imperative for firms to make profits for survival and growth, certainly does not mean that all capitalist institutions have remained unchanged. On the contrary, the pressures to earn profits, to accumulate, to invest, and to enlarge markets have themselves led inexorably to the growth of some large and very large firms. Whereas in the early nineteenth century competition between numerous small firms was characteristic of the industrial landscape, by the late nineteenth century giant firms, employing tens of thousands of people, had emerged and begun to dominate in several industries. This had already occurred in the railway industry in mid-century, and Chapter 7 has described in particular the rise of giant firms in steel and electricity. Chapter 8 concentrated on the oil and automobile industries and Chapter 9 on computers, software, microelectronics, and telecommunications. In each of these waves of technical change, entirely new firms expanded with extraordinary speed and joined the population of ‘giants’ that had grown up in previous waves.

Even in the eighteenth century, of course, there had been a few large firms, but these were mainly in trade (such as the East India Company) rather than industry, and in Adam Smith's time there were very few industrial firms employing as many as a hundred people. Nevertheless, as every economics student knows, Adam Smith gave severe warnings about the
dangers attending any meetings of businessmen and traders in the same line of business. Conspiracies to raise and fix prices would, in his view, often follow. Classical and neoclassical economics have retained this anti-monopoly tradition, and since the 1890s much effort has gone into refining models of perfect and imperfect competition, and into devising institutions that might limit or reduce the pervasive growth of monopolistic and oligopolistic firms and practices. In the United States in particular, popular political movements (p. 342) have mobilized widespread support for ‘trust-busting’ legislation ever since the Sherman Act in 1890, and many of America's largest firms, from Standard Oil to Microsoft, have been the object of investigation and legal action to restrict their power.

While no one denies the fact of the rise of large firms in most manufacturing industries and many service activities, there are many different interpretations of this concentration process. In the 1890s Alfred Marshall had already proposed his ‘trees of the forest’ metaphor, in which he accepted the obvious fact of the growth of giant ‘trees’, but suggested that limits to their growth would mean that periodically some would die and be replaced by new, younger trees. As time went by, however, other economists pointed to the fact that some of the giant ‘trees’ appeared to have uncommonly deep roots and to survive for a very long time. This became known as the ‘continuity’ thesis, which stressed the adaptability of large firms, their financial strength, their market power, and their political influence.

The evolution of ‘Big Business’ will be discussed here on the basis of the statistical and appreciative analysis of the population of the 200 largest US firms in the ‘Fortune’ list for 1963, 1983, and 1997. Prior to that we use Chandler's data for 1917, 1930, and 1948. Although it has been accepted that these two sets of information are consistent, and although other authors have used both sources simultaneously for their work, they have important shortcomings that must be emphasized. As we move back in time, the reliability of statistical information is more doubtful; furthermore, the classification criteria have shifted through time, as a response to the very change in the structure of the main industries.
The first problem cannot be solved, although it can be lessened, as in this section, restricting as far as possible the intertemporal comparisons to those domains for which clear conjectures about trajectories can be argued. The second problem can be addressed in a more satisfactory manner, and the selected strategy here was to develop a new classification, based on the two-digit SIC, but considering complementary information about the core business of the firms. The choice of the United States must also be stressed. It was the leading country in technology throughout the period we analysed and, moreover, one with a very large market and no wars at home during that period.

This section does not consider the question of ‘creative destruction’ in relation to technologies. Schumpeter's (1942) use of this expression has been taken by some people to mean the ‘destruction’ of older technologies as well as firms. This does in fact sometimes occur, but more commonly the older technologies are transformed or complemented rather than destroyed by the newer technologies. We stressed this point in relation to electrification and electro-mechanical technology in Chapter 8, and the same point is obviously relevant in relation to electronic technology. Patel and Pavitt (1994) and Pavitt (1986), in particular, have insisted that competence in older technologies is usually still important for firms using the new ones. They have (p.343) demonstrated this by analysis of the patent portfolios of large firms and argued that multi-technology capability is often essential for large firms today. Research by Birgitte Andersen (1998) on the accumulated trajectory of patents in the mechanical and electro-electronic industries makes the same point. She used a thirty-year weighted measure of patents in order to assess technological trajectories, and the comparison shows that mechanical innovations are dominant in the whole period (1890–1990). However, her research also reveals the extremely rapid rise of electronic patents in the most recent period (Figures C.1 and C.2). Even though this argument is not quite independent from the main continuity thesis, it might nevertheless be one of the factors explaining the longevity of some large firms. However, the counter-argument must also be considered—that competence in and attachment to an older technology may lead to some reluctance to embark on a new one. In any case, our argument here is concerned primarily with the continuity
of firms, not technologies. Old and new technologies undoubtedly co-exist, even if the population of firms that use them is changing.

We attempt to detect the major changes occurring in the twentieth century in the population of the largest firms as part of the test of the argument about

(p.344)

Fig C.1. Accumulated Patent Stocks Historically For Mechanical technologies

the importance of structural change in economic history. This limited purpose is constrained by the very nature of available data: identified by a very narrow set of variables, these populations of large firms are statistically inadequate to test conjectures on degrees of monopoly or forms of competition (Stigler 1969: 338).

We now review the evidence for and against the ‘continuity thesis’, which emphasizes the uninterrupted dominance of the same large firms in the core industries over the whole century. We then discuss some other interpretations of the history of big business, and finally present the argument for the long wave pattern.

Based on an extended inquiry on the foundation year of the largest 500 US firms as registered by Fortune in 1994, a study by the Harris Corporation concluded that there was a ‘remarkable endurance and adaptability of major firms as institutions in a world that has seen frequent, rapid, and tumultuous change’ (Harris Corporation 1996: 72).

But the very inquiry conducted by the Harris Corporation actually presents mixed results. To be sure, there is a clear predominance of old firms: 39 (p.345) per cent of the population was more than one century old; if we consider those firms founded between the 1880s and the 1920s, we get approximately 50 per cent. Yet some 16 per cent were founded after 1950, and the pattern of the emergence of new giants is
clearly indicative of the new opportunities related to the ICT revolution. This evidence points to three very relevant characteristics of the giants: (1) approximately half of the larger firms were created during the third Kondratiev wave; (2) the first movers naturally created important barriers to entry; but (3) new opportunities were still open for entrants in new industries and they rapidly became part of the club.

Chandler argues persuasively that the reasons for (1) and (2) lie in the accumulation of capabilities in the framework of early oligopolistic competition and the constructed advantage of large-scale investments in physical and human capital:

By World War I the major players in the capital-intensive industrial oligopolies had established themselves. Many of these firms remained the leaders in their industries for the next half century. Some would disappear by merger, and others would drop off the list of the top 200 as new technologies brought new industrial leaders to the top. Because of continuing oligopolistic competition, ranking in terms of sales, market share, and profit within an industry rose and fell. Nevertheless the first movers, those that made the largest initial investment in capital equipment, continued during the following decades to make large scale investments in physical capital, in most cases funded by retained earnings, and to be among the nation’s major employers of industrial workers. The barriers to entry became so high that few challengers entered the oligopoly. These enterprises thus became learning bases for further development of products and processes. They remained at the core of a network of suppliers, dealers, and other related firms. (Chandler 1997: 76)

And further:
By committing to the extensive long-term investment in human and organisational resources as well as physical assets, these large enterprises could exploit the complementarity between the large-scale investment in physical capital and the sustained capital formation in such intangible assets as human resources and technological knowledge. The capabilities that resulted became the core competencies of many of the international firms. These competencies enabled such firms to maintain themselves as major global players and to exploit the dramatic technological innovations in electronics, aerospace, chemicals, and pharmaceuticals associated with what might be considered a third Industrial Revolution after the Second World War. (Chandler and Hikino 1997: 25).

(p.346) Thus, for Chandler, this form of oligopolistic competition is at the origin of cumulative learning, leading to the construction of specific organizational capabilities, which generate high barriers against new entrants for a long period. These facilitate the persistence of high oligopolistic profits and hence fuel continued growth (Chandler 1994: 3). The oligopolistic profit is at the core of the capacity of these firms to prolong their advantage through large investment in R&D and the creation of new barriers to access.

Chandler's thesis is quite plausible as an explanation of the survival of a significant proportion of the large firms. However, Leslie Hannah came to rather different conclusions. He considered the manufacturing and mining companies of the most developed industrial nations, and compared the 100 largest ones in the 1912 and 1995 lists. The 1912 list is consistent with the results of the previously quoted research by the Harris Corporation: the average age was thirty-two years; i.e. the firms were created on average in the 1880s. But the trajectory from 1912 to 1995 suggests an outstanding conclusion: only approximately 25 per cent remained independent or grew from 1912 until 1995, and of these only about 20 per cent were still in the top 100 in 1995—i.e. 'disappearance and decline was nearly three times more likely among the giants than growth' (Hannah 1997: 18).

Hannah attributes the easy acceptance of the continuity thesis to the strong image of survivors, or to the fact that the authors treat different populations: 100 world or 500 US firms.
However, he found that European firms were actually more likely to survive than American ones. The overstatement of survivors is mainly a feature of our understandably inaccurate memory: ‘Who remembers today the Cudahy Packing Company?’ But they were one of the giant firms of 1912.

In our own analysis, we considered only the United States and the largest population we could get from secondary sources: the 200 largest manufacturing firms, which are identified by Chandler for 1917, 1930, and 1948, and then the prolonged Fortune data for 1963, 1983, and 1997. As a consequence, we got a population of 544 firms for the whole period.

The persistence in the series is limited: only 28 firms appear in the top list for all the six years. These are the ‘persistent’ giants, which were founded at the turn of the century or benefited from mergers during that period (Table C.1). But if 28 firms appear in all the lists, more than half of the firms constituting our population (267) appear only once. The frequencies of presence in the top list is shown in Figure C.3. Furthermore, the ‘persistent’ firms are, on average, higher placed in the general ranking (i.e. their average ranking is lower), as shown in Figure C.4. The two figures draw a picture that is consistent with the continuity thesis, only under the supposition that the irregularly present firms are still part of the top, although not of the 200 top, and that there is a large dispersion in the position through history of the following firms. But the evidence does not support such an assumption. As Figure C.5 shows, 24.8 per cent of the firms are present in our list only in the pre-Second World War lists and drop out afterwards, whereas 47.8 per cent come.

<table>
<thead>
<tr>
<th>Firm</th>
<th>Date of foundation/(date of most important merger)</th>
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<tbody>
<tr>
<td>Alcoa</td>
<td>1888</td>
</tr>
<tr>
<td>Amoco</td>
<td>1889</td>
</tr>
<tr>
<td>BestFoods</td>
<td>(not known)</td>
</tr>
<tr>
<td>Bethlehem Steel</td>
<td>1857 (1902)</td>
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<tr>
<td>Borden</td>
<td>1857 (1899–1904)</td>
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<tr>
<th>Firm</th>
<th>Date of foundation/(date of most important merger)</th>
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<tbody>
<tr>
<td>Coca Cola</td>
<td>1886</td>
</tr>
<tr>
<td>Deere</td>
<td>1837 (1911-12)</td>
</tr>
<tr>
<td>Du Pont</td>
<td>1802 (1895-1905)</td>
</tr>
<tr>
<td>Eastman Kodak</td>
<td>1884 (1903)</td>
</tr>
<tr>
<td>Exxon</td>
<td>1870</td>
</tr>
<tr>
<td>Ford</td>
<td>1903</td>
</tr>
<tr>
<td>Fortune Brands</td>
<td>(not known)</td>
</tr>
<tr>
<td>General Electric</td>
<td>1892 (1901-2)</td>
</tr>
<tr>
<td>General Motors</td>
<td>1908</td>
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<tr>
<td>Goodyear</td>
<td>1898</td>
</tr>
<tr>
<td>Inland Steel</td>
<td>1893 (1954)</td>
</tr>
<tr>
<td>International Paper</td>
<td>1898</td>
</tr>
<tr>
<td>Navistar</td>
<td>1846 (1902)</td>
</tr>
<tr>
<td>Owen Illinois</td>
<td>1903 (1929)</td>
</tr>
<tr>
<td>PPG</td>
<td>1883</td>
</tr>
<tr>
<td>Procter and Gamble</td>
<td>1837</td>
</tr>
<tr>
<td>Quaker Oats</td>
<td>1891</td>
</tr>
<tr>
<td>R. J. R. Nabisco</td>
<td>1875</td>
</tr>
<tr>
<td>Sun Oil</td>
<td>1886 (1895-1904)</td>
</tr>
<tr>
<td>Texaco</td>
<td>1902</td>
</tr>
<tr>
<td>Union Carbide</td>
<td>1886 (1917)</td>
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<tr>
<td>Unocal</td>
<td>1890</td>
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<tr>
<td>USX</td>
<td>1901</td>
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*Source:* authors' own analysis.
in just after the war, and not more than 27.4 per cent are present in both prewar and postwar periods. In other words, 72.6 per cent of the firms either dominated the first period and then simply disappeared from the top, or were not in the list in that period and came in only recently. Persistence is an important phenomenon, but it is an attribute of less than one-third of the giants. There is a dramatic divide at the middle of the century, drawing a number of firms out of the list for good, and opening a window of opportunity for a number of new entrants.

Other studies confirm this result and argue that turbulence may even have increased, affecting at least one-third of the US 1950 list. Friedland (1957) studied the fifty largest US industrial firms for 1906, 1928, and 1950 and concluded that 67 per cent of the 1950 list were already present in the list for the first period, while one-third were not. Audrecht computed the time taken to (p.348)

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**Fig C.3.** The Largest US Firms, 1917–1997, By the Frequency Of Their Presence In the Top List

*Source: authors' own analysis.*

**Fig C.4.** The Largest US Firms, 1917–1997, Average Rank According To the Frequency Of Their Presence
replace one-third of the Fortune list (500 largest firms) and concluded that during the 1950s and 1960s it would have taken two decades, whereas in the 1970s it would have taken one decade, and in the 1980s not more than half a decade (Audrecht 1997: 50). De Geus verified that one-third of the Fortune 500 list of 1970 had already disappeared in 1983, having been bought, dismantled, or simply gone out of business (de Geus 1997). Finally, Simonetti (1994: 1), in a study of the firms in the Fortune list from 1963 to 1987, found (p.349) that takeover activity was the main source of turbulence in the list, that there were major inter-industry differences, and that the emergence of microelectronics ‘had powerful destabilizing effects’. This image of turbulence and takeovers in the highly oligopolistic and protected niche of the larger firms refutes a strong continuity thesis. Moreover, the continued emergence of new giant firms in the software and Internet industries has provided further new evidence. As we have made clear, our own explanation of this turbulence is based on the periodic rise of new constellations of industries and technologies and the consequences of their diffusion through the economic system. In each of the chapters in Part II we have given examples of major firms, emerging from obscurity or newly founded before or during a Kondratiev downswing, which grew so rapidly that they set the tone for the ensuing Kondratiev long boom. Such was the case with the electrical and steel firms established from the 1860s to the 1890s, which became the giants of the belle époque before the First World War. Of course, these were not the only firms that grew enough, at least temporarily, to join the group of large firms.
Others, for example, were in the production of primary commodities, of tobacco, and of metal-working machinery, all so important for the rapidly growing American economy.

A satisfactory analysis of the population of large firms must explain both the phenomena of persistence and that of change. The chemical firms were a special category of rather persistent large firms. Originally, the chemical industry had grown mainly to serve the requirements of the leading sectors of the first industrial revolution—the textile industries—for bleach and dyestuffs. Very few of these small firms were able to make the transition to heavy chemicals and electro-chemistry in the third Kondratiev wave. (p.350) Sometimes they achieved this through amalgamation, and subsequently some of these much larger firms proved able to persist in the fourth Kondratiev wave by using their chemical know-how in the synthesis of new materials to develop and manufacture a new range of synthetic fibres, rubbers, and other materials, needed by the new mass production industries of the fourth Kondratiev. Some of them may be able to make a further transition to the new biotechnology, but it is still too early to assess this likelihood. The persistence of the largest chemical firms is clearly related to their capability in R&D and to both product and process innovations. The inhouse R&D laboratory was invented in the German chemical industry and has remained an outstanding feature of those firms that pioneered this managerial innovation, in both Europe and the United States. They are all research-intensive as well as capital-intensive firms.

However, the data set we are considering provides some confirmatory evidence, which is compatible with our own main hypothesis: new groups of firms have periodically entered the list of giants throughout the twentieth century based on their competence in the emerging new technologies. This has occurred with both electrification and motorization, but the ICT revolution offers the strongest confirmation.

In particular, the software industry has been populated mainly by new firms as well as by those computer firms that survived intensive competition (Chapter 9). This suggests that a concrete sociology of the diversity of agents, and not just simple assumptions on the level of information, is necessary.
for an explanation of technological development (Audrecht 1997: 68; Dosi 1982; Dosi et al. 1988).

Our argument is that there is a pattern of evolution that challenges the established firms, leading to their successful adaptation in some cases, e.g. producers of office machinery (such as IBM and NCR) and some of the chemical firms, or to their disappearance or takeover, or to the emergence of new firms from scratch. Chandler, while emphasizing the dominance of big business from the second to the third industrial revolution, detects the phenomenon of new entry of ICT firms, but dubs it an exception to the path-dependent evolution.

Our argument is that this major rupture in path dependence was possible in spite of the knowledge capabilities of the major firms, in spite of the oligopolistic structure of the market, in spite of the huge advantage in capital, research facilities, and technological power of the established firms. The 'old' firms could not overcome the inertia of their previous development, and the increasing returns obtained in the general trajectory of the previous Kondratiev became limiting factors for their ability to capture the new wave of innovations.

This process of transformation took a long time, and it constitutes one of the explanations for the shape of the long wave: 'A common feature to the development paths taken by major new technologies is that quite unforeseen capabilities and uses are discovered along the route' (R. Nelson 1995: 25). We emphasized in the Introduction to Part II that the (roughly) half-century pattern of long waves is attributable to these phenomena.

By 1963, at the peak of the fourth long wave, the distinctive capacity of generating and retaining larger profits in the motive and carrier branches associated with the new (ICT) techno-economic paradigm was already apparent, although industry was still dominated by the large mass and flow production firms based on mechanical and chemical processes. In 1983 and 1997 this trend was naturally reinforced, as shown in Figures C.6 and C.7. For the whole period we are considering, the history of these four sectors is presented in the Figure C.8, which shows the evolution of the weight of the firms of certain industries in the total assets of the universe. In
this case 1 1917, and the movement is clockwise until 6 1997; i.e. the right-hand side of each graph shows the period 1917–48, and the left-hand side the period 1963–97.

The figure shows that: (1) the production of metal products is specifically a feature of the third long wave (the right-hand side of the diagrams); (2) the importance of oil production marks the third and the upswing of the fourth long wave; whereas (3) the chemical industry retained its weight and adapted through times; and (4) the office equipment industries emerged in the framework of the decline of the fourth wave. Furthermore, the relatively limited weight of the latter in relation to the motive and carrier branches of the previous periods of expansion clarifies why the transition from the continuing decline to the next phase of upswing is so slow and contradictory—although profitability in the new sectors is remarkably higher than in manufacturing as a whole and their applications are widespread in industry and services, the emergence of a new mode of development is far from complete.

(p.352)

**Fig C.6. The Comparative Evolution Of Profits In Relation To Assets For the Metal, Oil, Chemical, and Office Equipment Industries, 1963–1997**

*Source: authors' own analysis.*
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Fig C.7. The Comparative Evolution Of Profits In Relation To Sales For the Metal, Oil, Chemical, and Office Equipment Industries, 1963–1997

Source: authors' own analysis.

Fig C.8. Evolution Of the Weight Of Sectors In the Total Assets Of the 200 Firms (a) Oil, Rubber (b) Metals and
Consequently, the role and fate of the computer and office equipment industries are at the core of any explanation of the general trends in development—as they are the *experimentum crucis* of the continuity thesis. Based on the persistence of some of the giants and their ability to overcome wrong strategic decisions, e.g. IBM, Chandler argues that the computer industry provides a new confirmation for his argument: ‘With few exceptions the new technologies were exploited by long established large firms whose learned R&D capabilities gave them a powerful advantage over start-ups, or firms whose capabilities rested on the commercializing of less closely related technologies’ (Chandler 1977: 89).

Yet some evidence indicates otherwise, as Chapter 9 has shown. IBM did indeed show great survival power, but it was a fast second, rather than a leading, innovator. Moreover, new firms have proved to be of great importance in both hardware and software. Some of the mainframe producers were not able to make a successful transition.

Three main conclusions emerge from this account so far. First, the continuity thesis is challenged, since evidence from the highly oligopolistic markets and from firms protected by impressive barriers to entry nevertheless suggests that change and not stasis dominated the trajectories. A significant percentage of the larger firms both emerged before the divide between the third and fourth long wave and disappeared afterwards, or were created only after that moment.

Second, the emergence of new industries based on the changes associated with the diffusion of ICT was the driving force either for the creation of new firms or for the access of old but transformed firms to the top list. Furthermore, the older surviving giants are in general those that were able to change and to explore new processes of production, new knowledge, and new markets. This dynamic was based on the accumulation of profits and, related to that, of technological competencies and organizational capabilities. In that respect, our analysis is in agreement with Chandler and his colleagues.

<table>
<thead>
<tr>
<th>Metal Products (c) Office Equipment (d) Metal Products (c) Office Equipment (d)</th>
<th>Chemicals, Pharmaceuticals, Cosmetics Chemicals, Pharmaceuticals, Cosmetics</th>
</tr>
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<tbody>
<tr>
<td>Source: authors' own analysis. Source: authors' own analysis.</td>
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</table>
Whether from the standpoint of continuity theories or from our own standpoint of the periodic irruption of new firms into the top echelon, profitability is clearly of the greatest importance. Those firms that survive and continue as members of the leading group can do so only by accumulating sufficient profits to re-equip, and to conduct and finance new activities, or introduce new processes. In recent times, diversification is frequently based on expensive inhouse research and development.

Equally, the new entrants to the top echelon need profits to finance their headlong expansion at some point, even if initially they are able to expand by borrowing. During the ‘bubble’ expansion periods, it may sometimes seem as though the law of gravity is suspended, but sooner or later the requirement for profitable investment reasserts itself, and when the bubble bursts only the profitable survive and grow further.

The imperative need for profitability explains, on the one hand, the bitterness of some of the labour conflicts, which we shall analyse in Section C.3, and, on the other hand, the attempts of leading firms in new technology to cement their leadership through patent protection, through influencing standards, through market power, through scale economies, or through a variety of other means. This is why the evolution of a relevant regime of regulation discussed in Section C.4 is the arena also of intense political and social conflicts. Sometimes, attacks may be directed against the previous dominant incumbent firms, as in the assault on the ‘old’ monopolistic telecommunications utilities; sometimes the pressure is directed to the relaxation or abandonment of trade protection in foreign markets, and sometimes to changes in the patent regime or to taxation, or to all of these; but, in whatever specific direction policy adjustments are claimed and enforced, the objective is to improve profitability and to enlarge markets for the new constellation of technologies.

Although a precise computation of the profit rate is quite difficult with past data and even currently available data for international comparisons, it is still possible to identify the dynamics of the profit schedule in some sectors of the economy and in the aggregate national level. Available data on the most recent wave confirm several of our main points and are consistent with the swing of the last waves in the USA.
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(Figure C.9). First, they clearly show the upswing in the postwar period: in a study for the period 1948–97 in the USA, Duménil and Levy showed that after 1948, and in particular in 1956–65, the profit rate attained a historical maximum. From the end of the Civil War, excluding from the calculation the publicly owned (transport) and public utilities, the authors concentrated on the dynamics of the private business sector and showed that this upswing gave place to a structural crisis in the 1970s. Second, in the early 1980s the profit rate had declined to half of the average value for the period 1956–65. Third, during the social process of adjustment in the 1970s, the ‘effects of the decline of the profit rate were significantly offset by the devaluation of debt resulting from inflation and the low levels of real interest rates’ (Duménil and Levy 1999: 1). Finally, although since the mid-1980s the profit rate recovered half of the lost profitability, by 1997 it was still far short of the record values of the previous upswing. Indeed, between 1948 and 1982 the profit rate was between half and one-quarter of that rate, according to sector. And in 1997, in spite of some years of upturn, the aggregate rate had not yet recovered half of the value of 1948; in other words, the upswing still faced a mismatch and could not be generalized to the whole business economy. The fall in the productivity of capital has been mainly responsible for this behaviour, although the decrease in the share of profit also accounts for part of the effect. We have already shown the contrasting experience of the office...
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All of this helps to explain the seductive attraction of the Internet bubble, which appeared to offer quite extraordinary profits to the most fortunate investors, and also the intensity of the conflicts over many features of the new regulating regime, such as the ‘Bit Tax’, the Seattle trade negotiations, and the huge takeover battles in the ICT industries.

In this section, we have examined one of the most controversial and difficult issues in the debate on long waves. The statistical data are far from satisfactory in any of the areas we have examined, but we hope that we have provided some persuasive data and arguments to justify our view that the entry and diffusion of successive new constellations of interdependent innovations has had profound effects, not only on the structure of the economy, but on the political behaviour of contending interest groups, parties, and classes, as we shall discuss further in Sections C.3 and C.4.

C.3 Strike Movements and Trade Unions in Recurrent Structural Crises
In spite of its early definition as *political economy*, since the classical period economics has never been at ease with the political and social variables that described the evolution of the system as a whole, and barriers were built in order to ignore their impact in most econometric models. Yet it is quite obvious that the production and distribution of wealth, the access to material and immaterial goods, and the power to influence, to regulate, and to determine social and technological trajectories have been and will be the subject of great conflicts. In that sense, economics must deal with these historical trends in the production, allocation, and change of power and wealth. Ricardo’s work on rent exemplifies the recognition of this fundamental point in the classical tradition.

In the economics literature after the end of the great classical period, this interaction between economic variables and political and social actions, (p.356) agents, and strategies was scarcely discussed. Only the institutional economists, such as Veblen, continued this debate. Supple (1963: 14) went so far as to say that, with the exception of Karl Marx and one or two individuals, ‘for almost a century after 1850 there was no fresh systematic discussion of the nature of economic
development’. Occasional heretics, such as Kalecki (1943), discussed the possible social and political consequences of Keynesian full employment policies with his theory of the political business cycle. Subsequently, the original agenda set by Kalecki was abandoned; yet his model of collective power and the relationships of forces in disputes over the distribution of wealth across a divided society showed insights that we need in order to understand societal changes over time. Indeed, what we have been discussing so far is precisely an interpretation of the evolution of power in modern capitalist societies. The available theories based on general equilibrium —i.e. the non-existence of social conflict—do not provide a relevant model for the understanding of political cycles, since they axiomatically reject its very existence and cannot therefore present a general explanation for the recurrence of periods of social unrest.

An insightful economic historian proposed an alternative approach. Hobsbawm had earlier suggested the hypothesis that social conflicts were somehow clustered and emerged at the end of ‘long phases of development’, or Kondratieff cycles (Hobsbawm 1964: 148). The four cases he indicated are the strike wave of 1847–8 at the end of the first Kondratieff cycle; the 1868–73 and 1889–93 strikes at the end of the expansion and the end of the depression of the second wave, respectively; and the wartime strikes at the turning point of the third wave (Hobsbawm 1964: 153). We will explore this hypothesis, as well as that of Kalecki, as a framework for our assessment of social conflict in the perspective of long periods of history.

Our basic hypothesis follows Hobsbawm's conjecture that there are compelling reasons for the clustering of social conflict at the two turning points of the long wave. In the long phase of the dominant expansionary trend, the workers' movement tends to build strong organizations, namely trade unions, on the basis of full employment and consequently with better chances of disputing new social gains. At the peak of this strengthening process, workers are more able to exert pressure for sharing in undistributed increases in the profits from rising productivity. However, employers try to retain these profits in order to maintain the process of accumulation in a period of growing difficulty for generating new
opportunities of high profitability and of intensified competition in the ‘old’ activities.

Consequently, strike waves tend to cluster near the upper turning point of long waves, as was clearly the case with the 1808–20, 1868–73, 1910–12, 1968–9, and 1974–5 periods. Some of these conflicts were prolonged into the first years after the turning point, when there were still some forces not sufficiently damaged by unemployment or political repression to engage in defensive struggles or even sometimes offensive actions. Cultural and political time lags mean that traditions and behaviours, once established, (p.357) may often persist in changed circumstances, as Salvati (1984) showed so clearly. A new generation of young leaders may adopt a more militant stance in industrial conflicts after a long period of full employment.

The second form of clustering is related to resistance to the adjustment process associated with the spread of a new techno-economic paradigm, which takes place before and around the lower turning point of the wave. As we have already argued, the structural crisis of adjustment at the end of each wave is attended by higher levels of structural unemployment and greater job insecurity. Those who remain in their jobs may have to adjust their expectations of remuneration and promotion. These adjustments may drastically change the daily life of the workers by requiring a renewal of skill and professional distribution as well as new forms of control and hierarchy, all of which are felt as major challenges to the previous balance of forces. The new techno-economic paradigm imposes new rhythms of mental and manual work that challenge the traditional norms of production and lead to defensive struggles. This was the case in the 1880s–1890s, the 1920s–1930s, and (in relation to ICT) the 1970s–1980s.

These conjectures may be tested against empirical evidence, such as that provided by Figure C.10, which summarizes the dynamics of strikes in five countries for the end of the second and for the third and fourth long waves. Although this figure provides valuable information, it has some shortcomings that must be pointed out. First, aggregation plays some tricks, and peculiar nationally located events may distort the picture. In spite of this, there are important elements of coherence in the strike waves across countries, and the explanation may be
found in the overall political and social framework as described by the specific settings of each long wave. Second, some important countries are missing from this picture, especially Spain, a country whose social battles dominated the 1930s, a period that is particularly underestimated in Figure C.10 in view of this exclusion. Nevertheless, the graph indicates very roughly some major features of the rhythm of social movements over one century and these are summarized in Table C.2.

Although information about numbers of strikers and lost working days is scarce and frequently unreliable for the whole period we are considering, it is possible to complement it with qualitative information about the scope of social and political conflicts and insurgencies and with indirect information from other sources. This analysis demonstrates major strike waves and periods of intense conflict for those countries for which we have enough information (Table C.2). Indeed, Figure C.10 shows that there are clear patterns of strike waves: in specific political contexts, frequently dominated by international trends (e.g. the strike wave after the end of the First World War and in 1968–74). How can we explain this feature, without resorting to a conspiracy theory? We suggest that part of the explanation lies in the common dynamics of developed capitalist countries, as imposed by the diffusion of each techno-economic paradigm, including of course political as well as economic influences.  

![Fig C.10. Strikers and Strike Days For Five Countries (Britain, USA, France, Italy, Germany) In Two Long Waves, 1880–1983
Source: Gattei (1989)](p.358)
### Table C.2. Major Strike Waves in Five Countries

<table>
<thead>
<tr>
<th>(1) Long wavesb</th>
<th>(2) Major strike waves at peaks</th>
<th>(3) Major strike waves at troughs</th>
<th>(4) Peaks in numbers of strikers</th>
<th>(5) Peaks in strike days</th>
</tr>
</thead>
<tbody>
<tr>
<td>I A Expansion,</td>
<td>1808–20</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1793–1825</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>I B Depression,</td>
<td>1847–8</td>
<td></td>
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<tr>
<td>1826–47</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>II A Expansion,</td>
<td>1868–73</td>
<td></td>
<td></td>
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<tr>
<td>1848–73</td>
<td></td>
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<td></td>
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<tr>
<td>II B Depression,</td>
<td>1889–93</td>
<td></td>
<td>1893</td>
<td></td>
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<tr>
<td>1874–93</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>III A Expansion,</td>
<td>1910–12</td>
<td></td>
<td>1912</td>
<td></td>
</tr>
<tr>
<td>1894–1913</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III B Depression,</td>
<td>1914/18–1939/45</td>
<td>1920–4</td>
<td>1920–1,</td>
<td>1921,</td>
</tr>
<tr>
<td>1914/18–1939/45</td>
<td>1936–7</td>
<td>1936</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV A Expansion,</td>
<td>1947–8</td>
<td></td>
<td>1949,</td>
<td>1946,</td>
</tr>
</tbody>
</table>

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*a* Long waves denote the expansion and depression phases of the long cycles of capitalist development.
<table>
<thead>
<tr>
<th>(1) Long waves</th>
<th>(2) Major strike waves at peaks</th>
<th>(3) Major strike waves at troughs</th>
<th>(4) Peaks in numbers of strikers</th>
<th>(5) Peaks in strike days</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV B</td>
<td>Depression,</td>
<td>1974–5</td>
<td>1975,</td>
<td>1974,</td>
</tr>
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<td></td>
<td>1974–. . .</td>
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<td>1979,</td>
<td>1979,</td>
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<td></td>
<td></td>
<td></td>
<td>1982</td>
<td>1983</td>
</tr>
</tbody>
</table>

(a) Columns (4) and (5) are based on Gatteei's data for five countries (UK, USA, France, Italy and Germany).

(b) A,B: dominance of expansion or depression.

*Source:* adapted from Gatteei (1989).
This process of clustering of social conflict has been discussed by Salvati (1984) and by Screpanti (1984), who also identifies four major strike waves (1808–20, 1866–77, 1911–22, and 1967–73), all situated after a peak and early in the long period of downturn. According to his interpretation, the intensity of the class struggle increases during the expansionary phase and decreases afterwards, with the strike waves evidencing the workers' efforts to negotiate the conditions for each readjustment, but faced with the weakening of their organizations during the long downswings.

Of course, each strike wave is an individual historical event and exhibits distinguishable characteristics. The first wave, in 1808–20, was concentrated around the new centres of industrial production in Britain: Lancashire, Durham, Northumberland, Yorkshire, Nottinghamshire, and the Midlands. A very specific feature of this period was the Luddite movement (1814, 1816–17), and the whole process culminated in the 1818–20 strikes of textile workers. The strikes in the 1830s and 1840s were associated with the big Chartist demonstrations and often had a direct political goal.

In France too the political context was important. The memory of the Revolution, the Napoleonic Wars, and the Restoration echoed in revolutionary conflicts: in 1830, in 1848, and again in the Paris Commune in 1871. The workers' movement took an active part in all these processes, as well as in Lyon in 1831, in the 1832–40 strikes, and again in 1893.

The following waves, in 1847–8 and 1866–77, were more international in character. Around the peak of the third long wave, rather militant tendencies were apparent in several countries, from a series of strikes in Berlin (1910), France (1911), and the Ruhr (1912) to the 'unofficial' strikes in Britain (1910–15) and in the USA (1911–16). But it was after the end of the war, and after the Russian Revolution of 1917, that most of the anger and delayed expectations were shown: claims for wages, employment, new legislation, reduction of the working day, and universal voting rights all came together in a period of great confrontation. In France, general strikes were called in 1919–20; in Britain, the railwaymen and steelworkers took action in 1919, and the miners in 1920, the shipbuilding workers in 1920–1, the sailors and dockers in 1922–3, and many millions of workers in the nine-day General Strike in May 1926, with the resistance of the miners continuing long after this. In Italy a movement for the occupation of factories and cities created a pre-revolutionary situation in 1920, while in Germany a strike prevented the Kapp putsch in that year. In
the USA the peak of strikes occurred between 1919 and 1923 and were severely repressed. Only with the more favourable labour legislation of the New Deal was the new Congress of Industrial Organizations (CIO) able to organize big new industrial unions in automobiles, steel, and rubber (tyres) in the 1930s. Elsewhere, fascist and military governments had already crushed trade unions in Germany, Italy, Portugal, Japan, and several other countries.

Strikes in the 1930s emerged from resistance taking place after the down-swing of the third wave was already largely under way. Apart from the USA, (p.360) the 1936 wave centred in Spain after a number of years of conflict, leading to the proclamation of the Republic, and in France, leading to the formation of a new Popular Front government and to the Matignon agreements, which established the principle of collective bargaining, new rights for shop stewards, increases in pay, and the recognition of the right to holidays. Thus, the strike movements of the 1930s, whether in the United States, France, or Spain, again showed a close connection with political events and with attempts to create a more favourable legislative climate for the activities of working-class organizations. Following the breakup of the wartime and early postwar anti-fascist coalitions and alliances, and the outbreak of the Cold War, a new wave of conflict erupted in 1947–9, centred especially in France, Italy, and Greece. Finally, the last great wave was that of May–June 1968 in France and 1968–9 in Italy, as is clearly recognizable in Figure C.8, and had its final episodes in the strike activity around 1974.

It has not been possible in this very condensed account to do justice to the complexity and variety of labour conflicts and strike movements in various countries. We hope, however, that even this very brief and simplified presentation has been sufficient to establish two major points.

1. On both a national and an international level, there has been quite strong evidence for a much greater intensity of such conflicts during two periods: (A) around the peaks of long wave booms (1808–20, 1868–73, 1910–15, and 1968–74); and (B) during the long ‘downswing’ periods following these peaks, which have been designated here as ‘structural crises of adjustment’. This is apparent both from the number of disputes leading to strikes and from the number of strike days.
2. Although there were specific local circumstances leading to these strikes and their varying intensity, many of them were strongly influenced by political events and themselves reciprocally influenced national and international politics. At the most elementary level, of course, a large number of strikes were simply about the right to organize and belong to trade unions. At a later stage, some were about the preservation of this right and of wider democratic rights in society, for example the successful 1920 strikes by German workers against the Kapp putsch (an attempt to establish military rule). Strike movements often accompanied or preceded political rebellions, as in 1905 in Russia.

However, most strikes were about ‘economic’ issues—pay, hours of work, conditions of work, and holidays. Many trade union leaders, as well as employers, were concerned to confine union activities to this narrower agenda, but they have never been wholly successful in this endeavour. There are obvious reasons for this, as the legal and political climate heavily influences the relative bargaining strength of the contending parties in labour disputes. From time to time rather determined efforts have been made, both by individual employers such as Ford and by governments such as fascist and military governments, to destroy unions completely. At a less acute level, (p.361) there have been fairly persistent attempts to curtail union power by labour legislation limiting the right to organize, the right to picket, the conduct of strike ballots, and so forth. These attempts began in the early days of the British Industrial Revolution, as in the Combination Acts of 1799, and have periodically recurred.

Both the more serious efforts to get rid of unions altogether and the lesser efforts to curtail their activities have occurred mainly, though not entirely, during the downswing phases of the long waves. It is in these phases that employers meet with stronger competition both on the domestic and the international market. In the ‘old’ industries this may often be based on low wage competition, and in these industries too problems of surplus capacity and plant closures may often occur. In the ‘new’ industries of the rising constellations the situation is rather different, as their problem may be one of skill shortages and lack of new capacity. For a while, they may
pay above-average wages and salaries and offer comparatively attractive conditions to a non-union labour force.

Thus, rather different circumstances may prevail side by side in these periods of intense structural change, with very variable levels of unionization and strike conflicts. Bitter and prolonged conflicts occur mainly in some older industries confronted with severe contraction, for example in the British coal industry in the 1920s and again in the 1980s, or in the steel and automobile industries in several countries.

However, despite the strength of feeling and bitterness often evident in such disputes, the capacity of the workers and their organizations to engage in conflict is likely to be severely undermined during the periods of structural adjustment. It is undermined on the one hand by the widespread prevalence of unemployment, and on the other hand by the heightened resistance of the employers, often reinforced by legislation and government intervention to limit union power. Whereas in the long boom period employers and governments would more often feel able and willing to make concessions on pay and would not feel disposed to endure loss of production in expanding markets, during the downswing periods they would more commonly feel that they could not possibly afford any increase in labour costs, or any other concessions to trade unions. Lockouts are quite likely to occur in these periods and were, for example, widespread in the 1830s in Britain. In 1834, in Lancashire and Yorkshire, many employers locked out workers who refused to sign a paper renouncing membership of trade unions (Cole 1941: 17).

All of this discussion demonstrates the importance of the political as well as the economic context in which labour disputes take place and strikes are fought out. This is most obvious of course when unions are banned and strikes illegal, but at the opposite pole, very different outcomes can occur where the legislative climate is made more favourable to unions. The most obvious example of this was the United States. For a long time, the resistance of American employers to the efforts of workers to organize had resulted in a very low level of union membership and activities. The Pinkerton (p. 362) Detective Agency was used by a number of large employers to combat the formation of unions and their activities. In 1933 fewer than 8 per cent of American workers were organized, but this situation changed dramatically in the
next few years as a result of the National Labour Relations Act (NLRA), passed by Congress in 1935 (Table C.3). By 1937 membership of unions had risen from 2.8 million (1933) to 7.7 million: nearly 4 million had joined the new Congress of Industrial Organizations (CIO) mass production unions. Yet, this was in a period of heavy unemployment, when union membership in many other countries was falling. In Britain, for example, the Trade Disputes Act, passed in 1927 after the General Strike, curtailed union activities, and membership fell sharply. This Act was not repealed until after the Second World War.

American employers were extremely critical of the NLRA, and in some instances continued to resist recognition of unions. In the steel industry, which had opposed unionization ever since the days of Carnegie and the Homestead strike (see Chapter 7), the smaller steel corporations (Bethlehem, Republic, Youngstown and others, known as ‘Little Steel’) fought bitterly against the CIO, while ‘Big Steel’ (Carnegie’s United Steel) made a deal conceding union recognition, a pay rise, and the forty-hour week (Huberman 1940: 367). ‘Little Steel’ stubbornly refused to follow ‘Big Steel’, and the CIO strike that ensued in May 1937 was defeated by a violent campaign.

The American steel industry illustrates the point that employers themselves were not always agreed on the tactics to be followed in relation to trade unions. GM recognized the CIO early in 1937 but Ford resisted, giving way only after a sharp struggle. Generally, American employers remained hostile to the NLRA and succeeded in reversing some of its achievements by

### Table C.3. Trade Union Membership in the United States, 1933-1937 (millions)

<table>
<thead>
<tr>
<th></th>
<th>1933</th>
<th>1935</th>
<th>1937</th>
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<tbody>
<tr>
<td>Organizable workers</td>
<td>35.0</td>
<td>35.0</td>
<td>35.0</td>
</tr>
<tr>
<td>AFL(^a)</td>
<td>2.1</td>
<td>3.0</td>
<td>3.4</td>
</tr>
<tr>
<td>Unaffiliated unions</td>
<td>0.7</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>CIO</td>
<td>—</td>
<td>—</td>
<td>3.7</td>
</tr>
<tr>
<td>Total organized workers</td>
<td>2.8</td>
<td>3.6</td>
<td>7.7</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Year</th>
<th>1933</th>
<th>1935</th>
<th>1937</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of workers organized</td>
<td>7.8</td>
<td>10.6</td>
<td>21.9</td>
</tr>
</tbody>
</table>

(a) The American Federation of Labor was originally mainly craft unions in the 19th century, but gradually extended its industrial membership until in the 1930s a ‘Committee of Industrial Organization’ made a determined effort to organize the semi-skilled and unskilled workers in the mass production industries, leading for a time to a split with the supporters of the Congress of Industrial Organizations (CIO).

Source: Huberman (1940: 359).

The case of Roosevelt’s presidency in the 1930s was somewhat unusual, as the general trend during the downswing periods of the long wave has been towards rather conservative or even reactionary regimes. At the end of Chapter 6 (Section 6.8) we described the swing towards nationalist and anti-liberal parties that followed the severe recession of 1873. In Germany, Bismarck’s ‘Anti-Socialist Laws’, passed in 1879, were intended to weaken the political representation of the German working-class movement. Protectionism became more fashionable and imperialism quite typical of the behaviour of the industrialized powers. In the downswing of the third Kondratiev, in the 1920s and 1930s, nationalistic and fascist movements were widespread in Europe and Japan. It is easy to see why such tendencies should become stronger in a period of falling prices, acute conflicts over markets, and structural unemployment. Job insecurity is clearly associated with hostility to immigrants, racism, and ethnic conflicts. This was also evident in many parts of the world during the downswing phase of the fourth Kondratiev (1970s–1990s), leading the
Secretary-General of the OECD to describe the mass unemployment as ‘alarming’ because of its potential social consequences during the period of structural change.

The rise of the American trade unions in the 1930s, and the NLRA which facilitated it, were therefore rather atypical, as were various other features of Roosevelt’s New Deal. This illustrates the point that there is no simple one-to-one correspondence between trends in the economy or technology and political events. The political subsystem is semi-autonomous and has its own dynamic and traditions.

C.4 The International Regime of Regulation
This final section deals with changes in the regulation regime, which, as Perez (1983, 1985) originally showed, is also a recurrent feature of the long wave. The changes that we have just discussed in the previous section in relation to strikes and trade unions are just one aspect of this wider regulatory regime. In this section we first of all discuss the reasons for our focus in Sections C.2 and C.3 on labour and big business, resembling in some respects the approach of the French regulation school; these authors have done more (p.364) than anyone else to develop this concept (Boyer 1975, 1979, 1988; Aglietta 1976). However, our main purpose here is to raise some questions about those institutions, whose function it is to regulate international trade, investment, and financial payments: the WTO (formerly GATT), the World Bank, and the IMF.

Once industry was firmly established in Europe and North America, it was the conflict between workers and employers that moved to centre stage because of its crucial importance in determining wages, costs, and profits. So far in this chapter, we have concentrated on this source of social conflict for that reason, and because it is strongly influenced by both short-term and long-term fluctuations in economic activity.

The changing conditions of capital accumulation and the relationships between labour and capital are also at the heart of the theory of the French regulation school. Boyer and his colleagues place less emphasis on technologies than we have done in this book, but their approach has many points of affinity to our own. For example, although their periodization is slightly different, they insist that, ‘contrary to the usual
approach in economics’, their focus is not ‘on short or medium-term but on the long-run and structural change in advanced capitalist economies’ (Boyer 1988: 68).

They explain that their approach, called ‘Régulation’ in French, is not easily translated into English, because ‘the English word “regulation” is usually associated with the much narrower problem of regulation of public utilities, whilst the expression “socio-economic tuning” brings a connotation of a conscious and sophisticated adjustment mechanism. . . . For this reason, we simply use the word régulation in the French sense of the word’ (Boyer 1988: 68).

We too have used the concept of regime of regulation in the wider sense of loose overall political and legal coordination and control, although we have placed greater emphasis specifically on the regulation of new technologies within the regime. We have briefly considered some of these specific problems of regulation of the Internet in Section 9.6, but we do not intend here to enlarge on this or any other aspects of regulation of ICT. We intend rather in this final section to concentrate on the international ‘rules of the game’ with respect to trade, payments, and investment.

It has become commonplace to speak of ‘globalization’ with reference to the most recent period of world capitalist development. However, as this second part of the book has shown, international trade, the migration of skilled people, flows of investment, and transfer of technology have been characteristics of every new technology system that has diffused through the economy for the last two centuries. In this sense, ‘globalization’ itself is not a new phenomenon: what has changed recurrently is the regime that has sought to regulate and to some degree coordinate these movements. (p. 365) Changes in this regime have been another of the recurrent features of the long wave. The rules of the game have to be changed periodically to accommodate not only the new technologies, but also the changes in the balance of power in international relations, in the economic strength of the various contending powers, and in the culture and ideology of the dominant social groups.

In the present change of regime, what is remarkable is the extent of liberalization of trade and of world-wide capital movements. This is true both for long-term investment,
whether through multinational affiliates or otherwise, and for short-term speculative transactions. Information technology has facilitated all of these flows and, in particular, has accelerated and expanded the latter type of transaction, but it is not in itself the main reason for the changes in regime. These lie rather in the political and cultural subsystems and the hegemony of the United States in the governance of the international economic and financial institutions in the closing decades of the twentieth century.

The collapse of the Soviet-style planned economies in the 1980s and 1990s, the weakening of many attempts at planned industrialization and import substitution regimes in the developing countries, and the tide of privatization everywhere have all converged to an unprecedented degree in the hegemonic influence of one country in the world economy, world military affairs, and world politics—the United States.

Again, the dominant influence of one power is not in itself an entirely new phenomenon. Some theories of the long wave are in fact based entirely or mainly on long-term changes in the hegemony of successive different powers. For example, Modelski and Thomson (1988) suggested that changes in naval power have historically been one of the strongest influences on commercial developments and world trade, and hence on the changes in the world economy, and perhaps have been the strongest single influence on long cycles of development.

For reasons explained in Part I, our own theory of history is not based on the exclusive dominance of any one subsystem in society, whether economic, technological, scientific, cultural, political, or military-political. But we are certainly far from denying the strong influence of military power in the evolution of the social system. Indeed, as explained in Chapter 4, we explicitly rejected all those theories of the long wave that have been based on simply omitting periods of war from the statistics (especially the First and Second World Wars) as an inconvenience. For us, this is one of the major fallacies in the GDP-trend type of standard econometric analysis, and an unacceptable distortion of real historical events.

Our account, rather to the contrary, has emphasized the influence of wars, whether sometimes as a retarding factor (as with Germany in the First and Second World Wars), or sometimes as a facilitating and accelerating factor (as
probably with Britain in the Napoleonic Wars and the United States in the First and Second World Wars). We would also accept with Modelski and (p.366) Thomson that the British naval supremacy in the eighteenth and nineteenth centuries was an important contributory factor to Britain's commercial and technological leadership in the world economy, as has also been the case with the United States Navy and Air Force in the twentieth century.

At the micro level, we have also reported many instances in Chapters 5–9 of the influence of military demand and military technology on the overall evolution of technological capability. Examples were block-making for the Admiralty, Henry Cort's role as contractor for the Navy, Frederick Taylor's work on special steels at Bethlehem for the US Navy, and the prolonged close relationship of Krupp with the Imperial German government and, later, the Third Reich. Finally, reverting again to the macro level of analysis, we have stressed the role of military technology in the evolution of ICT and the major influences of rearmament on the world economy in the 1930s. Thus, we have frequently reiterated the interdependence of civil and military developments at both micro and macro level.

However, in our view, the dominance of the United States in the international regulatory regime emerging with ICT cannot itself be explained exclusively in military–political terms. The technological leadership of American-based multinational corporations in ICT does owe a great deal, of course, to military R&D and procurement, and the Internet itself originated as a Pentagon ARPA project. However, the subsequent development of the Internet and of other aspects of ICT owes far more, recently, to the aggressive leadership of American firms in civil technology and civil markets.

To be sure, in the background of the international debates on the regime of regulation is always the possibility of American coercion, even though this has not always been effective, as was shown in Vietnam and Cambodia. The main sources of American dominance in the international regulatory regime now emerging lie rather in the economic, civil–political, and cultural subsystems of society, as we shall attempt to show in the example of the IMF, the WTO, and the World Bank, the
principal instruments of international regulation in the global economy.

Typically, the leaders in a new wave of technology, whether Britain in the nineteenth century or the United States in the twentieth, will advocate the opening up of world markets to the new products and services, although they may at the same time try to restrict access to technological know-how, through changes in the intellectual property regime (IPR). Both of these types of behaviour are fairly obvious and predictable. The need to sustain profitability, which we have discussed in Section C.2, is obviously a major factor influencing large corporations to exert political pressure on these points. The extent to which they are effective varies not only with the characteristics of the technology, but also with the balance of power in the system of international relations, and the extent to which the ideological and cultural (p.367) arguments in favour of free trade and a stronger IPR carry conviction in other countries, especially those that are in a ‘catch-up’ situation.

In the early and mid-nineteenth century, Britain had the naval strength to enforce compliance with a fairly stable free-trade regime in many parts of the world, but it also had considerable support for the free-trade ideology. All of this was reinforced by the Gold Standard and Britain's financial strength in regulating the system of world payments in trade and capital transactions. However, during the structural crisis of adjustment in the 1870s and 1880s, this system was gravely weakened by a growing movement for protectionism in the leading catch-up countries and in the end in Britain itself.

This weakening of liberal free trade ideology was due to a resurgence of nationalism, imperialism, and colonialism, as well as to the direct political influence of agricultural and industrial interest groups seeking to retain or enlarge their markets and their profits. The conflicts that ensued led to the breakdown of the old international regulatory regime and, finally, to a huge contraction of world trade in the Great Depression and to the Second World War. The Allied victories in this war and the memories of the 1930s made possible a renewed effort to establish a new and more stable international regulatory regime in the 1940s. American dominance in most of the world economy, albeit within the framework of the Cold War with the Soviet bloc, facilitated the
gradual return to a new regime of free trade and greater mobility of capital. These trends were influenced by the role of Keynes in the discussion about the design of the Bretton Woods institutions, which he intended to promote the catch-up of developing countries, and to prevent occasional balance of payments crises from leading to competitive devaluation, protectionism, and depression, as had occurred in the 1930s. Although Keynes was disappointed with the results of that discussion, he was clearly right to emphasize the dangers of uneven development.

Originally, the international regulatory institutions were intended to be part of the UN family, but disagreements among the powers led to the IMF and the World Bank being set up in Washington, under a different form of governance, amenable to much closer American influence. This Bretton Woods regime provided a fairly effective and stable regulatory framework for a quarter of a century after the Second World War during the long postwar boom.

To all outward appearances, it might seem that the American hegemony, emerging even more firmly in the 1990s, has re-established a still more stable regulatory framework for decades to come, and this is indeed the assumption of many forecasters. However, our historical analysis suggests otherwise, unless some big changes are made in this international regime. The appearance of harmony hides numerous conflicts just beneath the surface, and the instability of investment behaviour remains a fundamental problem of the system. The launch of the World Trade Organization and then its summit at Seattle in December 1999 provided abundant evidence of these problems. It was intended at this meeting to negotiate a new round of reductions \((p.368)\) in barriers to trade. The US representatives, supported by some of their allies, were anxious to use the meeting to promote easier access for the new products and services in which US firms are dominant, such as e-commerce and GM foods, but this agenda had to be abandoned because of riots in the streets of Seattle and tensions within the meeting. The official arguments in support of the American objectives went beyond the simple reductions in tariffs which were the staple diet of many previous successful trade negotiations over the last few decades within the framework of GATT, the predecessor of the
WTO. So-called ‘non-tariff barriers’ had become steadily more important in the successive ‘rounds’ of trade negotiations, and the conflicts both inside and outside the Conference Hall at Seattle indicated the apprehension aroused by this trend.

For some time before the WTO Seattle meeting began, the OECD had organized discussions on an international treaty on foreign investment, whose intention would be to do away with those national laws and business procedures that restricted practices allowed in one country but not another. Each country would be obliged to grant corporations all the privileges allowed by any other country. Clearly, this could seriously undermine legislation in any country designed to protect the environment or labour and welfare legislation. The conflicts in Seattle were in part provoked by fears of this interpretation of ‘globalization’ as well as by other more enduring trade conflicts between the developing countries and the rich countries, as in the case of agriculture. Paul Krugman introduced ‘Seattle Man’ and ‘Davos Man’ to symbolize the conflict of ideas at the time of the ‘World Economic Forum’ of top business people at Davos in January 2000.

Whatever we may think of the Seattle man metaphor, this example is sufficient to show that changes in the regulatory regime, whether at national or international level, can raise the most fundamental political and ideological conflicts within and between nations. A more serious commentary on the role of the United States in the international agencies was that of Joseph Stiglitz. He started out by suggesting that the demonstrators who trashed the WTO in Seattle were not simply ignorant rioters when they demonstrated against the IMF:

They’ll say the IMF doesn't really listen to the developing countries it is supposed to help. They’ll say the IMF is secretive and insulated from democratic accountability. They’ll say the IMF’s economic ‘remedies’ often make things worse—turning slow-downs into recessions and recessions into depressions. And they'll have a point. I was chief economist at the World Bank from 1996 until last November during the gravest global economic crisis in a half century. I saw how the IMF in tandem with the
US Treasury Department responded. And I was appalled. (www.thenewrepublic.com/041700/stiglitz)

In an outright indictment of IMF and US Treasury policy, Stiglitz went on to describe his attempts to convince top IMF economists and bureaucrats of the damage they were inflicting on the East Asian economies. He found, however, that 'changing minds at the IMF was virtually impossible': (p.369)

I shouldn't have been surprised. The IMF likes to go about its business without outsiders asking too many questions. In theory the Fund supports democratic institutions in the nations it assists. In practice, it undermines the democratic process by imposing policies. Officially, of course, the IMF doesn't 'impose' anything. It 'negotiates' the conditions for receiving aid. But all the power in the negotiations is on one side—the IMF's—and the Fund rarely allows sufficient time for broad consensus-building, or even widespread consultations, with either parliaments or civil society. Sometimes, the IMF dispenses with the pretence of openness altogether and negotiates secret covenants. (www.thenewrepublic.com/041700/stiglitz)

Stiglitz pointed out further that, even though the World Bank was contributing billions of dollars to the IMF rescue packages, its voice 'was ignored almost as resolutely as the people in the affected countries'.

Even more disquieting were his comments on the calamity of Russia, which 'shared key characteristics with the calamity in East Asia—not least among them the role that IMF and Treasury policies played in abetting it'. He described the conflict between two groups of top American economists in the advice to give to Russia. One of these groups, which included Stiglitz himself and Kenneth Arrow, emphasized the importance of the institutional infrastructure. But 'The second group consisted largely of macro-economists whose faith in the market was unmatched by an appreciation of the subtleties of its underpinning - that is of the conditions required for it to work effectively. These economists typically had little knowledge of the history or details of the Russian economy and didn't believe they needed any.'
Stiglitz went on to describe how ‘the rapid privatization urged upon Moscow by the IMF and the Treasury Department’ allowed a small group of oligarchs to gain control of state assets. Through the mid-1990s the Russian economy continued to decline and the nation was beset by enormous inequality, with a large proportion of the population falling below the poverty line. These lamentable results were due, according to Stiglitz, mainly to the secrecy of the operations of the IMF. ‘If the IMF had invited greater scrutiny, their folly might have become much clearer, much earlier.’

Stiglitz concluded his critique of the IMF and the US Treasury by arguing that ‘some of the demonstrators are no more interested in open debate than the officials at the IMF’, but ‘the culture of international economic policy in the world's most powerful democracy is not democratic’.

We have quoted at length from these comments of Stiglitz, not because we wish to make proposals for specific reforms in the IMF or other institutions of the international regulatory regime, desirable though these may be, but rather to illustrate, from a uniquely authoritative and well-informed source, two of the main points we have been attempting to convey in this chapter and indeed in the book as a whole.

The first point is that the recurrent restructuring of the national and international regimes of regulation is not simply a response to the diffusion of a new technology, powerful though the present information technology undoubtedly is. The evolution of the global economy depends on the interaction and co-evolution of several subsystems of society (‘semi-autonomous variables’), certainly including technology and science, but also politics, economics, and culture. None of these can be ignored in a reasoned interpretation of history.

The second point is that the uneven development of the world economy, and the uneven diffusion of new technology, creates extraordinary difficulties for any regulatory regime. The British attempt to maintain an international free-trade regime at the end of the nineteenth century failed not simply because of the relative decline of British naval power and commercial supremacy, but because the entire international regulating regime in the early twentieth century could not handle the extreme inequalities and conflicts that arose, and was impotent to deal with the problems of the Great Depression of
the 1930s. The present more formal institutional regime may be in danger of foundering on the same rocks. The extreme world-wide inequalities in the distribution of income have become even greater and the manifest lack of social justice within and between nations threatens the stability of the international regulatory system. The fundamentals still apply, as time goes by.

Notes:
(1) This section is based in part on Louçã and Mendonça (1999).

(2) See Muchie (1986) for a particularly interesting doctoral thesis on the failure of attempts of workers' organizations to influence design and innovation in the early days of the revolution in Russia in the 1920s.

(3) The expression ‘Second Industrial Revolution’ is equivalent to our third and fourth Kondratiev waves, while the ‘First Industrial Revolution’ is equivalent to the first and second Kondratiev waves and the ‘Third Industrial Revolution’ is the Information Revolution. Von Tunzelmann (1995a: 100) designates the industrial revolutions distinguished in a similar way as ‘super-cycles’.

(4) De Geus's information refers to a private study carried out when he was coordinator of strategic planning research at an Anglo-Dutch multinational, Royal Dutch Shell Group, planning a confidential report, ‘Corporate Change: A Look at How Long-established Companies Change’ (September 1993). This study was conducted under the pressure of the second energy crisis. It addressed the determinants of corporate longevity and was retrospective in nature. Planners wanted to know about, and tried to derive practical lessons from, examples of large companies that were older than Shell and had successfully coped with fundamental change in their business environment. As de Geus indicates, this meant going back to the past—to the early years of the Industrial Revolution and even before—and abandoning the prevailing thinking and language of management and economics (de Geus 1997: 11).

(5) See n. 3 above.

(6) For a very good discussion of changes in regime for the transfer of technology, see Radosevich (1999).
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(7) For a thorough and interesting discussion, see Granstrand (1999).