
CHAPTER THREE

The Long Wave Debate 2: The Current Debate

The debate on economic long waves resumed after the lull of the 1950s and 1960s;¹ figure 3.1 shows the evolution of the long wave debate up through the mid-1980s. By around 1980 the debate had coalesced into three research schools (shown by dotted boxes), descended from the approaches of Kondratieff, Trotsky, and Schumpeter, respectively. The left side of the figure indicates that war and hegemony have been fenced off from the long wave debate as the disciplinary divide between economics and political science hardened in the 1950s and 1960s.²

The “capitalist crisis” school is led by Belgian Trotskyist Ernest Mandel. The “capital investment” school is dominated by Jay Forrester and his team of System Dynamics modelers at MIT. The “innovation” school is centered around Gerhard Mensch in West Germany and Christopher Freeman in Sussex, England. The synthetic work of Dutch scholar Jacob Van Duijn, and the less well known Marxist-innovation synthesis of Alfred Kleinknecht in West Germany, connect the innovation school with both the capital investment and the capitalist crisis schools. This chapter will discuss each of the three current schools of research in turn, then turn to the hybrid theories spanning research schools.

The Capitalist Crisis School

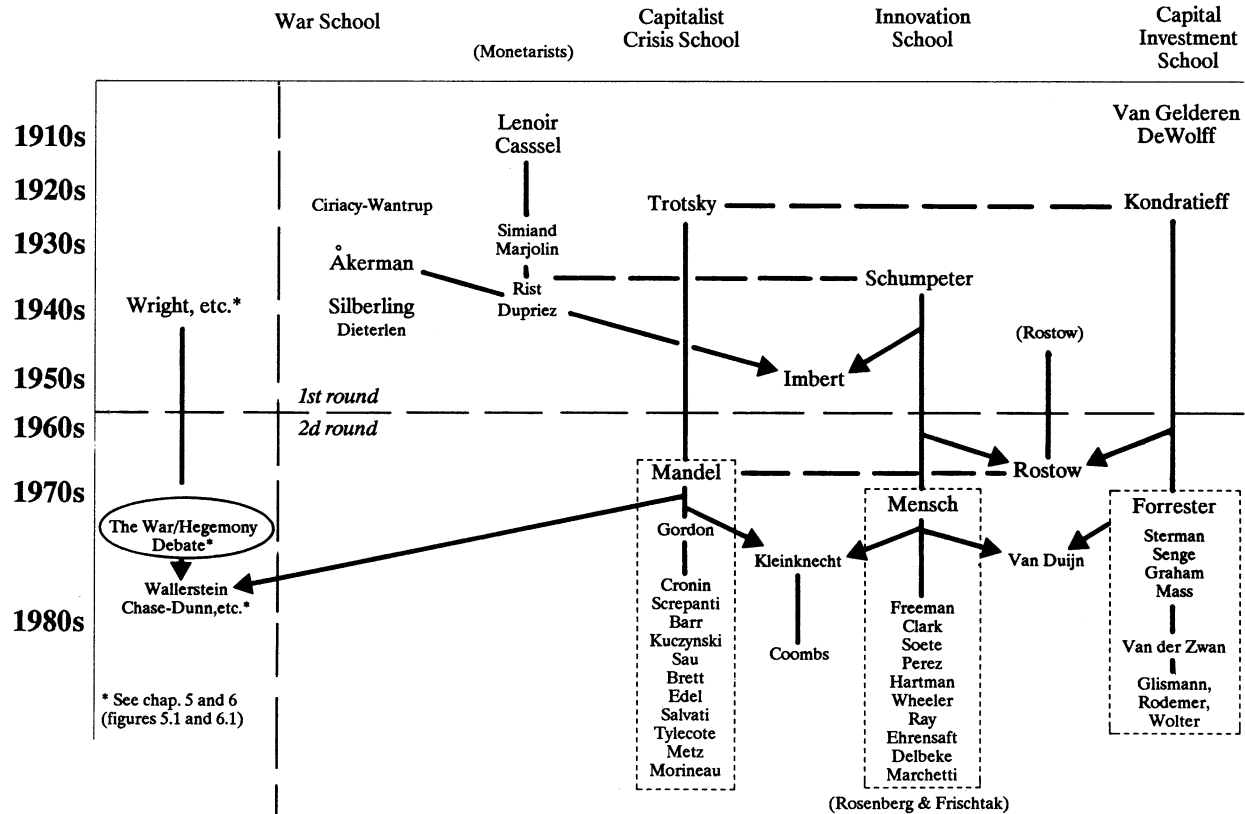
Ernest Mandel

The Marxist debate on long waves lay dormant from the time of Kondratieff’s arrest in 1930 until the mid-1970s, when the Belgian Trotskyist scholar Ernest Mandel (1975, 1980, 1981) reformulated a Marxist long wave theory. Mandel builds explicitly on Trotsky’s approach. He argues (1980:1) that the rejection of long waves “prevented most Marxists from foreseeing important turning points in recent economic history”—the upturn of capitalism in the 1940s and its downturn in the 1970s—and hence weakened Marxism.

1. The second round of the long wave debate began in 1975 with the publications of Ernest Mandel and W. W. Rostow.

2. The group centered around Wallerstein linking long waves with war and hegemony will be reviewed in chap. 6.

Figure 3.1. Structure of the Long Wave Debate



Mandel stresses that a Marxist theory of long waves should measure production, profits, and (since production serves a world market) exports.³ He starts “from the assumption . . . that the basic laws of motion of the capitalist system are those of capital accumulation and that capital accumulation originates in the production of commodities” (1980:8). In Mandel’s theory, the tendency of the economy to grow at a faster or slower pace (measured by the growth of commodity production) depends on the average rate of profit. Higher profits mean faster growth.

Marx’s law of the tendency of the average rate of profit to decline would indicate a general slowing down of growth and hence explain the downswing of the long wave—the onset of capitalist crises. How then can the upswing, the resolution of crisis, be explained? Mandel (1980:21, 28), like Trotsky, argues that recovery is not inherent in the capitalist system but results from exogenous forces acting to increase the average rate of profit.

Factors that can increase the profit rate (the rate at which economic surplus can be generated), according to Mandel, include technological changes and shifts in the flow of capital to different sectors and countries. A sudden upturn in the profit rate results from several such factors operating in synchrony: “Thus, expansive long waves are periods in which the forces counteracting the tendency of the average rate of profit to decline operate in a strong and synchronized way. Depressive long waves are periods in which the forces . . . are fewer, weaker, and decisively less synchronized” (p. 15).

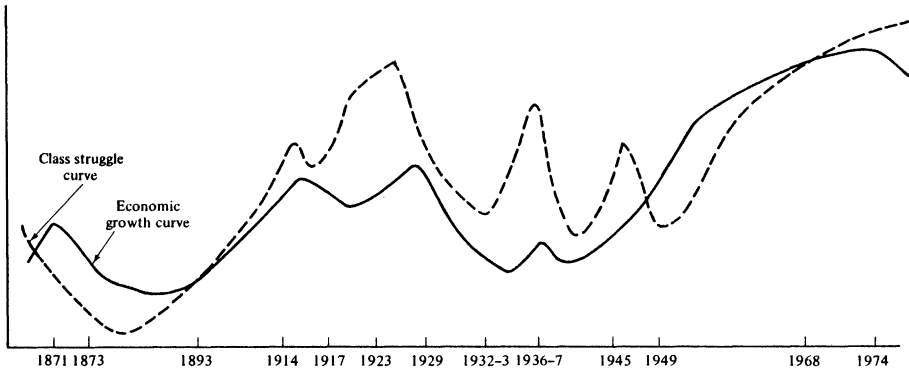
Mandel delineates the historical factors behind each long wave upswing as follows:⁴ (1) the revolution of 1848 and the discovery of gold in California, which broadened the capitalist world market, stimulated industrialization and technological innovation, and increased the productivity of labor (and hence the rate of profit);⁵ (2) the growth of imperialism after 1893; and (3) the historical defeat suffered by the international working class in the 1930s and 1940s (fascism, war, cold war, McCarthyism), which increased the rate of surplus value extracted from labor; while cheap Middle East oil, state-guaranteed profits from the armaments sector, and advances in telecommunications also increased the profit rate.

Class struggle (“working class militancy and radicalization”), according to Mandel, intensifies late in the expansionary phase, when the working class has been strengthened and expanded. During the depressive phase and early in the expansion (when workers still carry the scar of years of unemployment), by contrast, the interests of capitalists tend to prevail over those of workers. Figure 3.2 shows

3. Mandel seems to contrast his theory with Rostow’s, which emphasizes prices (see below). Most Marxists see prices and monetary variables as reflecting “exchange relations” rather than “production relations.” Only the latter are seen as fundamental driving forces in social development.

4. Why these upturns occurred “at certain turning points can be explained only in the light of concrete historical analysis of a given period of capitalist development” and “cannot be deduced from the operation of ‘capital in general’” (Mandel 1980:16, 21).

5. At the same time, changes in transportation and telecommunications (the steamship, the telegraph, and extensive railroad construction) and changes in credit and trade caused an increase in the rate of turnover of capital.

Figure 3.2. Mandel's Long Waves in Class Struggle

Note: Graph represents European class struggle and economic growth.

Source: Mandel (1980: 50). Copyright Cambridge University Press. Reprinted by permission.

Mandel's schematic graph correlating class struggle and economic growth in Europe from 1871 to 1974.⁶

Mandel (1980:50, 52) argues that class struggle plays a central role in producing long waves, through a "relatively autonomous long-term cycle of class struggle."⁷ Thus, "the outcome of the depressive long wave is not predetermined (it depends on the outcome of class struggles between living social forces)." Here again, Mandel parallels Trotsky.

Mandel sees technological change as an effect rather than a cause of the long wave (this responds to the competing procapitalist "innovation" school). He argues that investment in new technologies is held back during periods of low growth when profit expectations are low; then, as the expansionary phase begins, massive investment takes place in new technologies (using the backlog of unapplied inventions from the downswing period).⁸

Each of the last few upturns, in Mandel's view, has been more difficult to achieve (particularly since the Russian revolution). The upturn since the 1940s occurred only through massive public and private debt⁹ and the "artificial stimuli of permanent inflation, growing state intervention, permanent rearmament, etc." (p. 76). Mandel

6. The horizontal axis on this figure is not a linear scale (for reasons unknown to me), and the measurement unit of class struggle (vertical axis) is undefined.

7. Again, like Trotsky, Mandel sees superstructural events as important: "No Marxist would deny that the subjective factor in history . . . is in its turn determined by socioeconomic factors. But it is determined in a long-term sense" (p. 51).

8. Here Mandel seems to have adopted Kondratieff's approach, making common ground against those who see innovation as an inherent driving force in capitalism.

9. "Without the permanent debt explosion of the last thirty years . . . there never could have been any new long wave of expansion" (p. 75).

sees the downturn since 1968 as the last of the long waves. Capitalism can no longer recover since a massive change in the rate of surplus value extraction is not possible with today's stronger and better-organized working class.¹⁰ Mandel concludes that the only way to avoid economic ruin is through "socialism . . . on a broad international scale" (p. 123).¹¹

Other Marxist Theories

After Mandel, a number of other Marxist scholars began to write on long waves. I will summarize several of these to convey the scope and flavor of current Marxist scholarship in this field.

David Gordon (1978, 1980) develops a Marxist theory of long waves as *endogenous* to capitalist development—explicitly in contrast to Trotsky and Mandel (Gordon 1978:26). Gordon argues that "a full set of integrated institutions is necessary for individual capitalist-accumulation to continue (p. 27)."¹² "The interdependencies among the individual institutions create a combined social structure with a *unified* internal structure of its own." This he calls the "social structure of accumulation" (1980:17, 12).

The general tendency toward crisis in the capitalist economy (declining rate of profit) combines with a "relatively independent dynamic at the level of the social structure of accumulation": "When either the economy begins to stagnate or institutional contradictions within the social structure of accumulation begin to 'erupt,' accumulation in general *and* the social structure of accumulation are *both* likely to begin to dissolve" (p. 19). This creates what Marx called a "universal crisis." While short-term downswings can be resolved "within the context of prevailing social relationships," universal crises require a restructuring of social relationships (p. 20).¹³

Gordon sees the long wave as a "succession of qualitatively differentiable social structures of accumulation" (p. 22). When the internal contradictions of capitalism give rise to crisis, "individual accumulation cannot resume until the social basis for accumulation is reconstituted" (p. 25). The crisis under one social structure of

10. A drive to break the strength of the working class in today's context (in contrast to the 1920s and 1930s) "would imply a radical curtailment of the democratic freedoms" of the Western industrialized countries, which would be "impossible in the short run" (pp. 113, 115).

11. Mandel's call to arms is weakened, however, by his own evidence and that of Cronin (see below) that working-class militancy peaks near the crest, not the trough, of the cycle.

12. For Gordon, stable accumulation of capital requires stability in internal corporate structure, competition, class struggle, labor management, the monetary system, and the state (limiting the claims of personal political rights on capitalists' rights of property); as well as stable access to raw materials, to intermediate products, and to reliable supplies of labor; a supportive structure of family, schools, and other institutions; a structured social foundation for final consumer demand; a financial structure assuring access to external funding for investment; and a structure of administrative management to manage the circulation of commodities (record keeping, market research, advertising).

13. See also Gordon, Weisskopf, and Bowles (1983) on the relationship of the business cycle and the long wave.

accumulation creates, through class struggle, the institutional changes that allow the next upswing.¹⁴

Gordon's theory also incorporates capital investment but (unlike Kondratieff) not as a central cause. Each new stage of accumulation requires a physical foundation based on new systems of natural and intermediate supply, transportation, and communication—causing a bunching of infrastructural investments at the beginning of a stage of accumulation.¹⁵ These long-term investments may help stabilize the timing of long waves (1978:31).¹⁶ Investment bursts do not *cause* the upturn, however.

Gordon's theory resembles Trotsky-Mandel in locating the cause of long waves in the social "superstructure" and in seeing long waves as qualitative stages of development rather than endogenously generated cycles. And, like Trotsky and Mandel, Gordon (1978:28, 32) sees capitalism as fundamentally unstable: "Capitalist economies are incapable of permanent prosperity and stability." He agrees that the stagnation phase results from the tendency of profits to decline under capitalism. But Gordon differs in seeing capitalism as able to endogenously move from the downswing to the upswing as well: "Crises can . . . eliminate the problems which might originally have provoked the crisis. . . . [T]he process of crisis will force the system into a new set of institutional relationships" (p. 28).¹⁷

Mandel (1980:51–52) opposes Gordon's idea "that resolution of the long-term crisis of accumulation is as endogenous to the system as is [its] generation." He says of Gordon's approach that although it seems to break with "economism,"¹⁸ by introducing the "social conditions of accumulation," in fact it "sees the outcome of the depressive long wave as predetermined by the processes of capital accumulation and labor organization in the previous period. 'Economism' and straightforward economic determinism are back with a vengeance."

James Cronin (1980:101) does not share the neo-Marxist distaste for "economism." Cronin seeks a "properly materialist rendering of the past," emphasizing "the impact of economic change on social and political movements."¹⁹ Cronin

14. Thus, "long cycles of class struggle 'cause' the burst of new activity at the beginning of long waves" (1978:31).

15. Gordon (1980:31) adds that "infrastructural costs" of "world-market control" (e.g., transport, colonial, and military costs) follow the same timing, tending to cluster at the beginning of a stage of accumulation.

16. Here Gordon's theory draws on Kondratieff's approach.

17. Gordon (1978:26; 1984:123) has a good grasp of the previous long wave debate, including Trotsky, Kondratieff, and Schumpeter. However, he confuses the debate by referring to long waves as "long swings"—a term usually reserved for 20-year "Kuznets" (construction/migration) cycles. Edel (1983) and Glissman, Rodemer, and Wolter (1983) have followed Gordon's usage.

18. Economism is "the devil that latter-day Marxists of the Althusser-Poulantzas school relentlessly try to exorcise." Economism refers to the view that economic factors determine superstructural (political, social, cultural) ones.

19. Cronin (1980:101) stresses that "the baser aspects of things, the social relations and techniques surrounding production and reproduction, affect belief and behavior." He criticizes the tendency "among contemporary Marxist historians . . . to treat economic forces like the Deists treated the creator: the divine presence set everything moving and then retired; in like manner, the mode of production calls forth an

(1978) therefore seeks to explain the incidence of strikes ²⁰ as an outcome of the economic long wave. In the British labor movement from 1871 to the present, Cronin finds that sudden upsurges of labor militancy have taken place during long phases of prosperity.²¹ By contrast, the labor movement has been much less successful during long downswings.²²

Cronin (1980:109) concludes that economic conditions determine the behavior and success of the labor movement. Long waves “lie behind the discontinuous course of social struggle; they determine its form and content, and guarantee its expression.” Cronin thus sees class struggle as economically determined, in contrast to the “relatively autonomous” class struggle dynamic of Mandel and Gordon. Yet all agree on the timing—working class militancy increases (and succeeds) on the upswing, especially near the crest, of the long wave.

Ernesto Screpanti (1984:509), like Cronin, notes “a correlation between long economic cycles and recurring explosions of social strife.” But while Cronin portrays class struggle as an outcome of the long wave, Screpanti considers it a cause. Economic growth depends upon the “capitalists’ attitude toward investment expenditure,” which in turn depends on “strong psychological, social, and political—in a word, extra-economic—influences” (pp. 521–22). A higher “degree of workers’ militancy” will discourage investment (p. 523), while a decrease in workers’ militancy triggers the upturn and continues into the upswing phase. Late in the upswing phase, however, worker militancy eventually explodes again. This shakes the confidence of capitalists, reducing investment and hence growth. Lower growth decreases the gains workers can make, “workers begin to realize they have lost the game,” and militancy decreases again (p. 536).

Kenneth Barr (1980:87) focuses on the individual capitalist enterprise, arguing that “the business activity of an enterprise is . . . both a manifestation and a motor force of long waves.” He examines the English cotton-spinning industry during a single long wave, 1789 to 1849, following a single firm through each phase.²³ The upswing brought higher profits, mechanization, and specialization. The “transition phase” brought uneven growth, a contraction of profits, and an “explosion of working class political action”²⁴ lasting through the downswing. The downswing

array of class forces that face each other and do battle through culture and politics, but with little further attention to economic considerations narrowly or broadly conceived.”

20. Strikes are “a better indicator of working-class attitudes and behavior than any other as yet available” (p. 1194).

21. For example, “at the height of the speculative boom that preceded the Great Depression of 1873–1896,” major trade union membership quadrupled in four years. The years 1910 to 1913 (near the crest of the next long upswing) saw “another dramatic explosion of both union membership and strikes” (1980:106). The 1968–72 period (the next long wave peak) again saw “a strike wave of massive proportions and enormous success” (p. 108). Although workers are more needy during downswings, according to Cronin, more can be won from capitalists during the upswing. “Clearly, workers have learned to press their grievances at the hour most advantageous to themselves and are no longer governed by the cries of their bellies” (p. 103).

22. For instance, “the entire working class was defeated in the General Strike of 1926” (1980:107).

23. He dates the expansion phase in 1789–1810, a “transition period” in 1811–17, and the period of “forced growth” in 1818–49.

24. This timing agrees with Mandel and Cronin.

phase brought "a sharp and persistent decline" in profit margins; wage cutting; integration and reorganization of the industry; increasing investment in fixed capital;²⁵ and attempts to consolidate markets in an oligopolistic fashion (pp. 87–91).

In other recent Marxist scholarship, *Thomas Kuczynski* (1978:80) argues that falling profits cause the long downswing, which in turn stimulates new methods of production, leading to the upswing. Basic innovations, which are new productive forces, require changes in the relations of production (remaining within the capitalist framework), according to Kuczynski. *Ranjit Sau* (1982:574), an Indian Marxist, discusses the current world downswing in terms of the long wave and notes the downturn in profit rates in the major capitalist economies beginning in the late 1960s. *E. A. Brett* (1983:chap. 4) discusses long waves in the context of a more general Marxist theory of crises in capitalism, which stresses the disequilibrium inherent in capitalism and attributes crises to declining profits.

Matthew Edel (1983:117, 119) argues that energy policy is crucial in the upturn of the long wave. "Questions of the types and quantities of energy to be supplied must be settled at least partially before a new investment boom can occur." *Michele Salvati* (1983:204) applies Kalecki's (1943) Marxist theory of political business cycles to the long wave,²⁶ arguing that political power shifts between "the capitalists" and "the masses" in the course of the long wave. *Andrew Tylecote* (1984:703) ties economic growth phases to the "degree of inequality . . . in the world-economy. To simplify heroically, fast growth leads to increased inequality, which leads to slower growth, which leads to increased equality."

Other recent Marxist long wave research, most of it preliminary, includes *Jan Reijnders* (1984), a German working on removal of long-term trends in identifying long waves; Swiss scholars *Ulrich Pfister* and *Christian Suter* (1985) and *Volker Bornschier* (1985) working on long waves in international financial crises and the role of cultural consensus in long waves, respectively; and *Peter Grimes* (1985), an American studying the role of global inequality.

The Capital Investment School

This research school elaborates a capital investment theory much like that of Kondratieff. It developed rather independently of the Marxist capitalist crisis school and contains fewer internal debates.

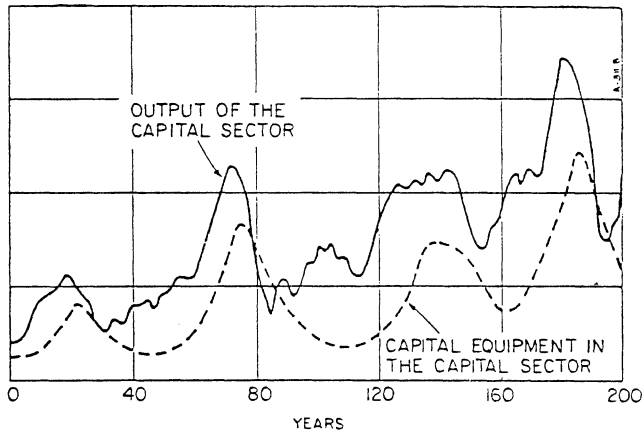
Jay Forrester & Co.

The capital investment theory was recreated in the late 1970s by the System Dynamics National Model Project under Jay Forrester at MIT.²⁷ Forrester and his

25. This timing does not agree with Kondratieff's theory.

26. Salvati distinguishes Kalecki's theory from current non-Marxist theories of the electoral business cycle (see Macrae 1981 on the latter).

27. Forrester (1976, 1977, 1978, 1979, 1981a, b, 1982, 1985); Forrester et al. (1984); Mass and Senge (1981); Senge (1982); Graham and Senge (1980); Mass (1975); Sterman (1983a, b, 1985, 1986); Sterman and Meadows (1985); and *Business Week* (1982).

Figure 3.3. Forrester's Long Waves in Capital

Note: Graph represents long waves generated in the capital-equipment sector of the model.

Reprinted from Jay W. Forrester, "Information Sources for Modeling the National Economy," *Journal of the American Statistical Society* 75, no. 371, 1980:555-74.

colleagues developed a computer model of the U.S. economy (Forrester, Mass, and Ryan 1976) and found that the model generated cycles of about fifty years' length (see fig. 3.3). After initially suspecting an error in the model, they eventually came across the existing literature on Kondratieff cycles and formulated a theory of why the economy as modeled would give rise to such cycles (Forrester 1978:6).

This theory sees long waves as "primarily a consequence of capital overexpansion and decline" rather than of basic innovation (Senge 1982:15).²⁸ The long wave upswing brings "an overbuilding of the capital sectors during which they grow beyond the capital output rate needed for long-term equilibrium" (Forrester 1981a:9). This is largely because in the early stages of the upswing capital investment takes place at a rate determined by the rebuilding of the economy from the depression rather than at the slower rate needed in the long term for depreciation of the existing capital stock.²⁹ Eventually, "capital plant throughout the economy exceeds the level justified by the marginal productivity of capital," and "the over-expansion is ended by a great depression during which excess capital plant is physically worn out and is financially depreciated on the account books" (Forrester 1981a:11). During the depression, capital investment is very low until the old capital

28. Forrester (1981a:9) notes that capital investment since 1800 "has been concentrated in periods of economic excitement lasting about three decades." Between these were depressions in the 1830s, 1890s, and 1930s.

29. Senge (1982:13) argues that long wave upswings in this model first generate employment but then displace employment. The initial employment created by renewed economic growth is later counteracted by the overexpansion of the capital-producing sector, which "begins to push capital into the rest of the economy, thereby displacing further employment."

plant is cleared out and “the economic stage has been cleared for a new era of rebuilding” (Forrester 1981a:9).

This tendency to overbuild capital stock is amplified by what Sterman (1983a:3) calls the “‘self-ordering’ of capital by the capital sector of the economy: the dependence of capital-producing industries, in the aggregate, on their own output.” This helps to explain the long span of the cycle and the difficulty of recovering smoothly from long-term overinvestment. Without this self-ordering of capital, the fifty-year cycle would be only a twenty-year cycle, according to Sterman.

Innovation, while not central, plays a role in the model. Forrester (1978:10) picks up the “leading sector” concept, reasoning that “each major expansion of the long wave grows around a highly integrated and mutually supporting combination of technologies.” Each such combination, because it embodies a massive long-term capital commitment, “rejects incompatible innovations.” Thus during the last half of an upswing, “radical innovation remains outside the circle of acceptance” (p. 10). During the early depression phase, “the process of using up and wearing out the old technology runs its course” (p. 11), so although innovations continue to be created, they are stored up and left dormant. As the depression draws to an end, “accumulated new ideas are tried and developed,” and innovation surges with the emergence of a new combination of technologies.³⁰

The theory of Forrester’s school follows that of Kondratieff in two important respects: (1) it sees long waves as endogenously generated within a fixed system structure,³¹ and (2) it explains the long wave with a capital investment theory. Forrester’s general approach is “conservative” in stressing the management of social systems (which he conceives as “multi-loop nonlinear feedback systems” in which actions can have unexpected consequences). Forrester’s computer models aim to enhance corporate and social management.³² While Trotskyists see the resolution of the long wave in class revolution and Schumpeterians (see below) see the resolution in technical innovation, Forrester’s approach implies that what is really needed is better management.

Wassily Leontief criticizes Forrester’s long wave model because “the whole structure of the economy changes” over the long time periods covered by long waves (see *Business Week* 1982).³³ Forrester (1982) responds that the model is based on

30. Forrester (1982:7) calls the depression period “a technological ‘window of opportunity’ when the old technology has faltered and new technology can most easily enter.” Forrester’s innovation theory parallels that of the Schumpeterian “innovation school” (see below) but sees clusters of innovations as an effect rather than a cause of long waves. The system dynamics model “can generate the long wave without any technological change” (Sterman 1983b).

31. I consider this theory conservative in assuming a fixed rather than evolutionary social structure.

32. “Until recently, those responsible for managing corporations and countries have not been able to test policy changes in the laboratory before trying them full-scale in the real system. Now, however, computer simulation models are becoming laboratories for analyzing social and corporate policy alternatives quickly and at low cost before new policies are committed to full-scale use” (Forrester 1971:2).

33. Forrester’s theory has been rejected by most liberal economists, who differ with his entire epistemology. Forrester’s dynamic modeling uses deductive reasoning (positing a theory and then seeing what data it generates) rather than the inductive reasoning of most of liberal economics (econometrics: applying standards of statistical assessment to build theory from data).

“five fundamental processes” that “have changed very little”: (1) the use of capital equipment for production; (2) the ten-to-forty-year life of capital plant; (3) the processes existing for the expansion of credit; (4) the lifetime of people; and (5) the influence of recent trends on the speculative attitudes of people. The Forrester-Leontief debate illustrates the different perspectives of the conservative and liberal world views.

Other Capital Investment Theorists

While Forrester’s group dominates the current capital investment school, several other scholars have recently proposed capital investment theories as well.

A. *Van der Zwan* (1980:201) proposes an “overinvestment hypothesis” of the long wave. He stresses the role of technologically advanced leading industries—these are where overcapacity occurs, and these industries shape the prospects for recovery from a prolonged depression (p. 205). As regards the current economic downswing, van der Zwan argues that “control of production capacity, especially within the advanced sector of the economy, is a prerequisite for a more lasting improvement of investment expectations” (p. 220).

West Germans *Hans Glismann*, *Horst Rodemer*, and *Frank Wolter* (1983:139–42) elucidate mechanisms whereby changes in capital investment affect upswings and downswings in production and employment. In their theory, the long wave is caused by changes in investment activity, which reacts to incentives. Long lags result from “institutional sluggishness in reacting to market signals.” Glismann et al. argue that labor cost developments and governmental activities (taxes, transfers, and consumption) are “the central agents in long waves” since they affect the incentives for investment. Their approach “is basically endogenous, as was Schumpeter’s” (and Kondratieff’s and Forrester’s). But they contrast it with Schumpeter’s theory in that they see investment incentives as central causes of the long wave, while Schumpeter sees them as effects, and in that Schumpeter sees clusters of innovations as central causes, while Glismann et al. see them as effects. This point parallels Forrester’s approach.

The Innovation School

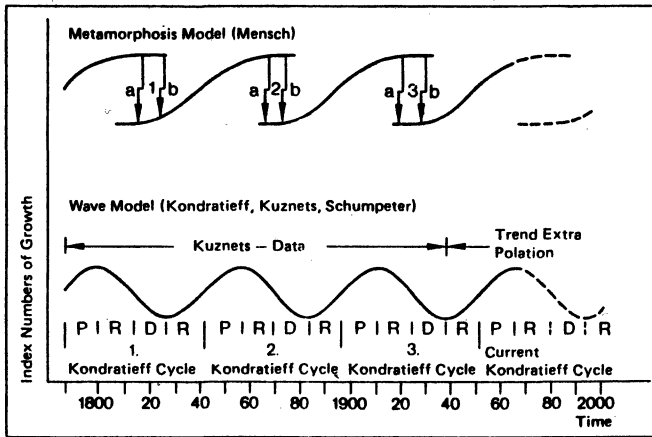
The third research school in the current round of the long wave debate—the innovation school—follows in the tradition of Schumpeter.

Gerhard Mensch

Gerhard Mensch, the first central figure in this group, writes that the common factor in depressions recurring every fifty years is “the economic stagnation of . . . the then predominant technologies” (1979:5). This stagnation, which Mensch calls a “stalemate in technology,” results from a failure to bring about new innovations in production and is overcome by the emergence of new innovations.³⁴ “There was

34. The innovation process, according to Mensch, is an attribute not only of capitalism but also of socialist economies.

Figure 3.4. Mensch's Metamorphosis Model



Source: Mensch (1979: 73). From Mensch's *Stalemate In Technology: Innovations Overcome The Depression*, Copyright 1975 by Umschau Verlag, Frankfurt. Reprinted by permission from the Ballinger Publishing Company.

only a limited interest in implementing basic innovations during the prosperous phases . . . ; in contrast to this attitude, the tendency to innovate was very marked during the critical periods of technological stalemate" (p. 130). Mensch's central thesis (a restatement of Schumpeter) is that "basic innovations occur in clusters" (p. 11). Innovations include both "basic innovations, which establish new branches of industry, and radical improvement innovations, which rejuvenate existing branches" (p. xvii).

According to Mensch, new products follow "life cycles" in which the market at first accepts them hesitantly, then rushes to acquire them, then eventually loses interest (p. 52)—the more basic the innovation, the longer the life cycle. A new product eventually saturates the market, and refinements in subsequent years bring diminishing returns (p. 63). The saturation of the market, supplier concentration,³⁵ and diminishing returns on improvements combine to set the stage for technological stalemate, according to Mensch. But stagnation in turn eventually stimulates innovation and leads to new growth in new economic sectors. Mensch predicts that the present technological stalemate will break with a cluster of innovations in 1984–94,³⁶ which will stimulate a new long-term upswing (p. 197).

Mensch proposes that the economy has "evolved through a series of intermittent innovative impulses that take the form of successive S-shaped cycles" (p. 73). Mensch calls this the "metamorphosis" model, as distinct from a "wave" model (see fig. 3.4). It parallels the approach of Trotsky and Mandel (and W. W. Rostow,

35. Concentration of economic firms, through mergers, "increases the market power of suppliers and allows them to . . . slow down the rate of quality improvements."

36. That decade, Mensch predicts, will achieve two-thirds of all basic innovations to be achieved in 1950–2000.

see below) in its stress on qualitatively different phases of development but differs in its formulation of innovation as an outgrowth of stagnation and hence as endogenous to the economic long wave.³⁷

In 1981 Mensch, Charles Coutinho, and Klaus Kaasch elaborated Mensch's model in terms of "phases of extensive and of recessive structural change in the economy" (p. 283). In expansion phases, extensive structural change occurs—innovations diffuse through new or modernized sectors, and capital stocks (fixed plant and equipment) rise in value, inducing owners to invest in "more of the same." In stagnation phases, recessive structural change occurs—the diffusion of innovations slows down, and the valuation of that capital falls, causing a shift of investment into alternative types of capital goods. This explains the rise in the innovation rate on the downswing.³⁸

Mensch's work has been criticized, mainly for inadequate empirical evidence of increased innovation on the downswing. Mansfield (1983:144), for instance, concludes that "evidence does not persuade me that the number of major technological innovations conforms to long waves of the sort indicated by Mensch's data The hypothesis that severe depressions trigger and accelerate innovations is also questionable."

Christopher Freeman & Co.

Christopher Freeman, John Clark, and Luc Soete (1982) build on the theories of Schumpeter and Mensch.³⁹ They argue that "the upswing of the long waves involves a simultaneous or near-simultaneous explosive burst of growth of one or several major new industries and technologies" (Freeman, Clark, and Soete 1982:80). The upswing builds momentum through economies of scale and generates high employment, especially in the early stages when "standardized plant and machinery is not yet available" and the industry is hence fairly labor intensive (p. 75).⁴⁰ Eventually, however, the new industry matures, as profits deriving from the innovation are reduced by competition and high labor costs. A process of concentration and cost cutting ensues, with lower employment being generated per unit of investment.⁴¹ As profits decline, unemployment grows and labor force willingness to cooperate with technical innovation decreases. Intense efforts at productivity improvement thus prove less effective than during the expansionary phase, and the economy heads into a period of stagnation and depression.

37. Note also Mensch's rejection of the Marxist term *developed* in favor of the liberal word *evolved*.

38. Mensch et al. (p. 281) work within a generally Schumpeterian framework but disagree with Schumpeter's "heroic interpretation of the causes of discontinuity" (sudden jumps caused by individual innovative entrepreneurs).

39. Clark, Freeman, and Soete (1981) call themselves "neo-Schumpeterian." See also Freeman (1979, 1981).

40. At the peak of the boom, demand for labor stimulates significant flows of immigration into the leading industrial countries and the entry of new groups into the labor force.

41. High labor costs, resulting from both the general expansion of the boom period and from shortages of certain essential skill categories in that expansion, continue even beyond the peak of the upswing.

Freeman et al., in contrast to Mensch, argue that deep depressions inhibit, rather than stimulate, new basic innovations. While they "do not rule out the possibility of some form of bunching of basic innovations or inventions," they attribute such bunching to scientific and technological breakthroughs and periods of strong demand, including booms and wars (Clark, Freeman, and Soete 1981:321). They (Freeman, Clark, and Soete 1982:81) therefore stress that "the role of public policy is crucial" in leading the way out of a depression by stimulating an increase in the general level of profitability.⁴² As for the economic situation in 1982, Freeman et al. conclude that technology policies, while not a cure-all, "are a vital ingredient of any strategy" against stagflation (p. 200).⁴³

Freeman's associate,⁴⁴ Venezuelan scholar *Carlota Perez* (1983:358), starts from a "Schumpeterian view" of innovation in the long wave but sees long waves as "not a strictly economic phenomenon, but rather the manifestation, measurable in economic terms, of the harmonious or disharmonious behaviour of the *total* socioeconomic and institutional system (on the national and international levels)." Whereas Schumpeter had assumed that social and institutional conditions are exogenous to the economic system, Perez proposes that capitalism contains two "subsystems": one "techno-economic" and the other social and institutional (p. 359). While short business cycles are explainable within the former subsystem alone, long waves involve both subsystems and are seen as "successive phases in the evolution of the total system" or "successive modes of development" (p. 360). Each phase in this evolution of economic life is marked by a "technological style . . . based on a constellation of interrelated innovations" (pp. 358, 360). A technological style generates a "dynamic complementarity" of economic and social/institutional factors that sustains the long upswing until the technological style approaches the "limits of its potential," culminating in a "structural crisis." Such a crisis indicates "a breakdown in the complementarity between the . . . economic subsystem and the . . . socio-institutional framework" and "forces the restructuring of the socio-institutional framework" to correct this. Perez does not mention the striking similarity between her theory and that of David Gordon (above), in the capitalist crisis school. She argues that her model is "consistent" with Forrester's capital investment theory—excess capital capacity occurring in the old technological style—as well as with Mensch's, Van Duijn's, and Freeman et al.'s innovation approaches (Perez 1983:8).⁴⁵

42. Their view of the exogenous causation of long upswings parallels that of Trotsky and Mandel.

43. Clark (1980) examines the economic effects of technical change, particularly on employment. He notes that the economic lifetime of a certain "vintage" of equipment may be less than its physical lifetime if newer models are more cost-effective. Clark builds a computer model of this process and draws conclusions generally supportive of Mensch's view of innovation.

44. As Freeman (1983:6) notes, his research group has no specific program on long waves. Since they are policy oriented, historical research on long waves remains "a hobby of a few highly motivated and interested individuals, unfortunately without formal financial backing."

45. Tylecote (1984:705) elaborates on Freeman's theory of the diffusion of innovations, paralleling Perez, from a Marxist perspective. Clusters of technical and organizational innovations, constituting a

Other Innovation Theorists

Several other authors working on long waves within the general framework of the Schumpeterian innovation approach may be mentioned.

Raymond S. Hartman and *David R. Wheeler* (1979:65–66) examine waves of innovation and of infrastructural development in British and American economic experience. Like Mensch, they find downswings “characterized by significant innovative activity” (as indicated by patents) and by high levels of infrastructural expansion as measured by miles of canals, railroads, highway, and aviation routes.

George F. Ray’s (1980a, b; 1983a, b) approach parallels Mensch’s but focuses on energy as a central element in the innovations associated with each upswing. The steam engine was developed to pump water from coal mines and in turn burned coal; the railway boom depended on the locomotive, built to haul coal and also fueled by coal; the generation of electricity drove the third upswing; and oil tied together the developments in transportation in the fourth upswing (motor vehicles, air transport, and expanded shipping fleets).

Philip Ehrensaft (1980:75–79) argues that waves of clustered basic innovations in North American agriculture closely follow the long wave. On the downswing phase, farmers adopt new technologies in an effort to increase production in order to maintain revenues in the face of declining prices. Ehrensaft argues that downswings in agriculture correspond with upswings in the general economy. Like Freeman et al., Ehrensaft argues that long waves call for “a degree of state intervention surpassing that of the neo-Keynesian system”—in order to bring about “collective action to direct resources towards innovative sectors.”

Jos Delbeke (1982a, b) studies production trends in nineteenth-century Belgium. Like Van Duijn (see chapter 4), Delbeke dates the long wave according to a sequence of shorter business cycles. He attempts to identify leading sectors in Belgium on this basis.

Cesare Marchetti (1983:331), who is associated with the International Institute for Applied Systems Analysis (IIASA) in Vienna, argues that the growth of a particular technology, such as motor vehicles, follows an S curve.⁴⁶ In the case of automobiles, Marchetti shows that “market saturation . . . comes practically at the same time all over the world” (p. 333), because the later a country started producing cars, the faster its growth. Thus, exports cannot be used to compensate for saturated domestic markets (p. 334), and the resulting global overcapacity leads to the long wave downswing. The fifty-year timing of long waves derives from the time required for a new technology to reach world market saturation (p. 336). Marchetti predicts a rush of innovations between 1984 and 2002, providing the “seeds of the next boom”

new technological “style,” appear in the leading country or countries; but their diffusion is held up by institutional rigidities and the unfavorable economic climate of the downswing. Institutional changes eventually come about, leading to faster diffusion of the “style” and hence a new upswing.

46. Marchetti argues that a set of innovations, like a species in a habitat, grows as if filling an ecological niche left by the dying-off of the previous population (earlier technologies).

(p. 337), and suggests nuclear energy as the “new primary energy source” in the next upswing. His prescriptions for government policy include helping entrepreneurs by “giving them money, making them heroes, and perhaps detaxing them” (p. 341).⁴⁷

A critical review of innovation theories by *Nathan Rosenberg* and *Claudio R. Frischtak* (1983, 1984), however, concludes that “an adequate or even plausible theory of long cycles, based primarily on technological determinants, does not presently exist” (1984:8). Such a theory, they argue, would have to fulfill four interconnected requirements: (1) causality—in particular, the relationship between growth and innovation;⁴⁸ (2) timing⁴⁹—since major innovations vary in terms of their rate of diffusion and how long they remain important, temporal regularity can come only from macroeconomic effects on the timing of innovation; (3) linkages—“the mechanisms through which particular changes in technology exercise *sizable* changes in the performance of the macroeconomy” (p. 16); and (4) repetition—not only that innovations create long waves but that such waves repeat themselves (p. 18).

Hybrid Theories

The hybrid theories of W. W. Rostow and Jacob Van Duijn combine innovation and capital investment theories, while Alfred Kleinknecht’s theory combines Schumpeterian innovation with a Marxist approach (see fig. 3.1).

W. W. Rostow

In his first work on long waves, W. W. Rostow (1948) criticized some of the assumptions of the innovation and capital investment schools. He objected that Schumpeter’s theory was vague regarding which variables (prices, production, and so forth) follow long waves and that Schumpeter “adduces no intrinsic reason” for the cycle. The actual scale and consequence of innovations historically “are demonstrably inadequate to explain the central phenomena,” according to Rostow (p. 29).⁵⁰ He was equally skeptical about Kondratieff’s concept of self-generating economic cycles. Rostow preferred the concept of “trend periods” rather than “cycles” (p. 7). A trend period is a period of time during which a coordinated trend (up, flat, down) affects such economic variables as economic expansion, commodity prices, interest rates, real wages, and terms of trade.⁵¹

In 1975 and 1978, however, Rostow pulled together his own long wave theory and

47. Other recent long wave innovation theorists include *Giarini* (1984) and *Erickson* (1985).

48. Forrester and Kondratieff postulate a causality opposite to that of Schumpeter.

49. “It is not enough to argue that the introduction of new technologies generates cyclical instability. It is necessary to demonstrate why technological innovation leads to cycles of four-and-a-half to six decades in length” (1984:11).

50. These criticisms were typical of the liberal economists of the era.

51. This conception of cyclicality is closer to Trotsky’s than to Schumpeter’s or Kondratieff’s.

applied it to the world economy from 1790 to 1976.⁵² He reviewed the long wave literature and concluded that “the phenomena identified but not explained by Kondratieff have still not been brought within the framework of ‘an appropriate theory of long waves’ ” (1975a:729). Rostow offered his own theory as such a framework.

From the innovation approach, Rostow incorporates the leading sectors concept, arguing that different economic sectors grow at different rates: “Old sectors may be declining, others may be stagnant, others may be moving forward at about the average rate . . . but there will be one or more leading sectors, reflecting the introduction of major new technologies, moving ahead more rapidly than the average” (1978:104). Historically, Rostow delineates the “classic sequence of such great leading sectors” as “cotton textiles; railroads and iron; steel, chemicals, and electricity; and the automobile industry” (see fig. 3.5).

From the capital investment approach Rostow (1978:107) incorporates the idea of capital over- and underinvestment. He attributes heavy investment in each new leading sector and the tendency over time to overshoot the appropriate long-term level of investment to three factors that distort the assessment of future profitability in the sector: (1) investors look at current profitability rather than rational long-term assessments; (2) investors rarely take into account that the same factors motivating them to invest also motivate others to act in the same direction; and (3) capital markets suffer from a psychological follow-the-leader tendency. The same factors that cause an overinvestment then bring about, in reaction, an underinvestment. These characteristics lie behind both the short cyclical fluctuations of the economy and the long trend periods, according to Rostow.⁵³

Through 1935, Rostow’s dating of upswings and downswings corresponds generally with that of Kondratieff and other scholars.⁵⁴ But, because of his emphasis on prices, Rostow calls 1935–51 an upswing (high inflation), 1951–72 a downswing (low inflation),⁵⁵ and the period starting in 1972 an upswing (high inflation). Rostow thus explains the high inflation of the 1970s as the start of a new long wave upswing phase. This is directly opposite to the majority of scholars, Mandel in particular, who see the 1970s as a stagnation phase rather than an upswing.⁵⁶ Rostow (1978:298)

52. As noted above, this helped (along with Mandel’s work) to reinvigorate the long wave debate in 1975. See also Gayer, Rostow, and Schwartz (1975).

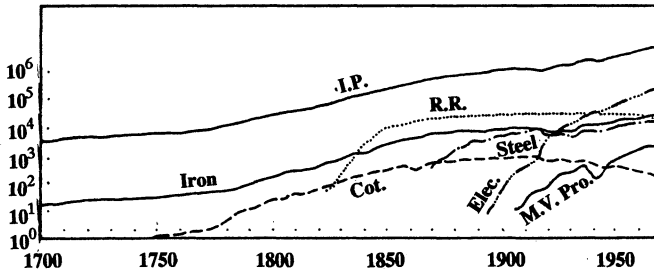
53. Rostow embraces two other elements in building his long wave theory. First, fluctuations in migration rates cause “accelerated investment in transport, housing, and urban infrastructure” (1978: 103). This migration/construction theory pertains to shorter cycles (about 20 years) discussed by Simon Kuznets, and I will not include them in this discussion of long waves. Second, “phases of agricultural and raw-material scarcity or abundance” play a central role. During Rostow’s upswing phases, prices of primary commodities (food and raw materials) tend to rise, along with prices in general; interest rates are high; agriculture expands rapidly; and income distribution shifts in favor of agriculture and profits at the expense of urban real wages. During downswings, price and interest trends are downward, income distribution shifts toward urban real wages, and profits are under pressure.

54. The question of alternative dating schemes will be taken up in chap. 4.

55. The period 1951–1972 is noted as sharing only some of the characteristics of previous price-decrease periods.

56. These scholars were generally interested more in production, and less in prices, than Rostow.

Figure 3.5. Rostow's British Sectoral Growth Patterns



Note: Graph represents aggregate and sectoral growth patterns for Britain, 1700-1972. I.P. = Industrial production. R.R. = Railroad mileage. Cot. = Raw cotton consumption. Iron, Steel, Elec., and M.V. Pro. = Production of iron, steel, electricity and motor vehicles, respectively.

Source: W.W. Rostow, *The World Economy, History and Prospect*, p. 107, Copyright (c) 1978. By permission of the University of Texas Press.

projects the 1980s as the “fifth Kondratieff upswing,” while Mandel (1980) foresees the 1980s as the fourth Kondratieff downswing.

Rostow’s dating has received considerable attention, but little support, from other long wave scholars.⁵⁷ Dupriez (1978:203–7) opposes Rostow’s dating and concurs with Mandel, describing 1945–74 as a rising phase (and 1974 as the point of downturn), despite assuming that the pricing system (Rostow’s key indicator) and credit system are “central to the long waves.” Dupriez argues that the “logarithmic growth” prevailing before 1974 “has been broken” by unprecedented structural unemployment and exhaustion of natural resources, which emerged as prime concerns in the early 1970s. These nonmonetary features were characteristic of previous downturns, including 1818, 1872, and 1920. In addition, Dupriez points to major changes in the monetary system around 1974. “The [1974] downturn stood in the center of monetary crises and reforms” (including the liquidation of the gold standard), which parallels past downturns.⁵⁸ As regards prices, Dupriez admits the sudden upsurge in prices in 1974 was “anomalous.” Nonetheless, from 1974 onward, Dupriez argues, “price relations became obviously of the type conducive to economic recession and reorganization” even though inflation continued. “Something of the same sort had happened around 1872, but not to the same extent,” he concludes.

Wallerstein (1979:669–70) also opposes Rostow’s dating. He suggests a more complex explanation to reconcile “stagflation” with Mandel’s dating. He links

57. Wallerstein (1979) reviews the Mandel-Rostow debate.

58. The introduction of the gold standard in England in 1818, the liquidation of the silver standard in 1874, and a general upheaval of currency parities after 1920.

“stagflation” to even longer price waves (“logistics,” see below), in which the period after 1815 was “one long deflationary B phase” and the period beginning in the 1970s was an A phase.

It would follow that Kondratieff B phases *within* logistical B phases showed a high correlation between stagnation and sharp deflation. But Kondratieff B phases within logistical A phases (the latter being in crude terms the sixteenth, eighteenth, and twentieth centuries) might well show the inverse phenomenon.⁵⁹

In my own reading, the evidence of the past decade goes against Rostow’s dating. In Wallerstein’s (1979:669) words, “the present phase is not yet over and we have yet to see if in the 1980’s the price inflation will not break.” Inflation did in fact break (at least in the United States) the following year. At this writing, for five years (1982–86) U.S. inflation has not exceeded 4 percent annually. Meanwhile, production, employment, and debt have continued to indicate stagnation in long-term growth.⁶⁰ Thus Mandel’s dating seems preferable to Rostow’s.

Rostow’s work has not been well integrated into the current long wave debate, probably because of his unusual dating scheme.⁶¹ Since the downturn in the world economy was the apparent factor that triggered the new round of interest in long waves, it is logical that those scholars would not take seriously a dating scheme that portrays the world economy as beginning an upswing just then.

Jacob Van Duijn

Jacob Van Duijn (1979, 1981, 1983), like Rostow, integrates the innovation and capital investment theories⁶²—but without Rostow’s dating scheme. Van Duijn (1983) provides perhaps the most widely accepted current synthesis of non-Marxist approaches to the economic long wave. Van Duijn’s (1981:19) theory integrates innovation and capital investment as follows:

[B]asic innovations will give rise to new industrial sectors. These sectors develop according to the familiar S-shaped life cycle pattern. [Van Duijn, like Rostow, begins with the idea of S curves of growth.] New sectors require their own infrastructure. . . . [E]xcess accumulation

59. Note that my review of Wallerstein’s own long cycle theory follows in chap. 6. In my view Wallerstein’s approach here is a more “conservative” Marxist interpretation (like Kondratieff and unlike Trotsky-Mandel). Logistic cycles lend stable structure to the world political economy over very long periods. Even phenomena that seem to represent sharp changes in the system (stagflation) are not really new. Wallerstein (1979:670) notes that both Rostow and Mandel “seem to feel that the years from here to 2000 A.D. will mark the definitive turning point towards a new era. Rostow is filled with liberal optimism” and Mandel with socialist enthusiasm. Wallerstein prefers Mandel’s analysis to Rostow’s, but “the preoccupation with the present forces Mandel (as it does Rostow) to concentrate on what’s new rather than what’s old, on what has changed rather than on what has remained the same” (p. 672).

60. As of 1986, U.S. production growth remains sluggish. 1985 GNP growth was back to 2.2%, typical of the 1980s, after a one-year spurt to 6.6% in 1984 (election year?), and the economy has been unable to shake massive trade and budget deficits.

61. He does not seem to attend the same conferences and publish in the same places as the other long wave scholars, although he continues to work in the field.

62. See Van Duijn (1983:chap. 8) in particular.

of physical stock will eventually occur. The levelling off of demand in the innovation-incorporating sectors will accentuate the overexpansion of the capital sector. The combined effect of those two forces is a long-wave downturn A long-wave decline means a period of depressed investment. A recovery sets in when replacement investment picks up The stimulus of investment demand will change the overall economic outlook, setting the scene for a new burst of innovations.

Van Duijn (1981; 1983) rejects Mensch's theory that downswings stimulate innovations, arguing instead that while "process" innovations will be stimulated by downswings, the more important "product" innovations will be held back until the upswing: "Ultimately, . . . innovators need to be convinced that they are tapping new growth markets. That conviction becomes easier during recovery than in the midst of a depression" (1981:29). According to Van Duijn (1981:25), different types of innovations cluster at different phases of the long wave as follows (my synopsis):

Phase*:	R	P	S	D
Product innovations:				
in existing industries	most			most
in new industries	most			
Process innovations:				
in existing industries		some	some	most
in basic sectors	some	most	some	
*R=recovery; P=prosperity; S=recession; D=depression				

Thus it is only the *product innovations* that cluster in the late downswing and early upswing period.

Alfred Kleinknecht

Alfred Kleinknecht incorporates the idea of innovation as driving the long wave within a "capitalist crisis" framework. Kleinknecht (1981a:688) argues that Mandel's exogenously induced upswings "seem to be more or less historically unique, if not purely accidental" and proposes instead an endogenous theory of long waves based on technological innovation, where the "basic renewal in production technology . . . [is] itself a result of low profitability and of sharper competition":

If Mandel assumed as a precondition for the achievement of a "technological revolution" an extraordinary increase in the average profit rate, we must here assume the exact opposite, namely the exploration of new spheres of economic endeavor through basic innovations as an expression of deteriorating valorization of capital within the existing areas (p. 707).⁶³

63. Mandel (1980:25) had argued that "large-scale innovation does not take place during the long wave of relative stagnation . . . because profit expectations are mediocre. Precisely for that reason, once the sharp upsurge in the rate of profit starts, capital finds a reserve of unapplied or only marginally applied inventions and therefore has the material wherewithal for an upsurge in the rate of technological innovation."

Thus while Mandel sees innovations as clustering in the early upswing, Kleinknecht puts them in the downswing.

Kleinknecht also finds fault with certain aspects of the innovation theory, however. In explaining the lack of basic innovations during upswings, Kleinknecht (p. 704) finds Mensch's blaming of "directive mistakes by management" unsatisfactory. He argues that actions leading into technological stagnation are not mistakes but "rational on the basis of the single firm." Carrying out a basic innovation involves heavy expenditure in research and development and heavy risks. Increasing such expenditures would be unwise for the individual firm as long as money can be made more quickly and safely with established products. "This means that during periods of prosperity it is rational to restrict innovations within existing industrial lines" (p. 705).⁶⁴

Rod Coombs (1981, 1984) follows in Kleinknecht's footsteps in integrating the innovation and capitalist crisis schools, in particular Freeman and Mandel: "[S]ome aspects of technical change at the lower turning point of the wave can be seen as endogenous to the mechanism, . . . without sacrificing the essentially political and nondeterminist character of the lower turning point" (1984:675–76).

Preindustrial Times

The hybrid theories conclude my discussion of long wave schools. Several other points of interest in the long wave debates remain to be noted. First, almost all scholars of long waves (Marxist and non-Marxist) have concentrated on the period since the late eighteenth century, since the industrial revolution.⁶⁵ But a few scholars claim to find long waves in earlier centuries.⁶⁶ This possibility raises thorny issues for Marxists—if long waves are seen as a necessary product of capitalism, then they should date back only to the beginning of capitalism (or even, as many argued, industrial capitalism). The traditional Marxist answer (held by both Kondratieff and Trotsky) is that long waves exist only in the era of industrial capitalism. But Wallerstein's "world-system" approach claims that a "capitalist world-economy" has existed since the early sixteenth century and that long waves may be found throughout that period.⁶⁷ Wallerstein (1984a) argues that an appropriately conceived long wave framework can be used for the pre-1800 as well as post-1800 period. While the world economy was "less structured and less commodified" before 1800, this change has been a secular trend over centuries, not a sudden shift in 1800, Wallerstein argues.⁶⁸

64. Here Kleinknecht parallels Mandel rather than Mensch.

65. Some are explicit in limiting long waves to the industrial period, while others simply ignore earlier times.

66. Imbert (1959) even claims to identify five long cycles of about 50 years' length (the third is shorter and weaker), dating from 1286 to 1510.

67. Imbert's long waves going back to the 13th c. would predate even Wallerstein's version of capitalism.

68. Nonetheless there were differences in the pre-1800 period, when economies were directly based on agriculture and crises arose from poor harvests, as compared with the industrially based economies after 1800, when harvests played a lesser role (Wallerstein 1984a).

Fernand Braudel (1972) describes long waves in fifteenth-to-seventeenth-century Europe.⁶⁹ Braudel (1984:75) argues that price waves were roughly synchronous across Europe, indicating an integrated network of markets, as early as the fifteenth century. He (1984:87) reviews the research indicating an inverse correlation of real wages to long-term price trends.⁷⁰ During economic expansion phases, wages fall behind prices, and real wages drop: "The progress made by the upper reaches of the economy . . . were paid for by the hardship of the mass of people . . . [and] the downturn at superstructural level actually led to an improvement in living standards for the masses." Braudel (1972:897–99) also notes that crusades and outbreaks of anti-Semitism in preindustrial Europe occurred during economic stagnation phases in this preindustrial era.⁷¹

Michel Morineau (1984) discusses long waves in grain harvests and grain prices in France in the sixteenth to eighteenth century. Morineau argues that war and technological innovation play a role in long waves in that era.⁷²

Rainer Metz (1984b) claims to show "long waves" in grain prices from the fifteenth to eighteenth centuries, but his "waves" are quite irregular and do not match the long waves described by other scholars (see chapter 4).

A separate but related debate among Marxists regarding this early period concerns longer cycles of several hundred years' duration, sometimes called "logistics" (or "secular cycles"), which apparently span the precapitalist and capitalist eras. Wallerstein (1984a) identifies these logistics, "even more strongly than the Kondratieffs," as price movements. He suggests that what is "exogenous" to the long wave for Mandel "is clearly endogenous to the longer 'logistic.'" ⁷³ Nicole Bousquet (1979:503) notes that "from the point of view of a world economy, the origins of which could date back only to the first half of the sixteenth century, the presence of such logistics [predating 1500] is a bit embarrassing [my translation]." The rise of the capitalist world economy should have broken their dynamic, Bousquet argues, but this did not happen. Albert Bergesen (1983a:78) likewise worries that "the fact that [logistics] appear to begin within the feudal era and carry over into the period of the capitalist world-economy presents questions of whether they represent the dynamics of feudalism or capitalism, or both." Hopkins and Wallerstein (1979:488) write that "one question that is blurred in the literature concerns the kinds of economic systems within which these very long cyclical rhythms are said to occur."⁷⁴

69. These cycles seem to follow on the earlier waves of (non-Marxist) Imbert (1959), whom Braudel cites.

70. Braudel cites Phelps-Brown and Hopkins ([1956] 1962), from whose data I draw similar conclusions in chapter 10. See also Von Tunzelman (1979) and Flinn (1974) on wages.

71. I wondered whether witch trials might follow a similar pattern. But data on witch trials in Southwest Germany in 1500–1700 (Midelfort 1972:201–30) showed no clear pattern when summed by economic phase period (the base dating scheme from chap. 4, below, was used). Data for England in 1560–1680 (Macfarlane 1970:26) showed one major concentration of witch trials, on the upswing phase of 1575–94. No long cycle was evident.

72. In a rare occurrence, Morineau cites Åkerman, the early theorists of the war school.

73. Wallerstein offers this as a resolution of the debate between Mandel and Gordon over endogeneity in the long wave.

74. See also Cameron (1973) and Hart (1945) on logistics.

Popularizations

With the deepening economic stagnation in the United States around 1980 the long wave began to receive more public attention. Various communities became interested in long waves, generally for reasons relating to their own interests.⁷⁵

Some members of the business community see the long wave as showing the importance of investment in new technologies (see *Business Week* 1982). Whatever set of industries emerges as a new leading sector in the next upswing (electronics, biogenetics, computers?) may be extremely profitable.

High-technology entrepreneurs use the long wave to call for increased public assistance to their industries. Craig Volland (1983:76), president of a Missouri consulting firm, writes in *High Technology* magazine that new technologies⁷⁶ could overcome the resource limitations of the previous “hydrocarbon era” and spur a new Kondratieff upswing.⁷⁷ “It is critical that policies for long-term economic recovery encourage new technologies . . . and not subsidize the further growth of conventional hydrocarbon-based technologies,” writes Volland.

The innovation theory of long waves has been taken up by “reform-oriented circles of the labor movement” in West Germany, according to Kleinknecht (1981a: 709). “Slogans like ‘policy of innovations support’ . . . could take on ideological importance (as possible cures to the crises of capitalism) similar to the ‘Keynesian economics’ of the past.”

An article in *Science* magazine (Dickson 1983) suggests that the long wave calls for “increased support for basic research” to lay the groundwork for technological innovation and hence economic recovery.

One book (Shuman and Rosenau 1972) attempting to popularize the Kondratieff wave for the general public (including effects on politics, foreign trade, war, women’s liberation, and so forth) made the mistake of predicting a “golden period” of economic prosperity, balanced federal budgets, and an end to inflation in the 1970s! It did not become a best-seller. Responsive to changing conditions, Beckman (1983) wrote a similar popularization a decade later based on the theme of how-to-profit-from-the-depression.

Weather Cycles

My review of the theoretical debates on long waves would not be complete without mention of what I call “crackpot theories.” All manner of cycles have been “discovered” at one time or another, covering every aspect of society (economic, political, spiritual, cultural, and so on). Many of these are

75. Even the Central Intelligence Agency wrote a staff report on long waves (Levy-Pascal 1976).

76. “Electronics and telecommunications, dependent on ubiquitous silicon, and genetic engineering, based on an endless supply of low-paid and easy-to-please microbes.”

77. Elsewhere, Volland (1985) reviews Kondratieff ([1928] 1984).

theories based on metaphysical or mystical ideas, usually elaborated with little regard for empirical evidence, and are responsible in part for the bad reputation of the cycles field.

Theories of long waves as driven by weather cycles generally fall in this category. For example, Raymond Wheeler (1943) attempts to tie both war and economic cycles to alternations in world climate (hot/cold and wet/dry). Wheeler's theory rests on racist assumptions about differences in productivity between peoples living in warmer and colder regions of the world, which he extrapolates to cover warmer and colder periods in history.

I do not dismiss weather cycles out of hand, however. A fifty-year weather cycle in the preindustrial period could plausibly affect harvests, hence economic surplus, and hence also the capacity to wage war.⁷⁸ Nevertheless, I find no evidence of such a cycle in weather, in sunspots (which affect weather), or in the record of tree-ring growth.⁷⁹

78. Recently, Danish researchers have tried to tie long waves to climate. Petersen (1986) argues that Goldstein's (1985) emphasis on war in long waves should be rejected in favor of climatological explanations. He cites Danish climatologist Christian Vibe, who claims to find climate cycles of 1395, 698, 116, 58, 30, and 10 years. I find these arguments unconvincing.

79. Rainfall and temperature data for several countries (from Mitchell 1980) were examined in a preliminary search for correlation with economic phase periods without success. Huntington (1914:117) gives annual Arizona tree-ring growth data in which he claims to find cycles of 11, 21, and 150 years—but not 50 years. Stetson (1947:chap. 14) claims a correlation of sunspots and short business cycles, but not long waves.