EUROPEAN UNIVERSITY INSTITUTE, FLORENCE

DEPARTMENT OF ECONOMICS

E U I   W O R K I N G   P A P E R   No. 91

KONDRATIEFF'S LONG WAVES *)

by

Wolfgang Gebauer

APRIL 1984

* Paper presented at an
EUI seminar in February 1984.

I am grateful to the seminar
participants for comments
and criticism.

All remaining errors and the
interpretation offered
remain my sole responsibility.

BADIA FIESOLANA, SAN DOMENICO (FI)

C O N T E N T S

INTRODUCTION

Comparisons have recently been made between our present economic situation and the "great depression" of the early 1930s in order to discover parallels and to derive possible lessons. The search for historical guidance is reflected, among others, in the 'rediscovery' of business cycle theory in general and of the "long-wave" hypothesis in particular. The long-wave hypothesis, formulated by the Russian economist Nikolai D. Kondratieff in the 1920s, postulates, for the "capitalist" economies of Western Europe, a pattern of long-term economic development whereby long periods of economic upswing of approximately 25 years are followed by downswing phases of approximately the same duration. These wavelike economic fluctuations are seen as cycles with a length of roughly half a century. They thus exceed by far the "normal" Juglar business cycles and in fact incorporate these, as it were, into an evolutionary process.

All long-wave chronologies so far produced put the Second World War as the end of a third "Kondratieff". This suggests that the period from 1950 to roughly 1970-75 saw the upswing phase of a fourth long wave - the awkward conclusion being that we might be caught today, in 1984, in the middle of a long-term downswing which, although it may be interrupted by short-term recoveries in the course of the normal "Juglar" business cycle, will confront us with a basic trend of economic decline and crisis until the 1990s. Given this long-wave pattern, the 1980s would have to be seen as the time of long-term downswing, followed by a phase of decelerating decline and recovery in the 1990s, during which the basis would be laid for a new long-wave upswing in the first quarter of the 21st century.

Such time horizons may appear fantastic, scientifically untenable or purely speculative. Furthermore, they do not fit in at all with the comparatively short periods with which economic policy makers normally concern themselves today - in the interest of re-election, for example. Nevertheless, it is a well-founded tradition in economics to examine all hypotheses which may offer an insight into burning issues of the day. The renaissance of business cycle theory and of Kondratieff's long-wave hypothesis in the literature is a striking and recent example of this tradition.

To recapitulate: Academic discussion on business cycles reached a peak during and after the "great depression" of the thirties, when Spiethoff (1925), Haberler (1937), Schumpeter (1939), and Tinbergen (1939) published important contributions. It was at that time, too, that authors such as de Wolff (1924), Dupriez (1935), and Hansen (1932) looked closely into the long-wave hypothesis which Kondratieff had developed and defended during the 1920s. However, after the Second World War and Keynes's "General Theory", interest in business cycle phenomena slackened noticeably. Economists concentrated instead on the analysis of macroeconomic fluctuations using income-expenditure models or theories of growth and inflation. They expressed doubt as to whether the actual subject of business cycle theory - namely the systematic recurrence of upswing and down-swing - existed at all. "Is the business cycle obsolete?" was the question asked at the end of the 1960s - for example by Bronfen-brenner (1969). While this question, put to a symposium, was mostly answered in the negative, the fact that it was posed at all reflects the uncertainty as to what was to be designated as "cyclical" and as to the part which business cycle theory should play in relation to economic theory generally.

Nowadays, aspects of business cycle theory meet with renewed interest in macroeconomic research. An important collection of writings compiled by Lucas (1981) bears, significantly, the title "Studies in Business Cycle Theory". In the Lucas collection, the view is repeatedly expressed that there are frequently long time lags before important real economic phenomena materialize and expectations are affected. One example is the "implementation lag" for research and development projects, investment in physical assets, the reversal of inflationary expectations or structural adjustments in the economy. There is an intuitive case for believing that economic activity is subject over the course of time to lengthy fluctuations: even after an oil shock, there is first research and development expenditure and only later increased investment in conserving or replacing oil - investment in real capital takes a long time before it actually affects the production process.

Hence, modern business cycle theory is, inter alia, concerned with consciously fitting familiar short-term macroeconomic stabilization problems into a long-term cyclical context. It is in this area that Kondratieff's long-wave thesis has gained increasing attention. Major post-war writings in this field, which deal also with the possible existence of a fourth "Kondratieff", did not appear, significantly, until after the pronounced recession of 1974/75; examples are publications by Rostow (1975), Mensch (1975), Nullau (1976), van Duijn (1977), Forrester (1977), Glisman/Rodemer/Wolter (1978) and (1980), Schröder and Spree (1980), Petzina and v. Roon (1981), Maddison (1982), van Ewijk (1982), and the recent American Economic Association Overview on "Long waves in economic activity" (Papers and Proceedings, May 1983). Common to all these writings is the reference to the potential significance of a long-wave hypothesis for assessing

future economic activity. Only rarely, however, are conclusions drawn for economic policy - perhaps because these appear to be too serious.

Modern discussion on long waves has gained momentum despite strong criticism. The number of critical voices at least matches the number of those who support Kondratieff's thesis and who would like to use it as a serious long-term view of business cycle and growth policy. In the following, we are therefore moving into the shaky ground of a controversy which is far from being settled. This is one more reason to turn, as a firm first step of analysis, to Kondratieff's original contribution (chapter 1). Thereafter, the very existence of long waves will be discussed, from a present-day viewpoint, considering new empirical evidence for selected EEC countries (chapter 2). Two theoretical explanations of a possible long-wave phenomenon are then critically reviewed in chapter 3, followed by a brief, concluding discussion of policy implications (chapter 4).

1.   KONDRATIEFF'S ORIGINAL CONTRIBUTION

1.1 Background

N.D. Kondratieff, Professor at the Academy for Agriculture and Institute for Economic Research in Moscow, set out his theory of long waves in several publications between 1922 and 1928. The fact that his name is linked with the phenomenon is due to Schumpeter (1939), who wished to acknowledge Kondratieff's contribution by using the term "Kondratieff cycle". The long-wave movement was already the subject of a number of investigations before and at the same time as Kondratieff. As early as 1847, Hyde Clarke described a cycle lasting a good 50 years which included five regular

cycles (later called "Juglar cycles" in honour of Juglar, a pioneer
of business cycle theory). Jevons (1848), Parvus (1901, 1908),
Aftalion (1913), and Pareto (1916) also produced fragmentary con-
tributions before Spiethoff (1925), Sombart (1927), and the Dutchmen
van Gelderen (1913) and de Wolff (1924) made major strides in the
formulation and development of the long-wave hypothesis.

Kondratieff's first published thesis on the existence of a long-wave
pattern, which appeared in 1922, immediately encountered sharp criticism
in his own country. In response to this, he produced further writings which
were concerned primarily with a more precise dating and empirical description
of long waves. Only later, when commentators became increasingly critical
of the lack of a theoretical basis, did he provide a theoretical explanation
for the phenomenon. In 1926, the first translation of his work appeared in
German under the title "Die langen Wellen der Konjunktur" (Kondratieff,
1926), which then also triggered vigorous and controversial discussion in
Western Europe, with contributions, for example, by Woytinski (1931) and
Dupriez (1935). Finally, Schumpeter (1939) provided a major contribution
by incorporating the long-wave movement into a comprehensive theory of
business cycles, including the "normal" Juglar business cycles (approxi-
mately nine years) and Kitchin's short inventory cycles (approximately
three years).

Despite overwhelming criticism in his own country, Kondratieff stuck
to his long-wave hypothesis for capitalist economies. This had serious
personal consequences for him: charged with formulating bourgeois-reaction-
ary hypotheses, he was removed from all office in 1930 and banished to
Siberia, where he died. The fact that the cyclical aspect of Kondratieff's
thesis necessarily implied the continuous development of capitalist
economies was unacceptable to Marxist dogmatists responsible for economic

policy in the Soviet Union at that time: owing to the claimed endogenous nature of long waves, each downswing had necessarily to be followed (after some 25 years) by a lower turning point and thus by a new, long-lasting upswing. This clearly contradicted the Marxist theory of mounting crises leading inevitably to the end of the capitalist system itself. The official Soviet-Union interpretation of the economic and political situation in Western Europe after the First World War was therefore inconsistent with the long-wave thesis: the end of the capitalist economic system itself, as predicted by Marx, was believed to be fast approaching via a chain of further revolutions and wars.

1.2 Evidence (dating and empirical characteristics)

Kondratieff had investigated time series for prices, nominal interest rates, bank deposits, nominal wages, foreign trade and real output of selected industrial products in a few Western European countries (Britain, France, and Germany) and in the USA, as well as the volume of world production of coal and iron.

Where the time series revealed a secular trend (particularly the physical production figures but not interest rates and prices), he elimi-nated the trend firstly through division by the population figure (per capita series) and secondly by the calculation of a trend line using the least squares method. The deviations from the trend, smoothed by a nine-year moving average (in order to eliminate the Juglar cycles and random fluctuations or short-term "Kitchins"), produced Kondratieff's figures for his long waves. He found the turning points in the various series conspicuously concentrated on a few years, with or without trend adjustment. (The turning points are based on the unsmoothed deviations from trend.) For Kondratieff, this correspondence seemed sufficient proof

that the long-wave pattern could not be a "statistical artefact".
Furthermore, his results indicated that, despite problems of statistic-
al comparison, the long-wave pattern was roughly the same in all
countries investigated.

On the basis of these findings, Kondratieff suggested a rough
dating or chronology for three long waves, which is shown approximative-
ly in Fig. 1, being continued into the present. Kondratieff did not
regard the somewhat varying total wave length as a problem; he rightly
pointed out that there is no strict periodicity in any social or
economic phenomenon, even in the "regular" Juglar business cycles.

Kondratieff was well aware of the difficulties of interpreting the
evidence collected. He therefore consulted additional descriptive and
historical information, like Spiethoff did before him (in his analysis
of "Wechsellagen der Konjunktur") and Schumpeter did after him (in his
"Business Cycles" volume). Kondratieff (1926) summarized his overall
findings in five "empirical characteristics":

(1) The long waves are part of a complex dynamic process which at
the same time produces the medium-term (approximately nine-year) "Juglar"
cycles (see the Schumpeter diagramme, Figure 2). But the actual course
of the "Juglar" cycle largely depends on whether the long wave is in its
upswing or downswing phase: on the upswing of the long wave, the business
cycles typically have only short recession phases, but marked, intensive
upturns; on the downswing of the long wave, this situation is reversed.

(2) During the downswing phase of a long wave, agriculture experien-
ces a particularly sharp decline. Kondratieff cites as examples the period
following the Napoleonic Wars (from 1815) and the years after the First
World War.

FIGURE 1
========

Approximate dating of long waves by Kondratieff

(later years in brackets)

Upswing   Downswing

Deviations of moving
nine-year averages
from trend
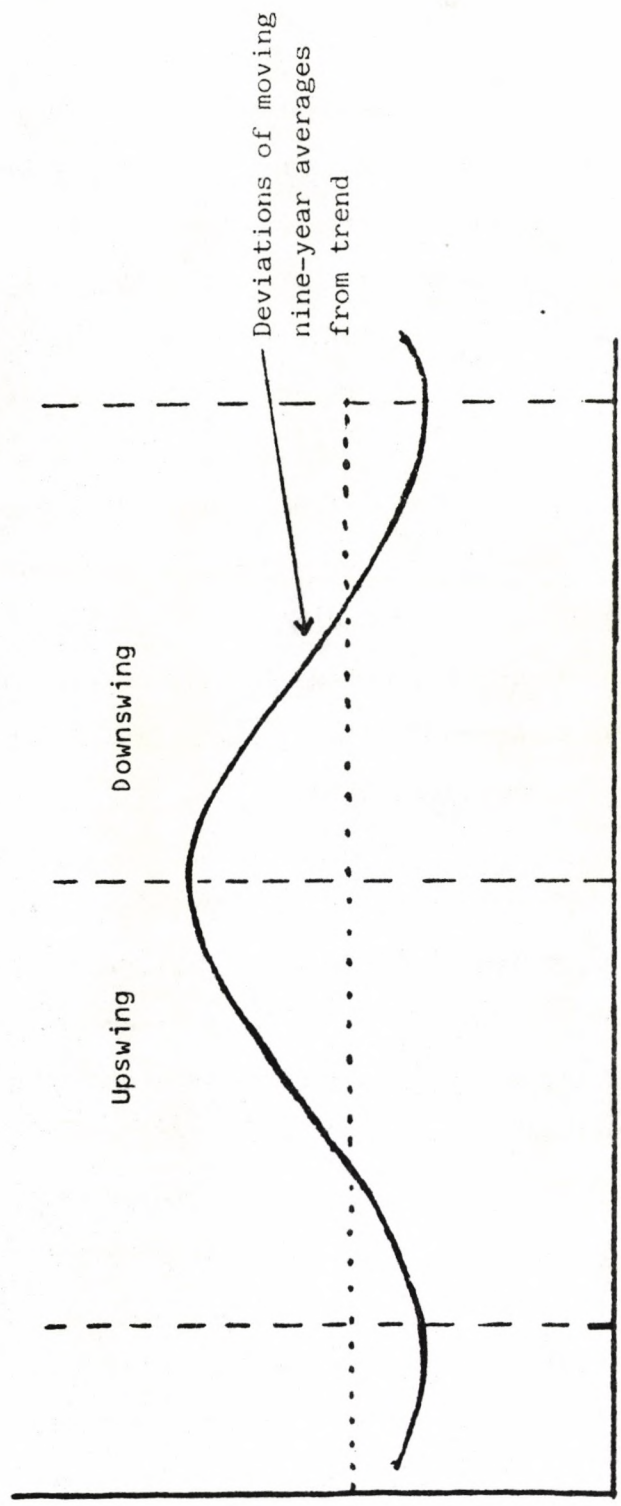
Basic innovations

E.g. Steam power	1790	1815	1847
			1. "Industrial" Kondratieff (approximately 57 years)
E.g. Railways	1847	1873	1893
			2. "Bourgeois" Kondratieff (approximately 46 years)
E.g. Motor car	1893	1920	(1949)
			3. "Neo-mercantilist" Kondratieff (approximately 56 years)
E.g. Computer	(1949)	(1970)	(1995)
			4. "Neo-classical" Kondratieff? (approximately 46 years)

(3)   During the downswing phase of a long wave, there is a particularly high number of technical inventions; however, these are not widely applied until the transition to the new, long upswing.

(4)   The fundamental structural changes which take place before the upswing of a new wave are not simply restricted to technological progress (as a result of previous inventions), but also include an increase in the amount of money circulation and an expansion of the world market through the emergence of new countries.

(5)   The most violent wars and revolutions are concentrated in the upswing phase of a long wave, reflecting an increasing, explosive straining of 'economic forces' before the upper turning point.

Kondratieff stressed that these five empirical characteristics are in no way intended as an explanation of the phenomenon observed. He cited them in order to emphasize that the observed long-wave pattern is rooted not only in purely economic processes but also - with corresponding cyclical manifestations - in recurrent social, political, and technical phenomena. Kondratieff was firmly opposed to any attempt to interpret his empirical characteristics as exogenous causes of long waves; these long waves, he argued, are an endogenous, "integral" part of cyclical, dynamic manifestations in capitalist economies. In his opinion, the particularly marked long-wave patterns in price trends or gold production are not capable of providing a causal explanation any more than external shocks or fortuitous influences.

FIGURE 2
========

Simultaneous cyclical fluctuations with different wave lengths:

Kondratieff (1), Juglar (2), Kitchin (3), and "actual" summary (4)
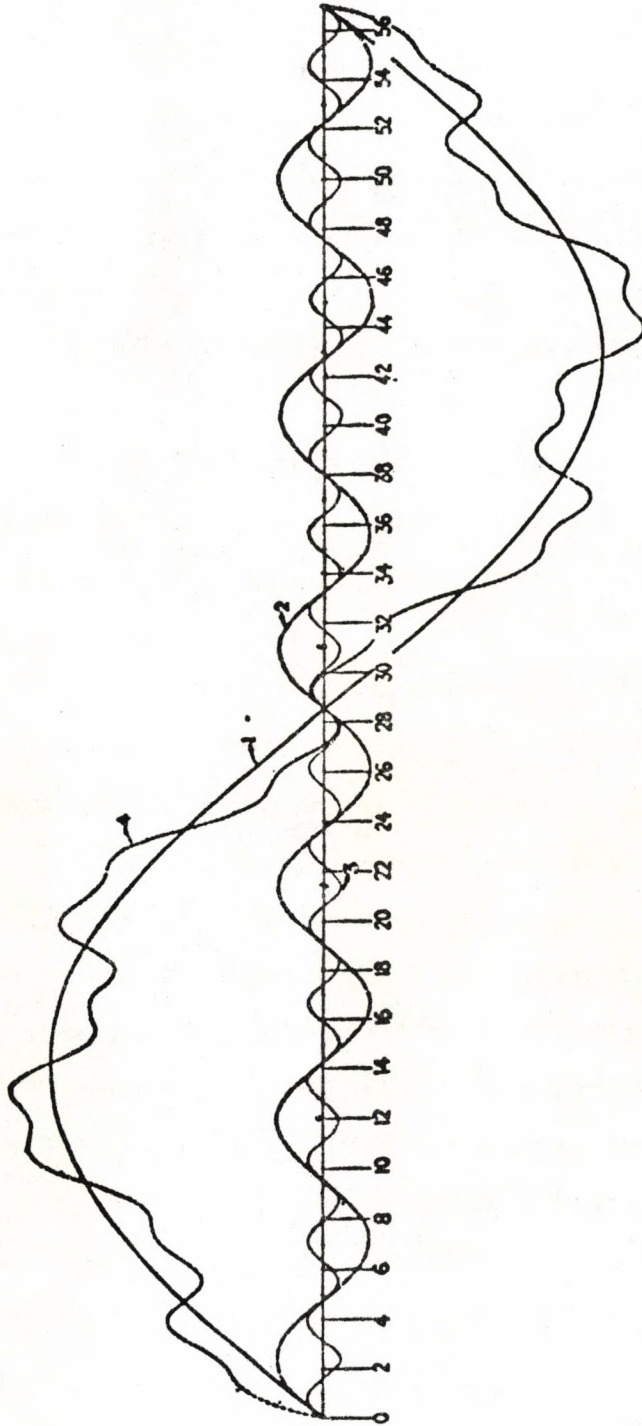
Source: J.A. Schumpeter, Business Cycles, vol. I, New York, London 1939, p. 213.

$(1) = 18 \sin (\frac{360}{684} t)°;$ $\quad (2) = 3 \sin (\frac{360}{114} t)°;$ $\quad (3) = 1 \sin (\frac{360}{38} t)°;$ $\quad (4) = (1)+(2)+(3)$

t = number of months.

1.3 Theoretical explanation

How then was the long-wave movement to be explained? Kondratieff postulated in essence - and in complete contrast to many claims in secondary literature that he had failed to come forward with any theoretical explanation - a theory of long reinvestment cycles.

Conceptually, Kondratieff's starting point is Marshall's distinction between market, short-term, and long-term equilibria. The long waves are seen as fluctuations around a specific long-term macroeconomic equilibrium (with an inherent tendency for them to converge toward this equilibrium). Kondratieff now adds the Marxist thesis that the normal (Juglar) cycles are caused by periodic reinvestment in phy-sical capital assets with a life of about ten years. He modifies this thesis by postulating an appreciably longer life cycle for basic capital assets and thus an appreciably longer reinvestment cycle. "Basic capital assets" include, for example, large plants, major traffic routes (railways, canals), large-scale agricultural projects (dams), and also human capital. According to Kondratieff, investments in such capital assets have exceptionally long life times; therefore, very long reinvestment cycles are generated, producing the long-wave phenomenon.

However, linking the life of particularly important physical capital assets with the phenomenon of cyclical long waves still failed to explain why reinvestment in basic capital assets should show such a discontinuous pattern. Kondratieff therefore advanced monetary arguments as the third and final link in his chain of reasoning, in particular the 'loanable funds' theory (Tugan-Baranowsky). According to this theory, a large fund of liquid resources must be freely available to create the

financial conditions which are necessary for substantial reinvestment
in basic physical capital assets and hence as a basis for a (new)
long-wave upswing (see the third empirical characteristic above).

Altogether, Kondratieff lists four (basic) financial conditions
for a long-term economic upswing:

- a high propensity to save;
- an excess supply of bank credit at low interest rates;
- the accumulation of liquid funds in the hands of firms or
  credit institutions, and
- a low price level (to encourage savings and long-term investment).

These conditions for a fundamental self-supporting economic upswing
sound highly topical to us today (perhaps with the exception of 'liquid
funds'). The monetary factors mentioned were in fact largely relied upon
by Kondratieff to explain the upper turning point of a long wave. Accord-
ing to him, the upswing of a long wave meets its limit in the increasing
shortage and cost of finance. This shortage and cost also play an essential
part in Kondratieff's explanation as to why investment activity gradually
slackens during a long-term upswing: "In the course of the upward movement,
a relative shortage of financial capital gradually develops and the effects
of a growing cost of capital are felt; ...external or internal conflicts ...
entail... an expansion of unproductive consumption ... and accentuate the
crisis... Finally, the steady rise in goods prices and the consequent
fall in purchasing power ... reduce the scope for continued upswing"*
(Kondratieff 1928, pp. 37 et seq.).

---

* Translated form the German-language source cited above.

Kondratieff's attempt at a theoretical explanation was at first severely criticized. The assertion that reinvestment in basic physical capital assets was discontinuous was dismissed; it was considered impossible that certain inventions and techniques had to wait some 20 years before they took shape in new plant and machinery purely because the 'monetary capital' ('loanable funds') was not available to finance the necessary investment. The notion of long waves as reinvestment cycles that were determined by monetary factors appeared unacceptable; given the possibilities of modern credit facilities, it was considered unrealistic, even in the 1920s, to suggest that innovations had to wait until the necessary loanable funds were accumulated.

This indeed seems a justified objection. It was backed up by the argument that the anticipated rate of return of innovative capital invest- ment was the more decisive factor - an argument which has generally dominated investment theory since at least the appearance of Keynes's "General Theory" (1936).

The empirical characteristics and Kondratieff's attempt at a theoretical explanation have - although he himself never explicitly said so - clear implications for economic policy. Essentially, they consist in the need to promote investment in physical capital assets, which has to bring about the innovative renewal of aggregate supply. Monetary policy has to perform the difficult task of ensuring not only low interest rates and favourable financing conditions to promote innovations, but also a stable and low price level. The difficulty applies, however, in the "short-term" business cycle context much more than in a Kondratieff-like long-run perspective.

2.   DO LONG WAVES EXIST?

At Kondratieff's time, two arguments were put forward to challenge the existence of long waves.

Firstly, it was claimed that empirical proof of a long-wave pattern had been established only for price and nominal interest-rate series but not for real variables. The long-wave pattern in fact disappeared from Kondratieff's time series for wages and foreign trade as soon as they were adjusted for price changes (Garvy 1943).

Secondly, it was argued that the long waves calculated by Kondratieff were a statistical deception, the artificial result of manipulating and distorting time series on real variables.

What can be said today about these two arguments?

2.1 Long waves of aggregate production and investment activity

On the basis of the data available today, the multinational existence of long waves in aggregate production and investment has been claimed, for example, by Glisman, Rodemer, and Wolter (1978) and (1981).

For the period following the Second World War, their time series show falling real growth relative to the trend at least since the 1970s in all countries under investigation, i.e. in Germany, France, the United Kingdom, Sweden, Italy, and the United States. The authors conclude that there have in fact been long waves of economic develop- ment even though the production series in Western industrialized countries have fluctuated to differing degrees. Overall, the findings of their investigation also provided some support for Kondratieff's

dating of the long waves. The long-wave chronology by Glisman, Rodemer,
and Wolter (see Table 1) indeed corresponds closely to the original
chronology presented by Kondratieff. (See Figure 1.)

TABLE 1 — Cyclical growth of aggregate production in selected
countries (1) (average annual rate of change) (2).
— Results by Glisman, Rodemer and Wolter (1980) —

Country	Bourgeois Kondratieff			Neo-mercantile Kondratieff			Neo-classical Kondratieff		
	From	End around	%	Beginn around	End around	%	Beginn around	until	%
Germany	(1854)	1882	2,6	1882	1932	2,0	1932	(1975)	4,0
France				(1905)	1938	1,1	1938	(1975)	3,7
U.K.	(1834)	1893	2,1	1893	1933	1,2	1933	(1975)	2,4
Sweden	(1864)	1892	2,6	1892	1934	2,8	1934	(1975)	4,0
Italy	(1864)	1899	0,8	1899	1934	1,9	1934	(1975)	3,6
U.S.A.				1893	1934	2,7	1934	(1975)	3,9

(1) The low points of the cycles were determined on the basis of
aggregate production figures, using deviations of moving avera-
ges from trend. Where the beginning or end of a cycle could not
be established, the year was placed in brackets.

(2) On the basis of nine-year moving averages of the production
series.

One disturbing shortcoming in the data series used by Glisman
and others is the presence of gaps for war periods (like 1913 to the
early 1920s and 1939 to the late 1940s). This means that economic
development during wars is simply ignored. However, economic perform-
ance in war periods is, apart from being interesting in itself, of
considerable relevance for subsequent economic growth. Therefore,
it appears desirable to analyze complete time series in search of long
waves in aggregate output figures.

Recently, Maddison (1982, Appendix A) has presented complete, and consistent, real GDP series for a number of Western industrialized countries. His long-term annual data begin as early as 1820 (France and Denmark), 1830 (United Kingdom), 1850 (Germany), 1861 (Italy), and 1900 (Netherlands). I have used the Maddison real GDP "raw material" for these six EEC countries to calculate trend lines plus deviations from trend; the deviations from trend in log form, smoothed by a 9-year moving average, are taken as possible long waves.

On Figures 3 to 8 the evidence is displayed graphically. Given the correctness of the trend lines fitted (Figs. 3a to 8a), the question is whether the smoothed deviations from trend (Figs. 3b to 8b) indeed show a second, third, and perhaps one half of a fourth "Kondratieff". As a 'reference grid', we should refer to Kondratieff's long-wave chronology and/or to the Glisman evidence (see above).

Inspection of Figures 3b to 8b gives, however, some disappoint-ment if we had hoped to detect a similar and definite pattern of long waves. Except for Denmark, where we could (roughly) date a "second Kondratieff" from 1840 to 1890 (50 years) and a "third Kondratieff" from 1890 to 1944 (54 years), the long-wave pattern, if any, appears to be quite irregular in terms of total duration as well as in dating across countries. For France, for example, there seems to be a "super-long wave" of roughly 100 years from 1824 (or before) to 1919 and a "half-size" long wave from 1919 to 1944 (Figure 4b). For Germany (Figure 5b) we might correspondingly talk of two quasi-long waves from (at least) the 1850s until the 1920s (70 years) and from the 1920s to 1950 (30 years). However, a firm "believer" in the Kondra-tieff phenomenon could advance a more favourable interpretation with at least one 50-year long wave from 1883 to 1933, leaving the following

FIGURE 3a
==========

ORIGINAL SERIES AND TREND (IN LOG)

DENMARK
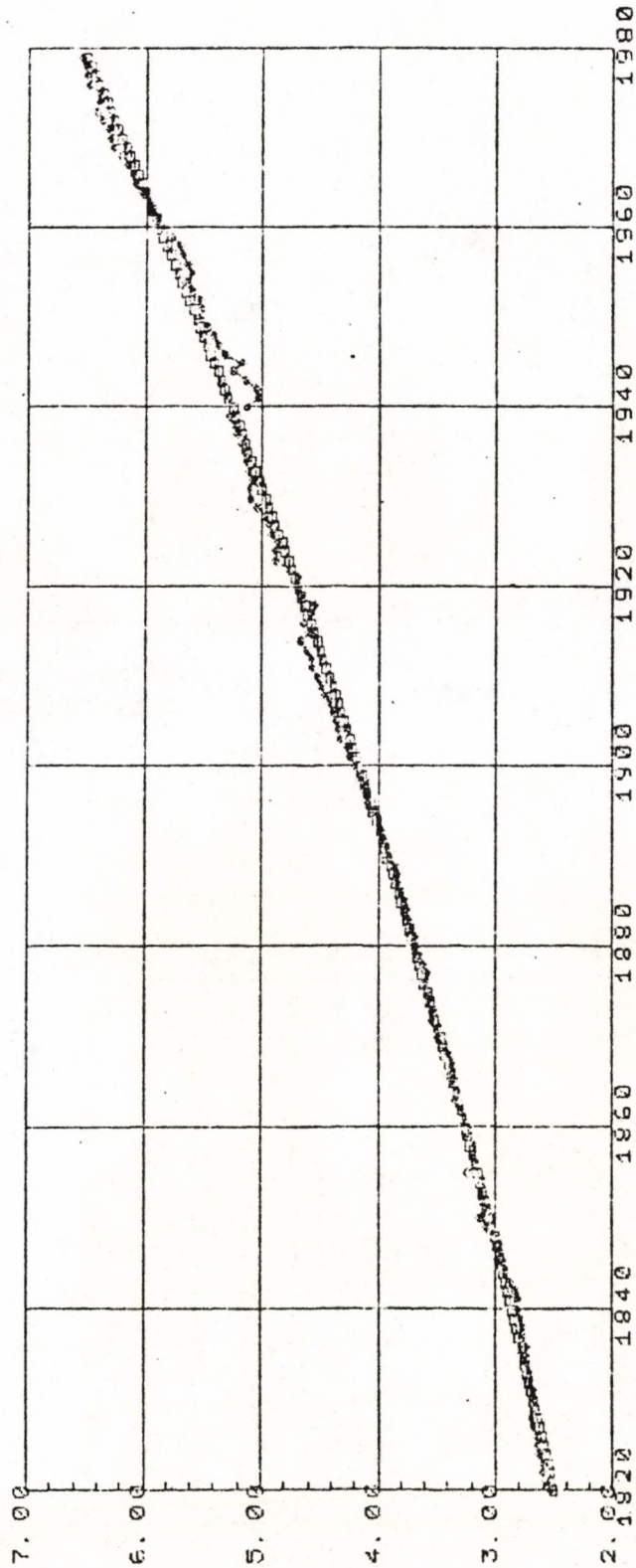
TIME BOUNDS: 1820 TO 1979

SYMBOL	NAME						
▫ Trend	TLDK	=	2.50	+ 0.016 TIME	+ 0.000056 TIME^2	NOB	= 160
			(147.88)	(33.023)	(19.3666)	CRSQ	= 0.996
• Original Data	OLDK					DW	= 0.280

FIGURE 3b
========

DEVIATIONS FROM TREND (IN LOG), 9-YEAR MOVING AVERAGES   DENMARK

TIME BOUNDS: 1824 TO 1975

ORIGINAL SERIES AND TREND (IN LOG)

FIGURE 4a
========

FRANCE

TIME BOUNDS: 1820 TO 1979

SYMBOL   NAME

   Trend   TLF   =   3.42   +   0.0048 TIME   +   0.000067 $TIME^2$ NOB   =   160

                            (65.49)   (3.2413)   (7.46304)   CRSQ   =   0.920

   •   Original Data   OLF   DW   =   0.088

FIGURE 4b
=========

DEVIATIONS FROM TREND (IN LOG), 9-YEAR MOVING AVERAGES   FRANCE
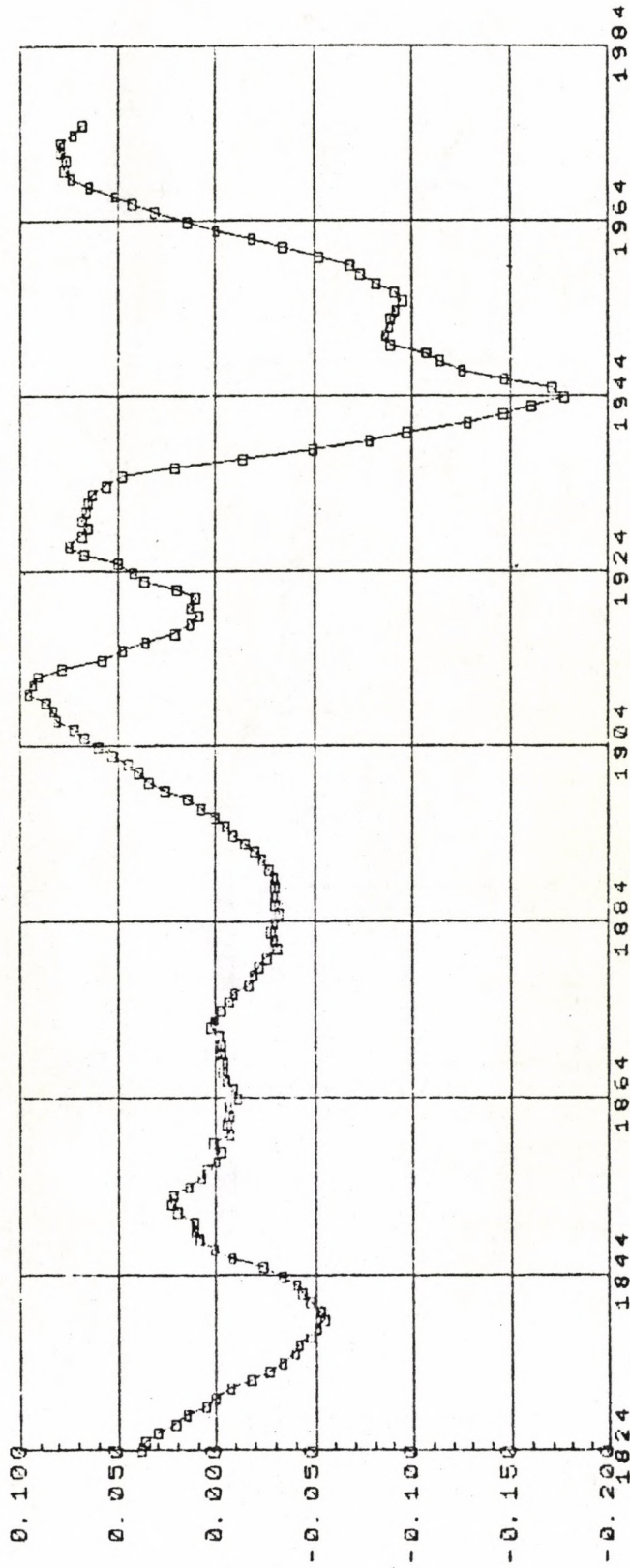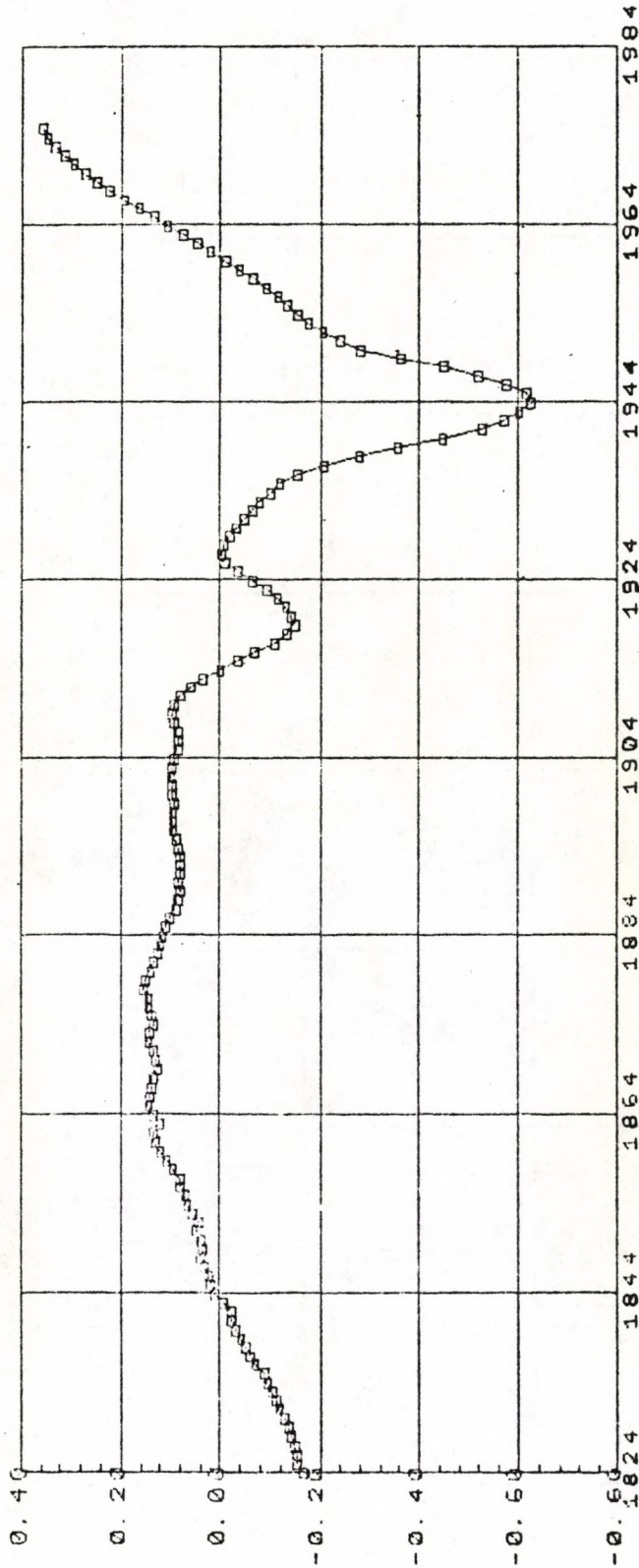
TIME BOUNDS: 1824 TO 1975

FIGURE 5a
=========

ORIGINAL SERIES AND TREND (IN LOG)

GERMANY

TIME BOUNDS: 1850 TO 1979

SYMBOL	NAME				
□	Trend	TLD =	4.02 +	0.023 TIME +	0.000093 TIME^2
			(183.86)	(41.519)	(7.68155)
●	Original	OLD			
	Data				

NOB = 130

CRSQ = 0.970

DW = 0.219

FIGURE 5b
=========

DEVIATIONS FROM TREND (IN LOG), 9-YEAR MOVING AVERAGES   GERMANY
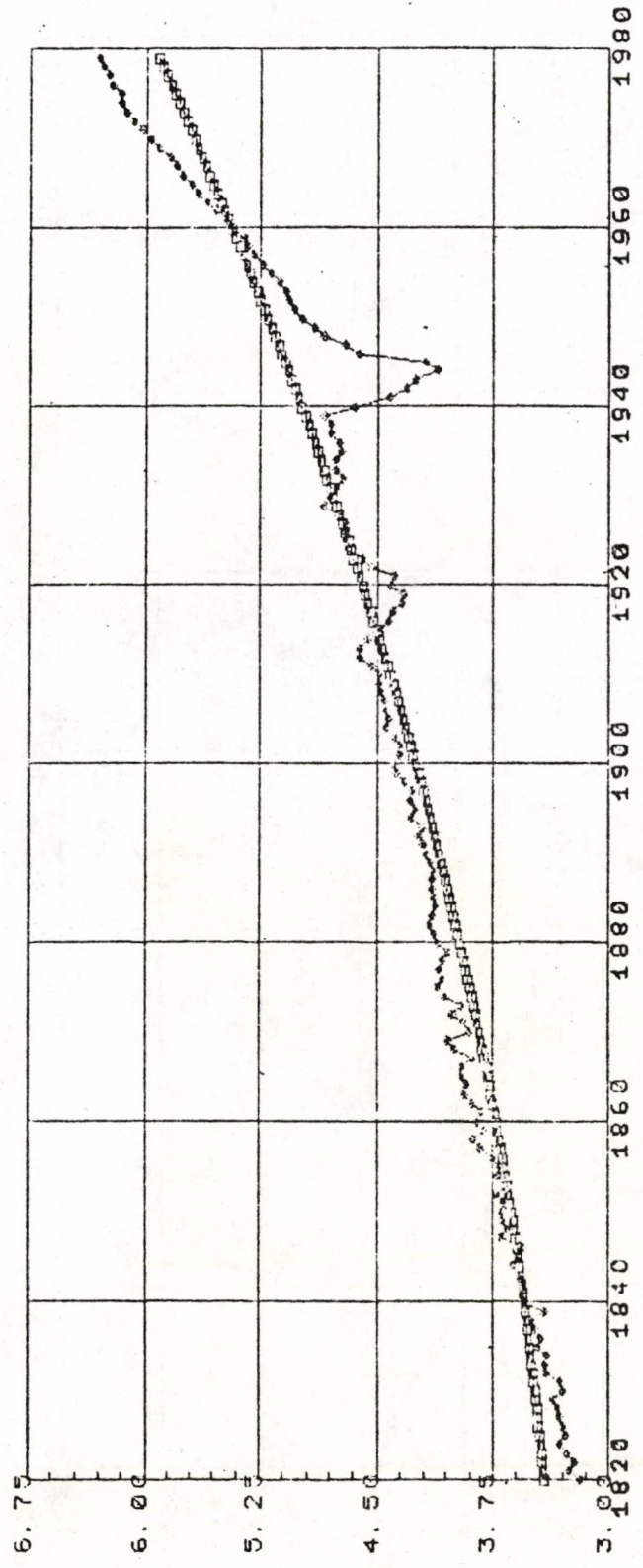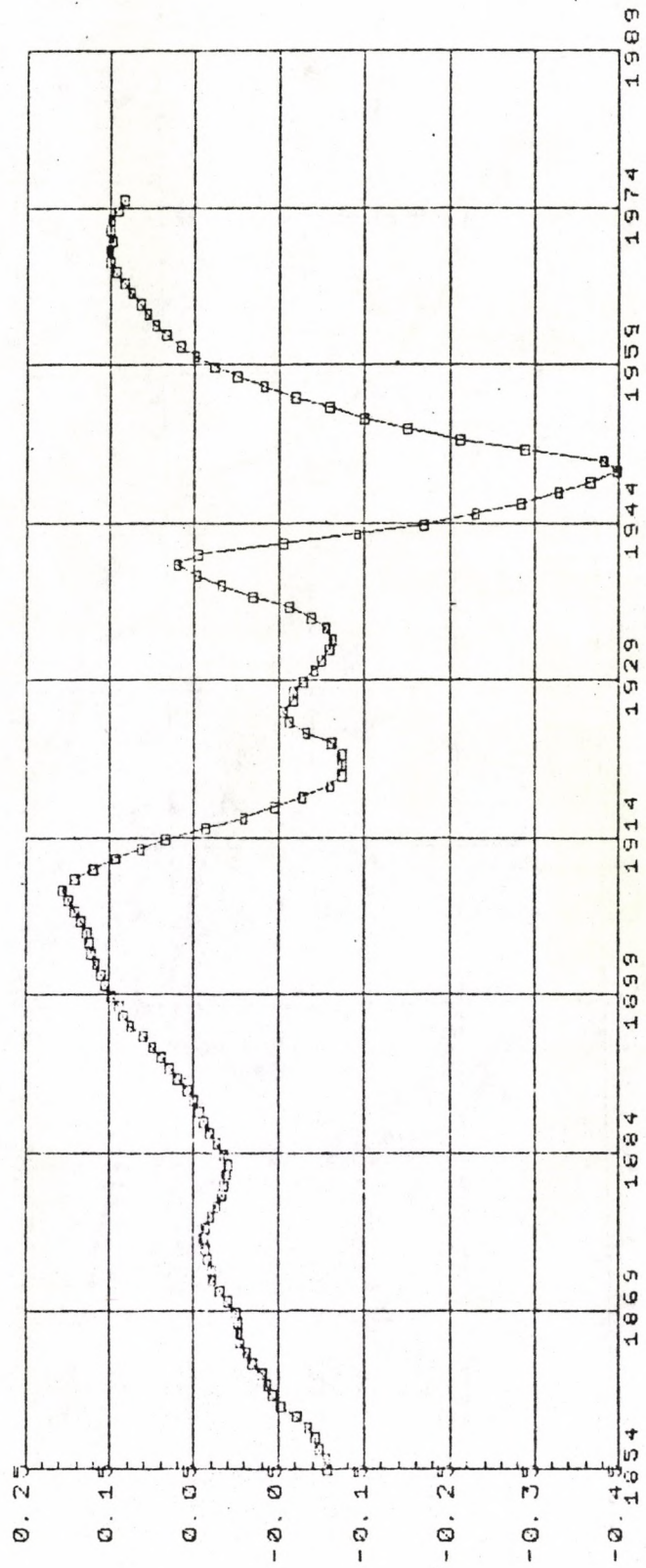

TIME BOUNDS: 1854 TO 1975

FIGURE 6a
========

ITALY

ORIGINAL SERIES AND TREND (IN LOG)

TIME BOUNDS: 1861 TO 1979

SYMBOL   NAME
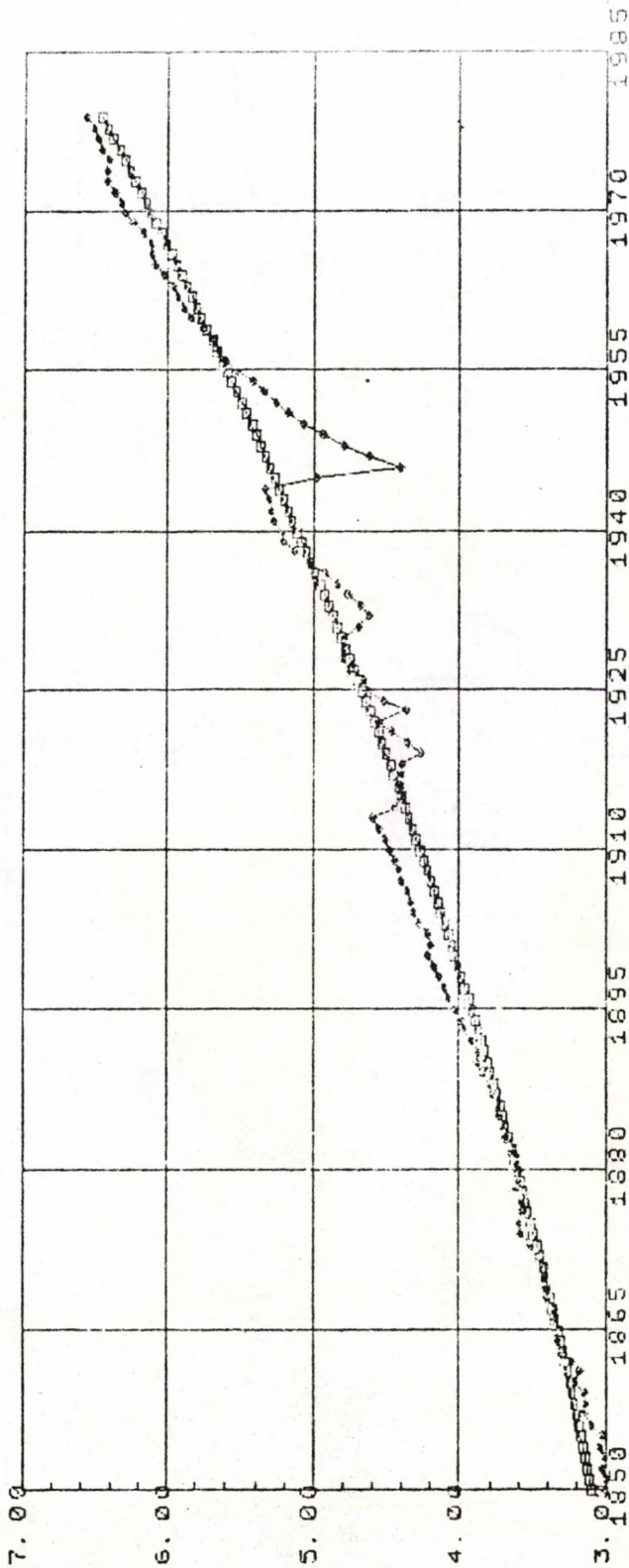
□   Trend   TLI = 3.98 - 0.0013 TIME + 0.000185 TIME^2 NOB = 119
                    (99.92) (-0.8207)   (14.929)   CRSQ = 0.965
●   Original Data   OLI   DW   = 0.169

FIGURE 6b
=========

DEVIATIONS FROM TREND (IN LOG), 9-YEAR MOVING AVERAGES   ITALY
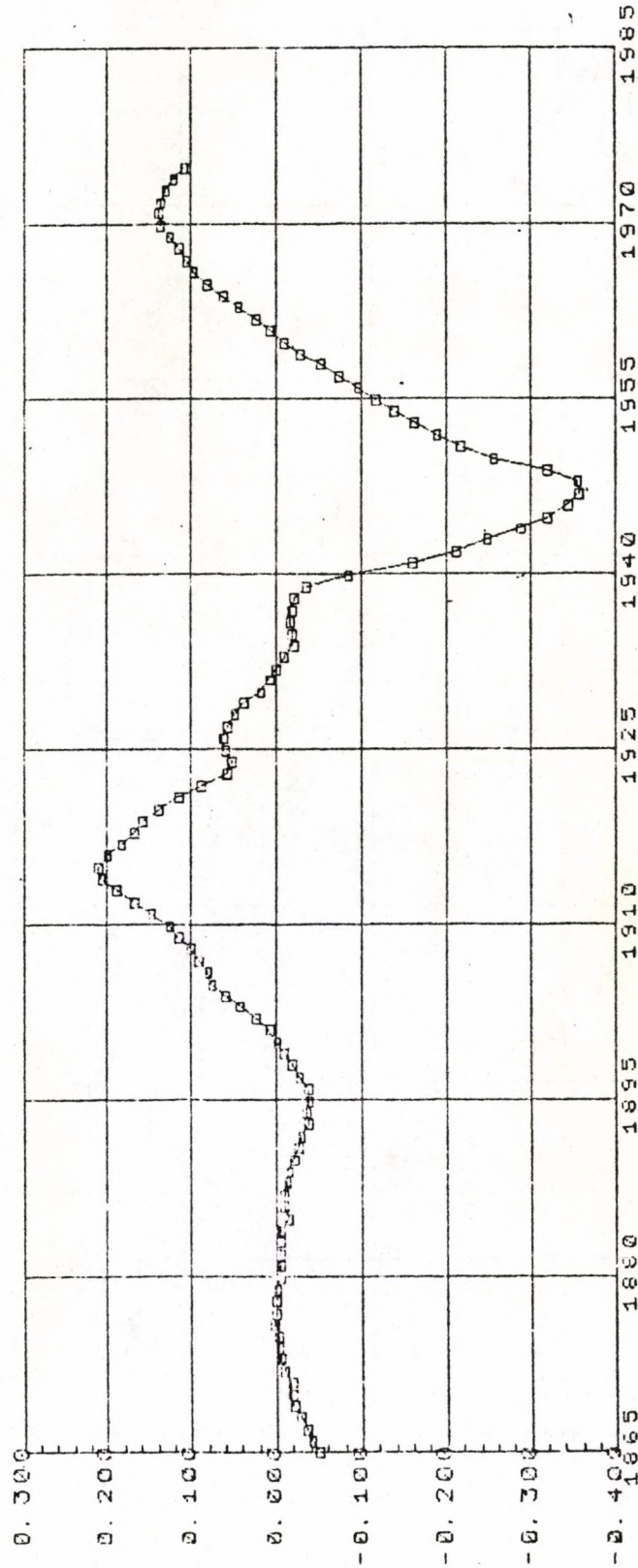
TIME BOUNDS: 1865 TO 1975

FIGURE 7a
=========

ORIGINAL SERIES AND TREND (IN LOG)
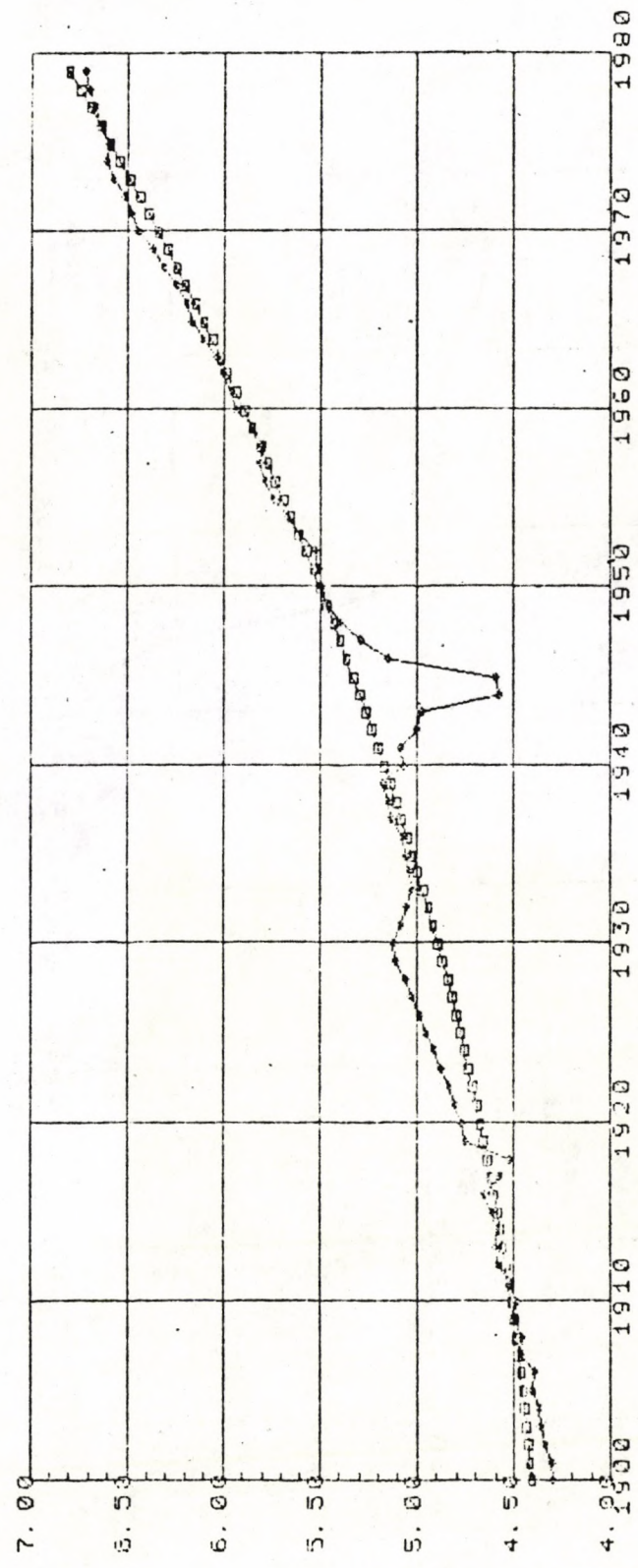
NETHERLANDS

TIME BOUNDS: 1900 TO 1979

SYMBOL   NAME

□   Trend   TLNL =   4.41 + 0.0068 TIME + 0.00029 TIME^2 NOB = 80
                        (82.93)   (2.257)   (7.94929)   CRSQ = 0.955
                                                                  DW   = 0.332

●   Original Data   OLNL

FIGURE 7b
==========

DEVIATIONS FROM TREND (IN LOG), 9-YEAR MOVING AVERAGES   NETHERLANDS
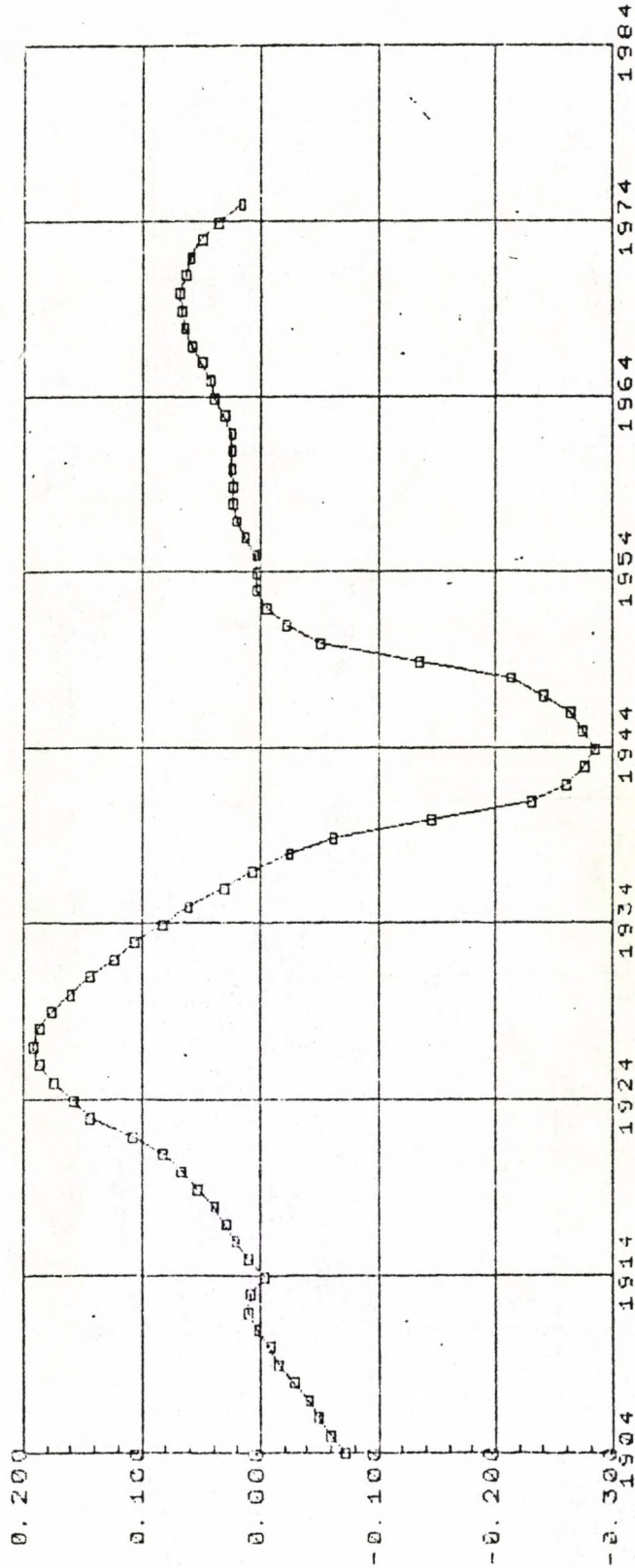
TIME BOUNDS: 1904 TO 1975

FIGURE 8a
=========

ORIGINAL SERIES AND TREND (IN LOG)

UNITED KINGDOM
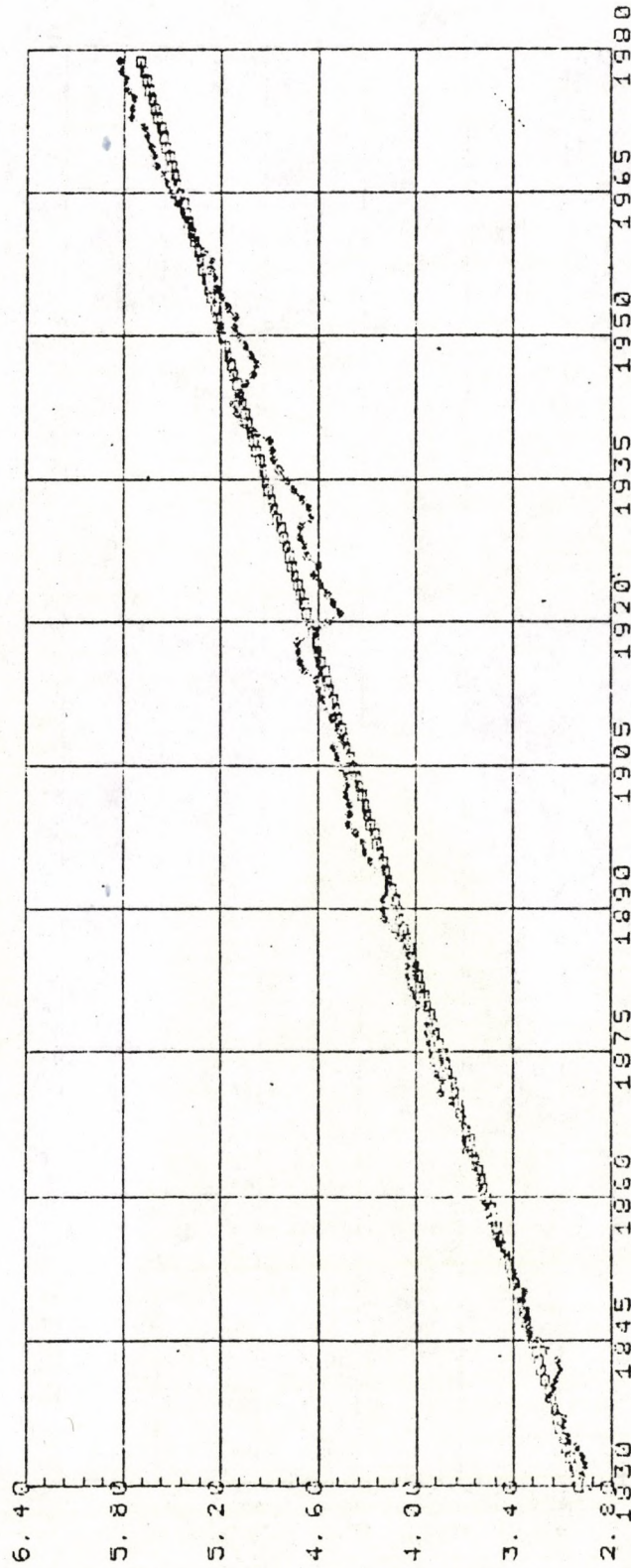
TIME BOUNDS: 1830 TO 1979

SYMBOL   NAME

□   Trend   TLUK   =   2.99 + 0.019 TIME - 0.0000052 $TIME^2$
                     (139.31) (28.723)   (-1.22698)

○   Original Data   OLUK

NOB = 150
CRSQ = 0.988
DW   = 0.124

FIGURE 8b
==========

DEVIATIONS FROM TREND (IN LOG), 9-YEAR MOVING AVERAGES   UNITED KINGDOM
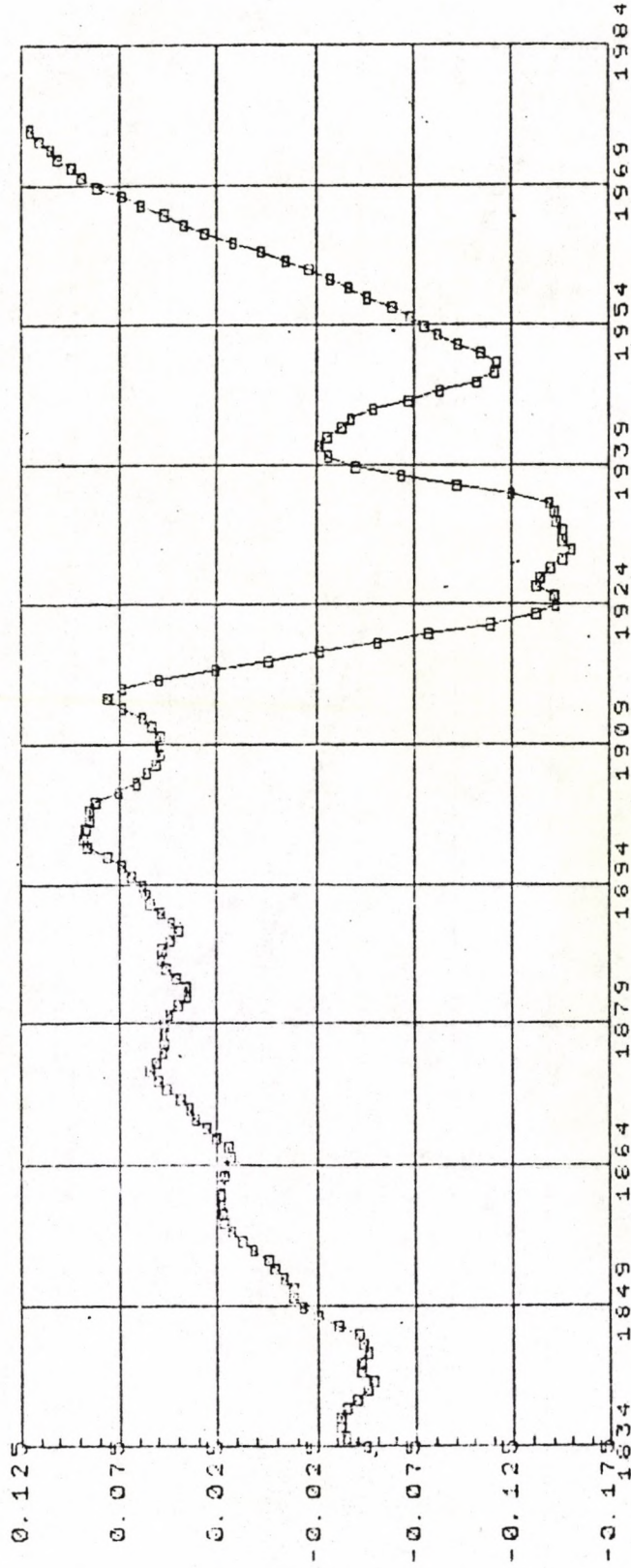

TIME BOUNDS: 1834 TO 1975

15 years until 1949 uncounted due to special war influences. For
Italy, again only one long wave of roughly 52 years can be identi-
fied from 1895 to 1947 (Figure 6b), and the same holds true for the
Netherlands (Figure 7b), with a proximate dating from the turn of the
century until 1944, i.e. roughly 50 years. Finally, and comparable to
the French and German case in terms of duration, there seems to be
just one extremely long wave in the United Kingdom (Figure 8b) from
about 1840 to 1930. But again, a more favourable interpretation is
possible, with a 43-year long wave from 1840 to 1883 and a 47-year
long wave from 1883 to 1930.

Overall, two conclusions are obvious:

Firstly, the detection and dating of Kondratieff-type long
waves has a large arbitrary or judgemental component, depending on
the researcher's a-priori beliefs and prejudices.

Secondly, due to the Second World War, there is a definite
uniformity as to the long-term upswing in the 1950s and 1960s. All
curves show a deceleration of economic growth (in terms of a slowdown
or sign reversal of positive deviations from trend) with the "right"
total duration of 20-25 years. Therefore, despite a rather mixed
evidence for past long waves, there could indeed be one "neoclassical"
or "Post-World-War II" Kondratieff, beginning around 1945/50 and encom-
passing the rest of the 20th century. This possibility cannot be re-
jected completely in view of the evidence.

To escape the somewhat confusing empirical results, it might
help to consider a few relevant questions as regards the statistical
procedures involved.

2.2 Are the long waves a statistical deception?

As early as the period between the wars, doubts were expressed concerning Kondratieff's statistical method (involving calculation and smoothing of deviations from trend) and the claimed long-wave movement was criticized as a "statistical artefact". The arguments were as follows:

(a) It is always possible, with a suitable polynomial, to fit a trend line to existing growth cycles such that the deviations from trend yield long waves or any other cycles - depending on the method of calculating the trend.

(b) The breakdown of time series into cyclical and trend components is asserted to be inadmissible, as trend and deviations from trend are an expression of the same economic growth process; their statistical breakdown is therefore said to be unjustified (see Garvy, 1943).

These objections, which were raised decades ago, can still be heard today as time-series analysis has made considerable progress. In a critical analysis of the recent papers by Glisman et al. on the long-wave phenomenon, Kleinknecht (1979) argues, for example, that the statistical method of revealing the long-wave phenomenon (adjustment and smoothing) produces just this pattern. However, additional spectral and correlation analyses seem to confirm (in the case of the German data at least) that there is no statistical artefact (Glisman et al., 1980, pp. 10/11). It is, however, possible in principle that the smoothing of trend deviations may artificially produce cyclical Juglar fluctuations which are not present in the original series ("Slutsky effect"). On the other hand, long waves have long ago been identified, without trend adjustment, for price level series - by Kondratieff himself and also,

for example, by Woytinski (see Figure 9).

In summary, the charge of "statistical artefact" remains a controversial and unresolved issue.

3. THEORIES OF A LONG-WAVE CYCLE

Given that the existence of long waves cannot be ruled out completely, the question as to the cyclical quality of long waves is important: it leads directly to the rather fateful inquiry of whether we are presently in the downswing phase of a fourth "neo-classical" Kondratieff: Is there more crisis or depression ahead in the 1980s?

For some observers, this question has to be answered with a flat YES: "At present, we are in the grip of the 'second lag' of the fourth Kondratieff cycle ..." (Kaldor, 1982, p. 18). In order to substantiate such an assertion, however, a theory must first be found which satisfactorily explains the recurrent and endogenous, and hence cyclical, nature of the long waves. Secondly, it has to be established whether - against the background of such a theory - there is empirical evidence of a cyclical long-wave pattern.

Before looking into these rather complex matters, the early criticism levelled against the long-wave hypothesis should be recalled. Kondratieff was criticized on the score that long waves, even when regarded as empirically existing, cannot be interpreted as a cyclical phenomenon. Contemporary critics in Soviet Russia in particular viewed the differences in length and between countries of the three long waves simply as qualitative proof of historically distinct epochs, namely of past evolutions of capitalist economies.

FIGURE 9
=========

Movement in wholesale prices in Britain, 1850 - 1910, and their trend.

○○○○○●   "Relative volume" of monetary gold according to Kitchin.

———————   Wholesale index numbers.

‐‐‐‐‐‐‐   Third-degree trend in wholesale index numbers.

‐·‐··‐··‐··   Sixth-degree trend in wholesale index numbers.

Source: W. Woytinski: Das Rätsel der langen Wellen, Schmollers Jahrbuch, 55. Jahrgang, II. Halbband, 1931, p. 601.

Trotzky (1923), for example, while accepting the existence of long waves, did not regard them as a regularly recurring - and thus cyclical - phenomenon stemming from the "internal dynamics of the capitalist economic system". He rather believed they were non-recurring historical developments each of which was caused by unique and quite specific political and economic circumstances. Other critics (Oparim, Gerstein) saw Kondratieff's long waves as individual historical trend periods of economic growth which had no significant connection with Kondratieff's claimed "clustering" of innovations at the beginning of a new long-wave upswing. A cyclical long-wave pattern was not apparent to them.

In response to Kondratieff's attempted explanation and subsequent theoretical discussions (e.g. by Spiethoff, 1925, Kuznets, 1930, and Schumpeter, 1939), two competing hypotheses of a cyclical long-wave phenomenon have developed: the innovation hypothesis and the distribution hypothesis.

3.1   The modern innovation hypothesis

The modern innovation hypothesis combines the original innovation thesis of Schumpeter (1939) with the over-investment theory of Spiethoff (1925) and Forrester (1976) and the theory of industrial cycles by Kuznets (1929) and Vernon (1966). More recently, it has been analyzed by van Duijn (1977) and Kleinknecht (1980).

The starting point is Schumpeter's thesis that cycles result from the differing pace at which innovations are implemented. Cyclical long waves stem from the simultaneous emergence of pioneering firms which, concentrated at the lower turning point of a long wave, introduce basic innovations, rake in pioneering profits from the "new combinations" and then attract imitators to the scene.

This starting point is of course - it must be said straight
away - open to attack on a number of points: why do the pioneering
firms emerge in such a concentrated (unevenly distributed) fashion?
Here it can be argued, broadly in line with Kondratieff, that difficult
conditions in times of depression may hinder the practical application
of "new combinations" for some time. Why, however, should basic inno-
vations, assuming for the moment that they are endogenous in character,
produce fifty-year cycles? The modern innovation hypothesis adduces
here (again inspired by Kondratieff) an "echo effect" whereby the con-
centrated production of capital goods also gives rise to clustered
reinvestment. The basic innovations of Schumpeter's pioneering firms
induce a series of industrial cycles which lead to a surge in demand
for capital goods. These industrial cycles, which are cycles specific
to individual branches, stem from the lifespan of basic innovations
 (e.g. television) and improvement innovations (e.g. colour television);
inherent in them is a matching reinvestment pattern.

The scenario is that the surge in demand for capital goods leads
to the growth of new industries. This in turn causes, in the capital
goods sector, a backlog of orders and production bottlenecks. Production
capacity is expanded. However, lengthening order books prompt manu-
facturers of capital goods to form exaggerated sales expectations and
this generates all the excesses of a boom. They do not recognize in
time that a saturation point will progressively be reached.

These arguments repeat basically Spiethoff's ideas of "over-
production" of physical capital assets: Because the rise in effective
aggregate demand is overstimated, there is increased stockbuilding, a
reduction in the order backlog in the capital-goods sector and, finally,
under-utilization of capacity. Firms now go to the other extreme: with
profits falling, they view their future profits and sales position too

pessimistically, investment is shunned and there is a sharp fall in the investment ratio.

In the ensuing downward phase of the long wave, investment in conventional technology becomes less and less profitable, the longer and the sharper the downswing is. National economies are increasingly incapable of overcoming the economic slump by themselves. Only when a new generation of courageous pioneering firms comes forward with a new generation of basic innovations can the next long-wave upswing begin.

In essence, the innovation hypothesis is characterized by regularly recurring misguided reactions of economic decision makers (i.e. false expectations of manufacturers of capital goods). This point is open to criticism: Should we not expect "rationally" acting economic agents to form rational expectations? The innovation hypothesis at any rate implies an unchanged incapacity from one generation of entrepreneurs to another to learn from the mistakes of the past. Kaldor may have had this in mind when he commented: "Indeed the most plausible explanation seems to be that these cycles are fundamentally a reflection of cycles in human thought and preferences, and their length is best explained by the fact that 25 years is normally taken as the best estimate of the length of a human generation (Kaldor, 1982, pp. 18/19). This statement shows Kaldor as a supporter of the German business-cycle analyst Wagemann who, as early as 1928, linked the change of generations with the long-wave phenomenon (see also the discussion in Weinstock, 1964, pp. 66-68).

All in all, there are two weak points in the modern innovation thesis: Firstly, a downswing does not necessarily entail an automatic bunching of basic innovations; all it does is to create favourable conditions for such bunching. This brings the empirical problem of iden-

tifying such innovations into even sharper focus. Moreover, attempts to prove the existence of such clustering by means of modern statistical methods have so far been unsuccessful (van Duijn, 1977, p. 570; Glisman et al., 1980, p. 4).

Secondly, no explanation is offered of why firms continually react to market signals only after a considerable time lag and therefore keep over-reacting without learning their lesson. Here, recent analyses by Lucas (1981) could be incorporated into the hypothesis: it could, for example, be postulated that large firms must nowadays be seen as institutions or even as bureaucracies which - unlike individuals - learn only slowly and react ponderously (see also Glisman et al., 1980, p. 6). This would imply, however, that, with increasing bureaucratization, the "wrong" reactions increase in duration and intensity - an implication for which there is even some supporting evidence (see below).

3.2   The distribution theorem

The distribution theorem was recently expounded by Glisman, Rodemer, and Wolter (1978 and 1980) and it is based, amongst other things, on the German Council of Economic Advisers' concept of wages which do not push up cost levels (wage 'neutrality'). The distribution theory, too, is based on concentrated changes in investment activity as the factor triggering long-wave fluctuations in national product. However, investment fluctuations are caused by price distortions on the factor and product markets, which in turn directly affect firms' profit expectations. The chain of causality is therefore profit expectations → investment → national product.

The distribution theory views profit expectations as follows:

- Through a wage policy that is not neutral in its effect on costs, functional income distribution may be so altered that real wages rise relative to business profits (this happened in the Federal Republic of Germany in the 1970s). If wages rise faster than can be absorbed without effect on costs, firms increasingly substitute capital for labour. Capital productivity is reduced and profit expectations and investment activity decline.

- Firms' profit expectations are also squeezed, according to the theory, by the spread of bureaucratic obstacles that are associated with the expansion of the public sector consumption ratio and lead to an increasing bureaucratic paralysis of entrepreneurial activities.

These postulated inter-relationships are added together to give the following sequence of events (see also Glisman et al., 1980, pp. 7-12).

- At the outset, growth equilibrium is disrupted by organized group inter-ests - e.g. by trade unions exploiting their power position and generating cost pressures on factor markets.

- Because of the persistent pressure of costs, investment activity slackens and production declines (in relative terms). The longer the contraction phase lasts, however, the more the interest groups which caused the dis-ruption lose power. This may be due to the fact that, with decline continu-ing, their financial base is eroded and their members increasingly lose confidence in their organizations and desert them; the self-interest of organizations may therefore prompt them to absorb the lessons of the downswing, moderating the struggle over distributive shares. Changes in social attitudes ("Zeitgeist") work in the same direction. The reduction in the original disruption tends to reduce manufacturers' cost in relation to profits.

As cost pressures slacken, profit expectations again improve and a
new upswing begins. As the upswing increases in duration, more and more
shortages develop on goods and factor markets which encourage new
monopolization tendencies. The same institutional and societal inertia
which was operative during the downswing prevents the interest groups
from reacting in time to their changing power; their 'approach',
marked by the last crisis, is not altered rapidly enough.

In my view, the most important objection to the distribution hypo-
thesis is that it fails to substantiate the argument that the postulated
course of events causes a long-wave pattern - and not a normal
business cycle. This is the disadvantage of dropping the idea of the
systematic clustering of basic innovations.

As in the case of the innovation hypothesis, misguided reactions
on the part of economic decision makers are postulated. However, they
do not relate to mistaken (and regularly recurring) expectations of
investors, but to the struggle between interest groups over distributive
shares. These groups engage in the struggle for the sake of short-term
benefits, but overlook the fact that in the long term they bring dis-
advantages for all concerned. The failure to see the long-term disad-
vantages can be traced to the same factors as the overreaction of
investors (e.g. unwieldiness of institutions and bureaucratic
structures).

3.3 Cyclical qualities of both hypotheses

Conclusions regarding the cyclical explanatory value of both
hypotheses for a possible long-wave phenomenon can be kept brief.
The distribution hypothesis is restricted to recent times, since

the economy-wide organized representation of group interests did not
occur until the end of the 19th century; the first two Kondratieff waves
(1790-1847; 1847-1893) cannot therefore be explained applying this
hypothesis. Supporters of the distribution hypothesis actually concede
that their investigations do not show a general "law" of cyclical develop-
ment, and their studies avoid to interpret long-term fluctuation in economic
development as cyclical phenomena (see, for example, Glisman et al., 1978
and 1980, p. 12).

The modern innovation hypothesis, on the other hand, can be applied
to all observed long waves as a possible explanation. With its thesis of
the concentrated emergence of new products and technologies ("basic inno-
vations") before the beginning of a long-wave upswing, it focuses attention
on a clearly endogenous imbalance mechanism in the market system. This
mechanism works through the relationship between profit trends and expecta-
tions, investment and growth (to this extent, there is no essential
difference between the modern innovation and distribution theories).
Owing to its larger empirical content, the innovation hypothesis should
be our first choice as a testable hypothesis of a cyclical long-wave
phenomenon.

It should be added that the theoretical and empirical study of
long waves must not be restricted to one cause only. Clearly, distribu-
tion aspects have also played a part, particularly in the last two decades.
Nor should we neglect the fact that some Western economies underwent a
reconstruction phase following the Second World War. We therefore again
find ourselves on shaky ground as far as theoretical arguments are con-
cerned; there is no satisfactory and complete theoretical model of a
long-wave cycle. The usual, but methodologically questionable rection
is to turn to results of recent tests for further insights. And indeed,

as will be shown subsequently, there is presently no systematic and/or convincing evidence at hand for a firm "Yes" or "No" to any tested long-wave hypothesis.

3.4 Testing the hypotheses partially

Preliminary comments on the data problem and earlier test results

Even if we have a reasonably satisfactory thesis, the enormous time horizon of long waves would appear to condemn strict statistical tests to failure from the outset. A rigorous, comprehensive statistical test cannot in fact be applied to the long-wave thesis if only because of the fortitious influences and external shocks that might occur during the course of half a century.

Fierce critics such as Kuznets have used this circumstance to flatly reject the phenomenon of long waves (Kuznets, 1953; Rostow, 1975; in the case of Kuznets, there may also have been personal reasons). Furthermore, with a maximum of three and a half 'Kondratieffs' so far observable, the data basis (frequency) necessary for confirming the claimed empirical characteristics of long waves looks far too narrow. Van Duijn speaks of "at least a further one hundred years" before a final judgement can be formed about the existence of a self-repeating long wave (van Duijn, 1977, p. 566). Yet more modest, partial hypothesis tests can in fact advance our knowledge to some degree.

An examination has been made, for example, of Kondratieff's first empirical characteristic, namely that the upswing phase of a regular (Juglar) business cycle during an upturn in the long wave is longer than during a downswing. The 'reference cycle' investigation by Burns and Mitchell (1946) for the period 1854-1938, covering the United States, Germany,

France, and the United Kingdom confirmed Kondratieff's observation; there were no significant deviations in the cycle lengths across the countries mentioned.

More important, however, are tests which directly examine the centrepiece of the innovation theory - the assertion that basic innovations are concentrated before the upswing phase of a long wave. Test results for a possible "fourth Kondratieff" are summarized below. It should be noted, however, that no attempt was made to examine whether each of the long waves is in fact the result of the same endogenous forces. This also leaves doubts about whether the fourth long wave can justifiably be extrapolated into a "depression phase". Perhaps we should simply accept that sceptical questions about the existence of long waves cannot be answered until a comprehensive study has been made of the mechanism of the normal (Juglar) cycles. After all, the cyclical forces which produce the long waves cannot work independently of those which generate the short cycles (see Haberler, 1975).

Some partial findings of recent innovation research

Kondratieff's "empirical characteristic" according to which a clustering of basic innovations can be observed toward the end of a long-wave downswing receives some backing from recent investigations (see for example Mensch, 1975); the claim that product/process innovations are concentrated around 1830/1840, 1885, and 1935 has been shown to be correct. If we assume that the modern innovation hypothesis is valid, it should be possible to demonstrate, firstly, that during the upswing phase of a long wave the emerging growth industries are those which implemented basic innovations during the preceding downswing phase and, secondly, that these "innovation industries" stagnate in their growth at the upper turning point of a long wave.

An empirical examination of this kind was recently carried out for the German economy from 1950 to 1977 (Kleinknecht, 1980). This established that the growth industries of the 1950s and 1960s (plastics processing, mineral-oil processing, chemicals, electrical engineering, road vehicle and aircraft manufacture) were the very industries which experienced a considerable surge in basic innovations during the 1930s and 1940s. It was also observed that the present weak growth conditions have coincided with the relative stagnation of most of the original growth industries. An indicator for industrial business profits suggests that this development in the production structure has been accompanied by a parallel movement in profits.

Further evidence of a "fourth Kondratieff"

More recent tests based on the distribution theory also show, for the Federal Republic of Germany, that the slower growth in the 1970s can be interpreted as the onset of the downward phase of a fourth long wave (see Glisman et al., 1978). The diagnosed trend in national product was traced back, amongst other things, to fluctuations in the functional distribution of income ("wages explosion" in the early 1970s) and to the expansion of the public sector (public sector comsumption ratio). This is therefore another test result which indicates that, applying the distribution theory, we are in the downward phase of a long wave.

Finally, international "empirical characteristics" of the past three decades have been cited which, in the manner of a shock, have contributed to the upper turning point of a long wave in the 1970s. Reference is frequently made in this connection to the first oil shock at the end of 1973, the related emergence of an international oil cartel, the collapse of the Bretton Woods system at the beginning of 1973, the end of the Vietnam war and the worldwide acceleration in inflation -

all factors which have increasingly affected national economies owing to the sharp growth in international interdependence. It must be stressed here, however, that such exogenous events, quite in line with Kondratieff's theory, are <u>not</u> to be used as a causal explanation of long waves. It is also debatable how far the hypotheses mentioned, which were tested for Germany, can be applied to other countries. This also raises the question of the mechanism by which fluctuations in economic growth are transmitted between countries. It is indeed tempting to speculate (as Kaldor has suggested) that parallel fluctuations in economic activity in the Western industrialized countries are the result of "Zeitgeist" value patterns changing from generation to generation and transcending frontiers.

4.   ECONOMIC POLICY CONSIDERATIONS

We cannot fully reject the possible existence of a "long wave" beginning after World War II. Therefore, we cannot fully dismiss the possibility that we are presently in the downward phase of a fourth long wave; further economic crisis and depression in the 1980s is a real danger, even if there should be a brief recovery over the next few years. If there is such a thing as long waves, it is in principle of major importance to find out if it is a cyclical phenomenon. However, we are presently not in a position to give a firm answer. On the one hand, the 1980s may well see a <u>sustained</u> economic recovery, demonstrating that there is no (fourth) long wave at all. After all, the partial research findings mentioned above concern a theory which has not yet been coherently formulated and fully tested.

On the other hand, the available research results do not exclude the possibility that we are presently in fact in the downswing phase of

a long wave. Nor have the shorter-term "alternatives" of a modern
supply-side policy or of conventional Keynesian demand management
been cleared of all theoretical and empirical doubts. Consequently,
the study of long waves yields more than just the usual conclusion
that further research is necessary. It also highlights the need for
economic policy thinking to be fitted into time perspectives which
are much longer than the conventional one-to-four-years horizon.

The fundamental question for economic policy makers is thus whether
and how gloomy prospects for the 1980s and 1990s can be counteracted.
Can conventional business cycle policy have an impact at all? In the
long term, it may be unable to influence developments decisively,
particularly if the long-wave phenomenon were cyclical and endogenous
in character. This is, admittedly, a very resigned observation. But it
may be more helpful than the usual purposive optimism, displayed year
in and year out, that the next upswing is "just around the corner".

In practical policy terms, the potential existence of a present
"neoclassical" or "Post-World-War-II" Kondratieff could mean the
following:

(1) Medium-term forecasts which predict a sustained upswing in the
second half of the 1980s (or tax revenue projections based on them) should
be treated with even more caution than usual.

(2) A stabilization programme that is geared to the short or medium
term need not at the same time be the most effective programme for
shortening a long-wave downswing. If, for example, a certain depression
phase would in fact need to be reached before there could be an endo-
genous surge in investment activities, it might be appropriate to pursue
an austerity policy which intensifies and so curtails the downswing.

(3) Apart from these points a quite pragmatic call must be made for greater emphasis on (at least) two particular long-term aspects of economic policy making:

- in the monetary policy field, consideration should be given to setting a monetary target for a <u>number</u> of years in advance and to deliberately aiming for an optimum long-term combination of low price inflation, low nominal interest rates, and exchange-rate levels consistent with these;

- in the incomes policy field it should be brought home to interest group struggles over distributive shares that short-term advantages may carry the price of long-term disadvantages for all if, for example, subsidies and redistributions delay or prevent the structural change necessary for a surge in investment and economic activity.

(4) An effective stabilization programme should be based on a careful forecast of current cyclical movements, not only in order to be able to influence the present phase of the "normal" business cycle but also to consider possible policy action against a long-wave downswing. In the final analysis, doubts about the existence of long waves probably cannot be settled until we have a reasonably full insight into the mechanism of "normal" cycles.

BIBLIOGRAPHY

S. BRITTAN, "The myth of the Kondratieff", Financial Times, April 7, 1983.

M. BRONFENBRENNER (ed.), Is the Business Cycle Obsolete?, New York, etc., 1969.

A.F. BURNS and W.C. MITCHELL, Measuring Business Cycles, New York, 1946.

G. CASSEL, Theoretische Sozialökonomie, 5th edition, Leipzig, 1932.

J. CLARK, Ch. FREEMAN, L. SOETE, "Long Waves and Technological Developments in the 20th Century", in: D. Petzina and G. von Roon (eds.), Konjunktur, Krise, Gesellschaft, Stuttgart, 1981, pp. 132-169.

J.J. van DUIJN, "The Long Wave in Economic Life", De Economist, vol. 125, No. 4, 1977, pp. 544-576.

L.H. DUPRIEZ, "Einwirkungen der langen Wellen auf die Entwicklung der Wirtschaft seit 1800", Weltwirtschaftliches Archiv, 42nd volume (1935 II), pp. 1-12.

L.H. DUPRIEZ, "1945-1971 als Aufschwungphase eines Kondratieff-Zyklus?", Ifo-Studien, Berlin/München, 1972, pp. 503-516.

C. van EWIJK, "A Spectral Analysis of the Kondratieff Cycle", Kyklos, July/Sept. 1982, pp. 468-499.

G. GARVY, "Kondratieff's Theory of Long Cycles", The Review of Economic Statistics, November 1943, pp. 203-220.

H.H. GLISMAN, H. RODEMER, F. WOLTER, "Zur Natur der Wachstumsschwäche in der Bundesrepublik Deutschland - eine empirische Analyse langer Zyklen wirtschaftlicher Entwicklung", Institut für Weltwirtschaft Kiel, Diskussionsbeiträge No. 55, June 1978.

H.H. GLISMAN, H. RODEMER, F. WOLTER, "Lange Wellen wirtschaftlichen Wachstums - Replik und Weiterführung", Institut für Weltwirtschaft Kiel, Diskussionsbeiträge No. 74, December 1980.

D.M. GORDON, Th.E. WEISSKOPF, S. BOWLES, "Long Swings and the Non-reproductive Cycle", American Economic Review, Papers and Proceedings, May 1983, pp. 152-157.

G. HABERLER, Prosperität und Depression, Eine theoretische Untersuchung der Konjunkturbewegungen, 2nd edition, Tübingen/Zürich, 1955.

INTERNATIONAL CURRENCY REVIEW, "Kondratieff's long economic cycles", November 1982, pp. 26-29.

W.A. JÖHR, Die Konjunkturschwankungen, Tübingen/Zürich, 1952.

N. KALDOR, "Economic Prospects of the 1980s", paper read to the International Economic Association Conference on Monetary Theory and Economic Institutions, Florence, September 1982.

A. KLEINKNECHT, "Überlegungen zur Renaissance der 'langen Wellen' der Konjunktur ('Kondratieff-Zyklen')", in: W.H. Schröder and R. Spree (eds.), Historische Konjunkturforschung, Stuttgart, 1980, pp. 316-338.

N.D. KONDRATIEFF, "Die langen Wellen der Konjunktur", Archiv für Sozialwissenschaft und Sozialpolitik, vol. 56(1926), pp. 573-609.

N.D. KONDRATIEFF, "Die Preisdynamik der industriellen und landwirtschaft-lichen Waren", Archiv für Sozialwissenschaft und Sozialpolitik, vol. 60(1928), pp. 1-85.

S. KUZNETS, Secular Movements in Production and Prices, New York, 1930.

D. KUZNETS, "Schumpeter's Business Cycles", The American Economic Review, vol. 30(1940/41), pp. 257-271.

Ph. LEFOURNIER, "La Fin d'un monde", L'Expansion, October 1982, pp. 57-72.

R.E. LUCAS Jr., Studies in Business Cycle Theory, Cambridge/London, 1981.

A. MADDISON, Phases of Capitalist Development, Oxford/New York, 1982 (in particular chapter 4 on long-wave analysis, pp. 66-85).

E. MANDEL, Der Spätkapitalismus, Frankfurt, 1972.

E. MANSFIELD, "Long Waves and Technological Innovation", American Economic Review, Papers and Proceedings, May 1983, pp. 141-145.

G. MENSCH, Das technologische Patt, Frankfurt, 1975.

G. MENSCH and R. SCHNOPP, "Stalemate in Technology, 1925-1935: The
    Interplay of Stagnation and Innovation", in: W.H. Schröder and
    R. Spree (eds.), Historische Konjunkturforschung, Stuttgart,
    1980, pp. 60-74.

B. NULLAU, "Die Kondratieff-Zyklen - Ein Slutzky-Effekt?", Wirtschafts-
    dienst, vol. 56, Hamburg, 1976, pp. 177-179.

POLICIES TO COMBAT DEPRESSION: A Report of the NBER (New York), Prince-
    ton, 1956.

N. ROSENBERG and C.R. FRISCHTAK, "Long Waves and Economic Growth: A
    Critical Appraisal", American Economic Review, Papers and
    Proceedings, May 1983, pp. 146-151.

W.W. ROSTOW, "Kondratieff, Schumpeter and Kuznets: Trend Periods
    Revisited", Journal of Economic History, vol 35(1975), pp. 719-753.

A. SCHUMPETER, Business Cycles (2 volumes), New York, 1939.

A. SPIETHOFF, "Krisen", Handwörterbuch der Staatswissenschaften,
    4th edition, 6th volume, Jena 1925, pp. 8-91.

R. SPREE, "Was kommt nach den 'langen Wellen' der Konjunktur?", in:
    W.H. Schröder and R. Spree (eds.), Historische Konjunkturforschung,
    Stuttgart, 1980, pp. 304-315.

W. SOMBART, Der moderne Kapitalismus, München/Leipzig, 1928.

A. STEINHERR, "The Great Depression: A Repeat in the 1980s?",
    EC-Commission, DG II, September 1982.

J. TINBERGEN and J.J. POLAK, The Dynamics of Business Cycles,
    Chicago, 1950.

J. TINBERGEN, Statistical Testing of Business Cycle Theories,
    Geneva, 1939.

H.J. VOSGERAU, "Konjunkturtheorie", Handwörterbuch der Wirtschafts-
    wissenschaft, vol. 4, Stuttgart/Göttingen/Tübingen, 1978,
    pp. 478-507.

U. WEINSTOCK, Das Problem der Kondratieff-Zyklen - Ein Beitrag zur
    Entwicklung einer Theorie der 'Langen Wellen' und ihrer
    Bedeutung, Berlin/München, 1964.

S. de WOLFF, "Prosperitäts- und Depressionsperioden", in: Der Lebendige
    Marxismus, Festausgabe zum 70. Geburtstag von Karl Kautsky,
    Jena, 1924.

W. WOYTINSKI, "Das Rätsel der langen Wellen", Schmollers Jahrbuch,
    55. Jahrgang, II. Halbband, 1931, pp. 1-42.

WORKING PAPERS ECONOMICS DEPARTMENT

No. 1: Jacques PELKMANS   The European Community and the Newly
                                          Industrialized Countries

No. 3: Aldo RUSTICHINI   Supranationalism Revisited – Retro-
                                          spective and Prospective. The Euro-
                                          pean Communities After Thirty Years

No. 9: Manfred E. STREIT   Information Processing in Futures
                                          Markets. An Essay on the Adequacy
                                          of an Abstraction.

No. 10: Kumaraswamy VELUPILLAI   When Workers Save and Invest: Some
                                          Kaldorian Dynamics

No. 11: Kumaraswamy VELUPILLAI   A Neo-Cambridge Model of Income
                                          Distribution and Unemployment

No. 12: Kumaraswamy VELUPILLAI   On Lindahl's Theory of Distribution
         Guglielmo CHIODI

No. 22: Don PATINKIN   Paul A. Samuelson on Monetary Theory

No. 23: Marcello DE CECCO   Inflation and Structural Change in
                                          the Euro-Dollar Market

No. 24: Marcello DE CECCO   The Vicious/Virtuous Circle Debate
                                          in the '20s and the '70s

No. 25: Manfred E. STREIT   Modelling, Managing and Monitoring
                                          Futures Trading: Frontiers of
                                          Analytical Inquiry

No. 34: Jean-Paul FITOUSSI   Modern Macroeconomic Theory; an
                                          Overview

No. 35: Richard M. GOODWIN   Economic Systems and their Regu-
         Kumaraswamy VELUPILLAI   lation

No. 46: Alessandra VENTURINI   Is the Bargaining Theory Still an
                                          Effective Framework of Analysis
                                          for Strike Patterns in Europe?

No. 47: Richard M. GOODWIN   Schumpeter: The Man I Knew

No. 48: Jean-Paul FITOUSSI   Politique de l'Emploi et Réduction
         Daniel SZPIRO   de la Durée du Travail

No. 56: Berc RUSTEM   Preferences in Policy Optimization
         Kumaraswamy VELUPILLAI   and Optimal Economic Policy

No. 60: Jean-Paul FITOUSSI   Adjusting to Competitive Depression.
                                          The Case of the Reduction in Working
                                          Time

No. 64: Marcello DE CECCO   Italian Monetary Policy in the 1980s

No. 65: Gianpaolo ROSSINI — Intra-industry Trade in Two areas: Some Aspects of Trade Within and Outside a Custom Union

No. 66: Wolfgang GEBAUER — Euromarkets and Monetary Control: The Deutschmark Case

No. 67: Gerd WEINRICH — On the Theory of Effective Demand under Stochastic Rationing

No. 68: Saul ESTRIN
Derek C. JONES — The Effects of Worker Participation upon Productivity in French Producer Cooperatives

No. 69: Berc RUSTEM
Kumaraswamy VELUPILLAI — On the Formalization of Political Preferences: A Contribution to the Frischian Scheme

No. 72: Wolfgang GEBAUER — Inflation and Interest: the Fisher Theorem Revisited

No. 75: Sheila A. CHAPMAN — Eastern Hard Currency Debt 1970-1983. An Overview.

No. 90: Will BARTLETT — Unemployment, Migration and Industrialization in Yugoslavia, 1958-1982

No. 91: Wolfgang GEBAUER — Kondratieff's Long Waves

No. 92: Elisabeth DE GELLINCK
Paul A. GEROSKI
Alexis JACQUEMIN — Inter-Industry and Inter-Temporal Variations in the Effect of Trade on Industry Performance

84/103: Marcello DE CECCO — The International Debt Problem in the Interwar Period

84/105: Derek C. JONES — The Economic Performance of Producer Cooperatives within Command Economies: Evidence for the Case of Poland