continuity in economic history. Continuity and discontinuity are devices of story-telling, telling the story of monetary policy over the past few months or the story of modern economic growth. They raise certain questions in philosophy and lesser matters, such as precedence and politics.

It is well to have a case in mind. The most important is that of the British industrial revolution.

If it was a 'revolution', as it surely was, it happened sometime. There was a discontinuity, a before and after. When? Various dates have been proposed, down to the day and year: 9 March 1776, when the *Wealth of Nations* provided an ideology for the age; the five months in 1769 when Watt took out a patent on the high pressure steam engine and Arkwright on the cotton-spinning water frame; or 1 January 1760, when the furnaces at Carron Ironworks, Stirlingshire, were lit.

Such dating has of course an amateur air. A definite date looks handsome on a plaque or scroll but the precision does not fit well with sophisticated story-telling. The discontinuity is implausibly sharp, drawing attention to minor details. The Great Depression did not start on 24 October 1929; the deregulation of American banking was not completed with the fall of Regulation Q. Nicholas Crafts (1977) has pointed out that the detailed timing of the industrial revolution should not anyway be the thing to be studied, because small beginnings do not come labelled with their probabilities of developing into great revolutions. He is identifying a pitfall in story-telling. Joel Mokyr identifies another (1985, p. 44): rummaging among the possible acorns from which the great oak of the industrial revolution grew 'is a bit like studying the history of Jewish dissenters between 50 BC and 50 AD. What we are looking at is the inception of something which was at first insignificant and even bizarre', though 'destined to change the life of every man and woman in the West'.

What is destined or not destined to change our lives will look rather different to each of us. Each historian therefore has his or her own dating of the industrial revolution. Each sees another discontinuity. E.M. Carus-Wilson (1941, p. 41) spoke of 'an industrial revolution of the 13th century': she found that the fulling mill was 'due to scientific discoveries and changes in technique' and 'was destined to alter the face of medieval England'. A.C. Bridbury (1975, p. xix–xx) found in the late middle ages 'a country travelling slowly along the road ... that [it] travelled so very much more quickly in Adam Smith's day'. In the eyes of Marxist writers the 16th century was the century of discontinuity, when capitalism set off into the world to seek its fortune. John U. Nef, no Marxist, believed he saw an industrial revolution in the 16th century, centred on coal (1932), though admittedly slowed in the 17th century. A student of the 17th century itself, such as D.C. Coleman (1977), finds glimmerings of economic growth even in that disordered age. The most widely accepted period for the industrial revolution is the late 18th century, especially the 1760s and 1770s (Mantoux, 1928; Landes, 1969), but recent students of the matter (Harley, 1982; Crafts, 1984) have found much to admire in the accomplishments of the early 18th century. W.W. Rostow (1960) placed the 'takeoff into self-sustained growth' in the last two decades of the 18th century, but others have observed that even by 1850 the majority of British people remained in traditional sectors of the economy. And later still there was a second industrial revolution (of chemicals, electricity, and internal combustion) and a third (of electronics and biology).

Wider perspectives are possible, encouraging the observer to see continuity instead. Looking at the matter from 1907, the American historian Henry Adams could see a 'movement from unity into multiplicity, between 1200 and 1900, ... unbroken in sequence, and rapid in acceleration' (p. 498). The principal modern student of the industrial revolution, R.M. Hartwell, appealed for continuity against the jostling throng of dates (1965, p. 78): 'Do we need an *explanation* of the industrial revolution? Could it not be the culmination of a most unspectacular process, the consequence of a long period of economic growth?'

Such questions of continuity and discontinuity are asked widely in economics, though sometimes half consciously. They should not be left to historians. Economics is mainly contemporary history, and faces the problem of deciding when a piece of history has been continuous or not. For instance the crucial discontinuity in the growth of big government, as Robert Higgs (1987) points out, might be placed when the institutions of centralized intervention were conceived (1900–1918) or made (1930–45) or expanded (1960–70). Even recent history faces this narrative problem. When, if ever, did purchasing power parity break down in the 1970s? When did policy on antitrust alter to favour mergers? When did monetary policy last become expansionary? Where is the break?

The difficulty in answering the question has often been misconstrued as philosophical. The philosophical difficulty was first articulated in the 5th century BC by Parmenides and his student Zeno: that if everything is perfectly continuous, change is impossible (Korner, 1967). Everything is so to speak packed too tightly to move. The economist will recognize the point as analogous to an extreme form of economic equilibrium, or to the physicist's maximum entropy. If human nature doesn't 'really' change, then history will be a string of weary announcements that the more things change the more they stay the same. If the economy is 'really' in equilibrium all the time, then nothing remains to be done.

Alexander Gerschenkron, the economic historian who has contributed most to the understanding of continuity and discontinuity in economics, noted that such a metaphysics would close the book of history (1962, p. 12). A history of economics that began with the Parmenidean continuum would never speak.

For purposes of social science Gerschenkron rejects the transition from the connectedness of all change to an absence of change. True, if you squint and fit a curve then no economic change looks discontinuous in the mathematical sense; but it is wrong then to deduce that 'really' there is no change at all, or that the industrial revolution is a mirage. 'Continuity' in the strict mathematical sense must be kept distinct from 'continuity' in the story-telling sense.

Economists have often been muddled about this philosophical distinction, drawing surprising ideological implications from it. Alfred Marshall enshrined on the title page of his *Principles* the motto 'natura non facit saltum' (nature does not make a jump; Leibnitz had invented it as 'la nature ne fait jamais des sauts'). Marshall himself perhaps believed that the ability to represent behaviour with differentiable functions implies that marginalism is a good description of human behaviour. It is less sure that he believed that the lack of jumps in nature (this on the eve of quantum physics) implies people should not jump either, and should change society only gradually. Anyway, both implications are non sequiturs. Though both have been attributed to neoclassical economics, neither is necessary for it. Much bitter controversy has assumed that neoclassical economics depends on smooth curves and in consequence must advocate smooth social policies. The peculiar alliance between discrete mathematics and Marxian economics has this origin, as does the enthusiasm of some conservative writers for continuities in economic history. Gerschenkron cursed both their houses; the social scientist should study change and continuity 'unbothered by the lovers and haters of revolutions who must find themselves playgrounds and battlegrounds outside the area of serious scholarship' (p. 39).

In one sense of 'continuity' it is trivial that economic history is continuous. History has causes (the fourth of five historically relevant definitions that Gerschenkron distinguishes). Continuity, then, can be viewed as being merely an impressively long causal chain. The exploitation of Scottish iron deposits in the 18th century was caused by bold investments, but these depended on a reliable law of property and commerce, which depended on certain legal developments in the 16th century, and on the growth of political stability in the early 18th century, which in turn depended on all manner

of earlier events. Establishing continuities, as Gerschenkron remarks, is the historian's purpose – or, one might add, the economist's, who is doing historian's work when he is not doing philosopher's. The purpose might be to find a cause of, say, the Great Depression. It would be to find a chain of events the absence of which would have made a difference: the international irresponsibility of the United States, for instance, as Kindleberger argued; or the domestic irresponsibility of the Federal Reserve, as Friedman and Schwartz argued. Finding such chains has its own philosophical difficulties (see the article in this Dictionary on COUNTERFACTUALS).

The main problems of continuity and discontinuity, however, are not solvable in seminars on philosophy. They are practical problems in the uses of measurement, and must be solved in the economic or historical workshop. When shall we say that the industrial revolution happened? Gerschenkron gives an answer confined to industry, for in common with most economic historians he regards agriculture and services as laggards in economic growth.

> In a number of major countries of Europe ... after a lengthy period of fairly low rates of growth came a moment of more or less sudden increase in the rates, which then remained at the accelerated level for a considerable period. That was the period of the great spurt in the respective countries' industrial development... . The rates and the margin between them in the 'pre-kink' and the 'post-kink' periods appear to vary depending on the degree of relative backwardness of the country at the time of the acceleration (pp. 33–4).

The level at which such discontinuity is to be observed is at choice. As Gerschenkron remarks,

> If the seat of the great spurt lies in the area of manufacturing, it would be inept to try to locate the discontinuity by scrutinizing data on large aggregate magnitudes such as national income... . By the time industry has become bulky enough to affect the larger aggregate, the exciting period of the great spurt may well be over (pp. 34–5).

In a footnote to these sentences he remarks that 'Walt Rostow's failure to appreciate this point has detracted greatly from his concept of the take-off, which in principle is closely related to the concept of the great spurt as developed by this writer.'

The point is a good one, and applies to all questions of continuity in aggregate economics. Small (and exciting) beginnings will be hidden by the mass until well after they have become routine. Joel Mokyr has put it as a matter of arithmetic: if the traditional sector of an economy is growing at a slow one per cent per annum, and starts with 90 per cent of output, the modern sector growing at four per cent per annum will take three-quarters of a century to account for as much as half of output (1985, p. 5). We may call it the Weighting Theorem (or the Waiting Theorem, for the wait is long when the weight is small to begin with). There are parallel points to be made elsewhere in economics and in social science generally. In growth theory, for instance, as was noticed shortly after its birth, a century of theoretical time is needed in most models for a shift to yield growth as much as 90 per cent of its steady state. More generally, economists have long recognized the tension between microeconomic explanations and the macroeconomic things to be explained. And sociologists have been quarrelling along similar lines for a century, using even the same jargon of micro and macro.

In other words, the search for discontinuity in an aggregate time series raises the question of the level at which we should do our social thinking, the aggregation problem. Yet Gerschenkron himself did not answer the question well, and was hoist by his own petard. Calculating Italian industrial output he placed his 'big spurt' in 1896–1908, and wished to explain it with big banks founded in the 1890s. Stefano Fenoaltea, once his student, applied the Weighting Theorem to the case (Fenoaltea, 1987). Surely, Fenoaltea reasoned, the components of the industrial index – the steel output and the chemical output – are the 'real' units of economic analysis

(note the similarity of this rhetoric to that advocating a micro foundation for macroeconomics). If the components started accelerating *before* the new banks appeared, becoming bulky only later, then the new banks could not have been the initiating force. Alas, the components did just this. They spoil Gerschenkron's bank-led story: the components accelerated not in the 1890s but in the 1880s, not after but before the banks. To paraphrase Gerschenkron on Rostow, by the time the progressive components of industry had become bulky enough to affect the larger aggregate, the exciting period was well over.

Yet the moral is still Gerschenkron's: that continuity and discontinuity are tools 'forged by the historian rather than something inherently and invariantly contained in the historical matter... . [A]t all times it is the ordering hand of the historian that creates continuities or discontinuities' (p. 38). Gerschenkron nodded, but in nodding made the point. The multiple datings of the industrial revolution make it, too. So does any choice of smoothness or suddenness in economic story-telling.

The point is that history, like economics, is a story we tell. Continuity and discontinuity are narrative devices, to be chosen for their story-telling virtues. Niels Bohr said once that 'It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about nature.' It is our say. We can choose to emphasize the continuous: 'Abraham begat Isaac; ... begat ... begat ... and Jacob begat Joseph the husband of Mary, of whom was born Jesus.' Or the discontinuous: 'There was in the days of Herod, the king of Judea, a certain priest named Zacharias.' It is the same story, but its continuity or discontinuity is our creation, not God's. That it is out of God's hands does not make it arbitrary. Scholars speak of the industrial revolution as early or late, gradual or sudden. Other scholars believe or disbelieve their stories on the usual grounds.

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See also ECONOMIC HISTORY.

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