

ments of the technological opportunities. In this respect one is reminded of the bureaucratic relationships both in public sector organization and in the modern, large, private sector business. It is here that small businesses have a major advance over large, multinational companies in catching up. Only if large scale organizations emphasize decentralization in management and responsibility, are they able to avoid, at least partly, the drawback of being big. Let me conclude by saying that the Abramovitz paper on the catching-up hypothesis remains a stimulating piece of analysis.

In the last two chapters of the book, Abramovitz turns to the welfare analysis of economic growth, without making a clear distinction between analytical statements and his own personal value judgments. He also fails to distinguish between economic theory and economic policy. It is here that one has the feeling that Abramovitz is not very clear in his own mind about the definition of welfare.

On p. 325 he states that welfare not only depends on people's command over goods and services, but also on friendship, love and the like. He seems to overlook that, from the point of view of economic theory, it is the subjective and formal satisfaction of wants, insofar as they depend on the allocation of scarce resources, that matters. If the concept of welfare is restricted to material wants, then economic analysis narrows down to only a subset of economic activity in reality, and if it is made independent of the allocation of scarce resources, economics blows up to an undefined mixture of pieces of analysis, personal opinion and political statements.

In conclusion, Abramovitz is, at his best, in his dealings with growth theory, technical change and empirical research on growth patterns over time and on a worldwide scale. He is less at ease on the tricky ground of welfare theory. However, this feeling by no means threatens our overall judgment that thinking with Abramovitz on economic growth is unique and long-lasting experience.

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E. A. Wrigley, *Continuity, Chance and Change*, Cambridge University Press, 1988. pp. 132, References and Index, ISBN 0-521-39657-03.

Today, we are keenly aware of the importance of hydrocarbon fuels to a modern, industrial society, and that access to these fuels should be available to all countries. We date a sustained increase in output per head and a rising, modern standard of living to the British industrial revolution of the eighteenth century. Large-scale factory production began at that time. Before this, we document a society of essentially small-scale, handicraft production, in tune with nature, but leaving many in society in poverty. After the industrial revolution, poverty was not necessarily the lot of mankind although, without institutions (and politicians) able to take steps to provide a "safety net" for the unfortunate, poverty might still be witnessed.

In his monograph entitled *Continuity, Chance and Change*, Wrigley provided an analysis of an essential ingredient of economic growth, namely, technological change. Wrigley challenged the traditional view of economic change as a unitary process and relates his analysis to economic thought at the time of the industrial revolution. He distinguished between an advanced organic economy, which he believes Adam Smith analyzed, and a mineral-based economy which was the essential element of a dynamic economy and the prime factor of the British industrial revolution. Wrigley suggested that the organic economy and the mineral-based economy overlapped in time and that the industrial revolution should be seen as a two-stage affair. He suggested that the classical economists were very much concerned with the problems of an organic economy but failed to notice the key importance to economic growth of the emergence of a mineral-based economy.

Two strategic elements in Adam Smith's growth analysis have been singled out: the division of labor and capital accumulation. Many economists believe that discussion of the "division of labor" can serve as a metaphor for the process of mechanization of invention. At first, Smith's elaboration of the virtues of the division of labor suggests enhanced efficiency and increased productivity.

Specialization of function would increase dexterity, save time in carrying out activities and

encourage the inventive process. Smith acknowledged the contribution of the "makers of machines" to innovation, but the stress in his analysis is upon the individual and the effort to save labor. The division of labor discussion does give the impression of progressive economic growth (as long as invention continues) and not of an uneven process of development — one of the leading and lagging sectors in the economy. Specialization was limited by the extent of the market, but the story of the pin-makers seems to indicate the enormous scale of possible improvement, even to a handicraft industry. "Laissez-faire" would release competitive forces and enlarge the market; in addition, an increase in communications, such as good roads and access both to the sea and to navigable rivers, were beneficial for the extension of the market.

Smith emphasized capital accumulation and that "capitals are increased by parsimony and diminished by prodigality and misconduct," Adam Smith *Wealth of Nations*, [London, Routledge (p. 259)] and that merchants, artificers and manufacturers are "naturally more inclined to parsimony and saving than [are] proprietors and cultivators" (*ibid.*, p. 531). Further, the division of labor is greater in manufacturing than in agriculture, but Smith, when looking at the use of capital, apparently favored agriculture.

Wrigley's delineation of the development of an organic versus a mineral-based economy helps us understand the eighteenth century situation. The growth of new manufacturing towns followed the development of agriculture, as it were, "of their own accord." Small scale manufacturers were the natural offspring of a buoyant agriculture. The adoption of new-type fodder crops would expand agricultural output and take place in response to the high prices of meat and dairy produce relative to cereals — problems of an advanced and progressive, organic economy.

An organic economy is, however, inevitably constrained by land productivity, especially as population increases, food and raw materials (including fuel) compete for land usage. The momentum of economic growth is difficult to sustain and the stationary state, the demon of the classical economists, and potentially, of many present Third World countries, must eventually

prevail. The western world was saved from the stationary state by the emergence of a mineral-based economy. Adam Smith was not the prophet, as is often assumed, of the industrial revolution. He did not analyze a steam power-based economy; his world was one of small-scale craft industries.

Large-scale industry and industrial innovation required hydrocarbon fuel. The "revolutionized" sectors of the industrial revolution were those using steam power (textiles and iron) and were characterized by high productivity and comparative advantage. Structural change is the essence of an industrial revolution and needed a breakthrough to a mineral-based economy. Industrial progress was not constrained in Britain by lack of hydrocarbon fuel, and Wrigley believes that it may be considered a fortunate "change" or stroke of luck that Britain possessed the necessary resources. It was not necessarily the result of previous economic developments or of Smith's hortations on the benefits of "laissez-faire." Output per head could expand easily and was not limited by land productivity because the country possessed abundant coal. Techniques which were applicable in a mineral-based economy could be and were later taken over by other countries with access to mineral resources but not necessarily similar economic institutions.

The mechanized horrors of the industrial revolution provided for sustained economic growth, and perhaps, as we can appreciate today, also economic growth for those countries that were able to obtain and use hydrocarbon fuels. The usage of these fuels gives rise, in the long run, to severe environmental problems; but access to hydrocarbon fuels has been the life blood of an industrial economy. Until other energy sources are fully developed, access must be freely available to all countries.

Wrigley's short book should be essential reading for economists and for business leaders because it reminds us of the mineral basis of the Industrial Revolution.

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