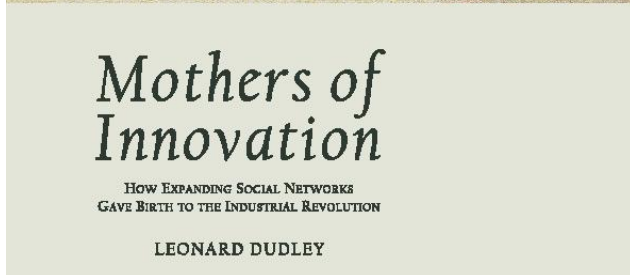


Leonard Dudley, *Mothers of Innovation: How Expanding Social Networks Gave Birth to the Industrial Revolution*, Cambridge Scholars Publishing, Newcastle upon Tyne, 2012. \$67.99

What does it take for a society to be able to innovate? The question is crucial today when an increasing share of world patents are taken out by countries such as Japan, South Korea and China, which have



limited energy resources and cultures very different from those in the West. However, most previous studies of the beginnings of industrialization have focused on the resources and institutions of Britain alone. As a result, they have missed the lessons to be learned from casting the net more widely so as to examine all regions of the North-Atlantic community. This book pinpoints the surprising differences between innovating and non-innovating regions. Protection of property rights, a practical ideology and abundant resources were not sufficient to spark accelerated innovation.

The key to the Industrial Revolution, this study shows through case studies and rigorous verification, was the effect of expanding social networks on people's willingness to cooperate. Language standardization permitted the widening of circles of cooperation to encompass individuals

with increasingly different sets of knowledge. The result was an unprecedented burst of what some linguists have called "double-scope blending" – the integration of hitherto unrelated concepts to create something new. These findings have important implications for corporate and government policy.

"In *Mothers of Innovation*, Leonard Dudley brings communication, networks and interaction to the study of innovation. It rings true. The Michael Porter study of high concentrations of successful competitors in a wide range of industries comes to mind. As one who has lived for many years in Silicon Valley, a modern center of innovation, I find that there are also echoes from the past: a delicate balance between cooperation and competition, multiple disciplines producing cognitive dissonance leading to innovation, and the prevalence of the human analog of a distributed network. The book does a masterful job of laying out the structural underpinnings of highly productive innovation environments, and uses a wealth of historical examples from the period 1700 to 1850, to establish that communication, education, common languages and interaction are key ingredients in technological advancement, past and present."

– Michael Spence, co-recipient of the 2001 Nobel Memorial Prize in Economics

"New theory and evidence on an old topic! Dudley considers and classifies over 100 innovations and locates them in individual cities rather than merely in nations. This permits him to consider important new evidence that concerns both existing demand and supply side theories of the causes of the innovations that constituted the Industrial Revolution and also the influence of the author's important new theories of the significance of social networking."

– Richard Lipsey, co-author of *Economic Transformations: General Purpose Technologies and Long Term Economic Growth*

"This book is a fair-minded and judicious attempt to deal with the Industrial Revolution in a new way. Professor Dudley asks a well-known question: why was there a rapid acceleration in the

rate of innovation from 1750 to 1850? But his approach is quite novel; rather than focusing on economic changes within nation-states, he investigates the extent of cooperation and communication technologies within towns and their surrounding regions. The research is thorough. Using a sample of 117 innovations across 201 regions in England and northern France, Dudley argues that it was the standardization of the English and French languages, and the attendant rise in literacy, that made the cooperation and the innovations possible. This is a serious scholarly study.”

– Ricardo Duchesne, author of *The Uniqueness of Western Civilization*

Link to publisher’s site:

<http://www.c-s-p.org/Flyers/Mothers-of-Innovation--How-Expanding-Social-Networks-Gave-Birth-to-the-Industrial-Revolution1-4438-4096-3.htm>

Reviews

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Reviewed by

***Mothers of Innovation: How Expanding Social Networks Gave Birth to the Industrial Revolution.* By Leonard Dudley (Newcastle upon Tyne, Cambridge Scholars Publishing Company, 2012) pp. \$67.95**

Why did the Industrial Revolution begin in eighteenth-century England? Which factors or policies promote societal innovation? In *Mothers of Innovation*, Dudley unravels these far-reaching questions in a fittingly bold and interdisciplinary manner, reminiscent of ambitious works such as Jared Diamond’s *Guns, Germs, and Steel* (New York, 1997), David Landes’ *The Wealth and Poverty of Nations* (New York, 1998), and Daron Acemoglu and James A. Robinson’s *The Origins of Power, Prosperity, and Poverty* (New York, 2012). His conclusions emphasize the connection between innovation, collaboration, and social networks, with both historical and present-day implications. Dudley’s means are as important as his ends; he offers readers a confident, compelling illustration of the value of multidisciplinary analysis.

Dudley’s argument builds upon a thorough review of existing scholarship. Prior attempts to explain the timing of the Industrial Revolution typically placed emphasis on one of two factors—institutions and [End Page 385] ideas that increased the *supply* of key innovations (for example, judicial systems that protect private property or the British Enlightenment’s emphasis upon useful knowledge); or conditions that increased the *demand* for innovations (for example, abundant coal and scarce labor that encouraged labor-saving inventions). Dudley acknowledges that both sets of factors are relevant, but even taken together, supply and demand arguments for innovaton do not fully explain the Industrial Revolution’s genesis and evolution.

Mothers of Innovation forges a new path, connecting innovation to the collaboration of multiple practitioners—primarily inventors but also managers, investors, and entrepreneurs—willing and able to bring multiple perspectives to bear on complex challenges. This form of collaboration depends upon mutual trust, the ability to communicate effectively, and access to necessary knowledge and experience. Dudley’s model predicts

the onset of innovation and industrialization by seeking societal precursors of successful collaboration, such as large populations that share a common language, high literacy rates, and open societies that tolerate diversity.

Dudley's emphasis upon collaboration and communication offers rewards to readers from all disciplinary backgrounds. He sheds light on a critical-historical question but also suggests policies to promote modern-day technology transfer, collaboration, and innovation. Even better, in the course of proving his thesis, he creates a versatile historical data set, a list of 117 major technological innovations during the decisive time period from 1700 to 1850. He categorizes these innovations into individual versus collaborative efforts and highlights "super" technologies that represent both radical technical ideas and the ability to fulfill a variety of applications. This data set, which can fuel a range of history or economics research projects, cries out for expansion into other time periods. Dudley also introduces and blends concepts drawn from disciplines such as cultural history, the history of technology, economics, psychology, linguistics, and policy studies. By the end of the study, readers have experienced both the theory and application of multiple analytical frameworks, including recombinant growth models, distributed network theory, the concept of conceptual blending, game theory, and many others.

Dudley practices what he preaches. His final product qualifies as an innovation because of its creative integration of theory and content from different perspectives. Moreover, in the true spirit of "super" technologies, *Mothers of Innovation* offers the world both an insightful new idea as well as its ensuing practical applications. **[End Page 386]**

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***Mothers of Innovation: How Expanding Social Networks Gave Birth to the Industrial Revolution*, by Leonard Dudley. Cambridge Scholars Publishing, 2012. xxii, 275 pp.\$67.99 US (cloth).**

Most studies of the Industrial Revolution are written by historians striving to look backwards with the help of methodological tools borrowed from the social sciences. This book is written by a forward-looking economist with an interest in modern information revolutions who has a point to make about the role of social networks in the gestation of innovative technologies. The historical component of his thesis is a mix of sweeping generalization and folksy anecdote. To this reviewer the broad brush strokes depicting stagnation and change in European states over three centuries seem rather schematic, and a historian of science would no doubt find the stories of individual 'inventors' and their collaborators that bring the analysis to life at intervals rather old-fashioned as well. Perhaps this does not matter very much as long as we focus on the fact that the book is not really about the Industrial Revolution as an event in the past, but is rather an extended argument offering 'an explanation of the burst of innovation that occurred in a number of regions of Western Europe and North America over the period from 1700 to 1850 (p. 219).'

To choose the region as the unit of analysis makes sense even if the author shows a great deal more sensitivity in selecting the zones of Europe and North America that displayed an early and sustained propensity to innovate, than in marking out the territories that do not merit inclusion. Birmingham and

Manchester together with their industrial hinterlands pass muster and so do Lyon and Philadelphia, but the whole of Scandinavia, Germany, Belgium and Switzerland have nothing to contribute, it seems. The analysis is complex and multi-tiered, whether at the level of the sampling (types of innovation) or the conclusions that can reasonably be drawn from the data as various hypotheses are tested. Probably the best way for the general-purpose historian to get a grip on the author's social-networks model of innovation is to turn to the end of the book (chapters 8 and 9), for it is here that he recapitulates his findings and confronts them with on-going debates between and among historians and economists.

On the whole, supply-side explanations of innovation and industrial take-off such as those favoured most recently by Joel Mokyr with his emphasis on the determining role played by useful knowledge fare less well. Demand and price factors cannot be excluded from the story of economic growth through technological achievement as R. C. Allan has always insisted. However, the combination of energy and labour costs will not explain adequately the chronology of technological breakthrough, nor is it an all-embracing argument applicable on its own to every case. In this regard the economic historian E. L. Jones gets closest to a full understanding of why industrialisation accelerated first in Britain – in Dudley's judgement because he gives full weight to the regional context in which both supply and demand factors can be seen to interact.

This is to leave the author's own findings out of account, though. The book highlights the role of empathetic communication (of ideas, skills) between individuals of a similar mind-set, an activity which singularly increased in geographical scope and social complexity in the course of the eighteenth century. There is nothing particularly new in this observation: historians routinely evoke Enlightenment 'sociability,' and communication between *savants* and *fabricants* has been explicitly discussed by a number of scholars. But Dudley refines this observation by working out ways of measuring the intensity of communication and by adding the variable of 'cooperation'. What emerges is a social-network geography which, it is the contention of the author, needs to be taken into account alongside supply-side and demand-side factors when analysing the propensity of certain regions not only to give birth to macro-inventions (dubbed here Super-Technologies), but also to carry on fostering related 'spill-over' innovations. This argument is accompanied by a great deal of jargon and some rather subjective categorisation (e. g. 'Other Cooperative Innovations' and 'Non-Cooperative Innovations'), but the basic intuition about the existence and role of social networks underpinning innovatory activity seems sound, and it withstands the battery of tests that the author applies to the concept. How are these social networks modelled? They are envisioned as zones of mutual trust, consisting usually of cities and hinterlands, which enjoyed the advantages of linguistic uniformity and an open, tolerant cultural environment, whilst being free of corporate institutions which might otherwise have suffocated the innovative urge.

The author places excessive stress on the linguistic factor as though cooperation in the joint enterprise of innovation was quite incapable of overcoming the barrier of language. Historians of scientific knowledge generation and diffusion in the late eighteenth century would beg to differ. Many of the entrepreneurs, engineers and skilled workers whom Dudley mentions by way of illustration of the process of collaboration had both international contacts and hands-on overseas experience. But the point about the existence of discrete regional cultures that tended either to be favourable, less favourable or frankly inimical to innovation is well made.

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EH.Net (June 2013)

Leonard Dudley, *Mothers of Innovation: How Expanding Social Networks Gave Birth to the Industrial Revolution*. Newcastle upon Tyne: Cambridge Scholars Publishing, 2012. xxi + 275 pp. \$68 (hardcover), ISBN: 978-1-4438-4096-5.

Reviewed for EH.Net by Eric Jones, La Trobe University.

The author, professor of economics at the University of Montreal, is a creative synthesizer with an adamant belief in the importance of literacy and linguistic standardization. In his latest book, Leonard Dudley enlists this interest in trying to explain why innovation accelerated sharply between 1700 and 1850, doing so in certain regions of Britain, France and the United States but not in other conceivable candidates such as the German states or the Netherlands. In the course of his argument he denies or restricts the force of currently influential interpretations such as factor proportions or the appositeness of British institutions coupled with the Enlightenment. He points out that neither can account for the timing of innovation nor cope with the strangely neglected fact that change was regional rather than national. Either may have been necessary or may not, since innovation was not confined to nor especially rapid in Britain but neither can have been sufficient.

Emphasis on the region is one of the tools in Dudley's kit. His model concentrates, though, on the new opportunities for cooperative innovation once language was standardized and networks of inventors who could trust one another arose; their conjunction fostered collisions of unrelated schema, the way Arthur Koestler said jokes are generated. The book is intricate, filled with computations, and ultimately draws in other factors. Typologies of discovery are elaborated, networks are modeled, informative biographies of inventors appear, tips are offered to policy-makers, and personal experiences enliven much of the text. (Any exception comes with the testing of the model, which no one could turn into a barrel of laughs.) There is some repetition and a little seeming self-contradiction but *Mothers of Innovation* is more pleasurable to read than the bulk of the industrial revolution genre.

Some findings may surprise. Dudley is thoroughly unimpressed by the standard view that British institutions were somehow programmed for growth: individual rights and empiricism were on the rise throughout north-western Europe during the sixteenth and seventeenth centuries. Before the industrial revolution the prices of factors of production had been high for a century. Among British regions the correlation between coal production and innovation was negative from 1700 to 1850 except in what he calls the center – negative in the north-east, in Scotland, in Yorkshire and throughout the remainder of England. And in the 'center' (which he calls the Midlands though meaning the West Midlands, Lancashire and Wales) the presence of coal may just happen to have coincided with an appropriate type of society. This would seem, therefore, to let attitudes and institutions return via preternatural enterprise in Birmingham and the lack of borough rigidities. One can also see that he comes back to half-approving the factor proportions argument, getting over the fact that relative prices never guarantee a response by finding that Brummagem zest was putting cheap factors to work.

Problems come with the explicandum, where Dudley is partly a prisoner of conventional wisdoms. His is a work that treats invention rather than innovation, with purely market explanations figuring as little as they do in so many industrial revolution studies. The assumption is that inventions will be used, which is akin to thinking that adjustments to factor proportions must be automatic. There is no point, in any case, in saying of resources that a substitute for charcoal was needed because Europe's forests had been destroyed. Charcoal comes from trees and trees are a crop. Similarly, Dudley accepts the nostrum that the Glorious Revolution of 1688 marked a major change from custom toward *contract*. If so, which I do not believe, it was agonizingly slow. The case that cooperation could take place among disparate inventors because language had become standardized is surely a red herring, and dated too late. Language cohesion is too far in the background to explain much. Differences were overcome. Consider the paper in *Semiotica* (1975) called, 'On the Non-Fatal Nature of Trouble: Sense-Making and Trouble-Making in *lingua franca* Talk'. Even Defoe and the 'dexterous dunce' with the Somerset accent could get by. But Dudley also makes much of the Baptists and Quakers. Their circles, he

ultimately implies, may be where the emphasis should lie. The non-conformist sects aided cooperation; contact within them was a given and trust was assured.

The sample of inventions seems limited and arbitrary, as the author also eventually admits, and their distributions are sometimes inexact, as when Cort's puddling of iron near Portsmouth is assigned to London. Geography is a difficulty on several counts. For example, Dudley insists on the inventive vacuum of the Netherlands. Dutch institutions did not cut it, he says. Yet why should people with high incomes from trade bother to invent? They could not be expected to predict what the future might hold and in the meantime allocated their talent rationally.

The industrial revolution was English, not British, and I have used 'Britain' hitherto only because Dudley does. Indeed, the book is really about England, with little about France or the United States. Of innovations between 1800 and 1849 only two percent – a single invention – surfaced in Scotland. The Scots took the high road to England, while Wales did not figure. Moreover the author's enthusiasm for Birmingham and relegation of Lancashire to a late phase of development leads him to miss the inspired, early watch-makers of south Lancashire, recruited to develop cotton machinery. Finally, we may be discussing an industrial revolution but it was one that grew from a broad base. Omitting agriculture means missing its close connections with other sectors and truncating the map of inventiveness. Leonard Dudley answers his own sharp questions about 'where' and 'when' in terms of cooperative networks, language standardization, the availability of resources, the absence of borough restrictions, the protection of property rights, and local path dependence. His is an engaging and challenging book that deserves to spark plenty of further research among the open-minded.

Eric Jones, Emeritus Professor, La Trobe University, and former Professor, Melbourne Business School, is the author of *Locating the Industrial Revolution: Inducement and Response* (World Scientific, 2010), *The Fabric of Society and How It Creates Wealth* (Arley Hall Press, 2013) (with Charles Foster), and *Revealed Biodiversity: An Economic History of the Human Impact* (World Scientific, in press).

