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Book Review — Digitized Version

[Book Review of] Antonelli, Cristiano: The microdynamics of technological change: London, Routledge, 1999

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REZENSIONEN – BOOK REVIEWS

Antonelli, Cristiano, *The Microdynamics of Technological Change*. London, New York 1999. Routledge. XVI, 286 pp.

This book provides a unified exposition of the author's extensive research record on the microeconomics of technological change, with special emphasis on models and implications of the evolutionary dynamics thought to arise from the local interaction of economic agents in knowledge-based economies. But the book is much more than a mere research monograph. It is also useful as a survey of the systems approach to technological innovation and can even serve as an accessible introduction and reference to some of the specialized research methodologies used and developed in the economics of innovation, for anyone with an economics education.

The author's central hypothesis says that if the creation of knowledge is a local event, the diffusion of knowledge will depend on the presence of various communications networks, and these in turn will depend on receptiveness and connectivity for their effectiveness. So, one question for research is how the receptiveness and connectivity of networks have changed over time, as the economy has become increasingly knowledge-based. The author's ambition is to provide a parsimonious explanation for this transition, an explanation of a complex phenomenon that rests on a small set of assumptions only. His main line of argument is that new information and communications technologies have changed the appropriability, divisibility and marketability of information, and that this has resulted in a much wider domain for the spatial interaction within innovation systems, increased opportunities for technological cooperation, a deepening of the social division of labour in knowledge creation and a boost of total factor productivity.

The book comes in two parts. The first part is subdivided into five chapters and develops the author's theoretical framework and methodological foundations. The first two chapters are basically surveys of the relevant literature on path dependence in industrial economics and on economic models of the production and use of knowledge within firms. The notion of path dependence is introduced as a theoretical device to model economic processes characterized by the irreversible and indivisible choices which agents make in innovating economies. Firms are central to the production and use of knowledge, and here the author follows Marshall's and Schumpeter's distinction between tacit and codified knowledge on the one hand and the acquisition of internal and external knowledge on the other hand. The methodology used to analyse the effectiveness of networks in lowering the costs of the external acquisition of knowledge relies heavily on spatial stochastic interaction, much of which is borrowed from physics.

The second part of the book applies the author's analytical tools to empirical issues in telecommunications technology, the global unemployment problem, new information technology, technological cooperation and technical standards, followed by a comprehensive test of some of the author's theoretical predictions for European data. Altogether, the book's second part comprises six chapters with applied studies plus the conclusions from all previous chapters.

Most of the applied chapters explore natural domains of the theoretical framework developed in Part 1. Chapter 6, on the emergence of advanced telecommunications technology, sets the scene. However, at the heart of the matter is the emergence of a new knowledge-producing industry, separate from the application and use of technological knowledge in established manufacturing corporations; and this is easily understood as an outcome of the diffusion of new information and communications technologies (Chapter 8). The same holds for technological cooperation, which the author views as a major innovation in the organisation of research and development, as the flip side of its increasing separation from manufacturing corporations (Chapter 9). In this context,

the emergence of standards and their role in converting tacit into codified knowledge is also important enough to warrant the extended treatment given in Chapter 10.

However, the author is stretching his assumptions when he strays from his core subject and seeks to explain unemployment in the globalizing economy as a consequence of localized technological change (Chapter 7). What he touts as the Schumpeterian approach to understanding unemployment has in fact a distinctly Keynesian flavour. Basically, he claims that wages, because they are efficiency wages, cannot establish full-employment conditions, and that these rather depend on a country's innovative capacity which determines its international competitiveness and employment level. In this chapter, the author states his argument in macroeconomic terms, bases his regression analysis on aggregate data from OECD countries and thus inevitably ignores the notion of comparative advantage, which has to be interpreted as an important endogenous determinant of industry-specific employment in the case of technological innovation. It is, after all, at the level of specific industries that the notion of international competitiveness appears to be really relevant.

The main test of the author's central hypothesis on the impact of the new information and communications technology on innovative capacity and total factor productivity is provided in Chapter 11. Here, the author argues that business services for communication are enabling devices of the new modes of localized interaction characterizing the knowledge economy, and that their diffusion can explain a country's innovative capacity and productivity. Based on a variety of evidence from European countries that confirms a positive correlation between the diffusion of communication and business services and total factor productivity, the author concludes that much of the transition to the knowledge-based economy has taken place at the end of the 1980s when total factor productivity increased markedly.

A weak part of the book are the policy conclusions, which is mainly because scant attention has been paid to alternative hypotheses in the empirical sections. However, the author touches a fundamental policy issue when he rejects the traditional paradigm of technology policy, particularly prominent in the United States, which calls for the creation of strong incentives through intellectual property rights, like patents. Since the adoption of the agreement on trade-related aspects of intellectual property rights (TRIPS) by the World Trade Organization in 1994, innovation incentives by means of intellectual property rights have been spreading fast beyond the OECD countries and around the world.

However, these incentives are not only about the appropriate level of innovative activity, as the author seems to imply, but also about the right choice of technological direction. And the mere improvement of percolation structures, as recommended by the author, can move innovative activity in unexpected directions that need not raise productivity. Moreover, the author's valuable theoretical insights into the firm-specific determinants of knowledge creation should have led him to draw some more industry-specific conclusions, because it is at this level that the conditions for innovation, appropriability and technology diffusion are known to differ markedly.

Michael Stolpe

Gambardella, Alfonso, and Franco Malerba (eds.), *The Organisation of Economic Innovation in Europe*. Cambridge, 1999. Cambridge University Press. X, 396 pp.

Objectives and Organization of the Book

This book addresses an important and highly topical subject: How are innovation systems organized, how do they emerge, and what promotes efficiency and dynamics