

Knowledge Economies

Clusters, learning and cooperative advantage

Philip Cooke

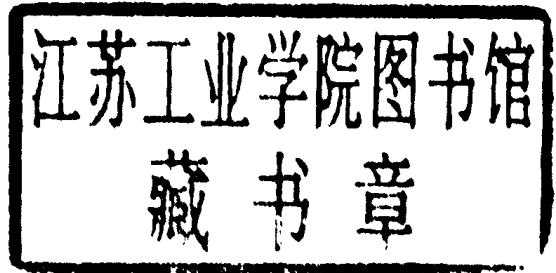
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Knowledge Economies

Today, concerns about national competitiveness and economic development are closely linked to notions of the information society and knowledge-based economies. Some see the emergence of a 'new economy', which is based on information, communication, media and biotechnologies. As in previous bursts of economic growth, these innovative industries emerge and grow in specific geographic locations, now called 'clusters'. The well-known case of Silicon Valley was merely the first of a large number of such clusters to have developed in recent years. It is argued that clusters are characterized by cooperative and competitive, trustful and rivalrous, exchange and favour-based business interactions.

This book traces the theoretical explanation for clusters back to the work of classical economists and their more modern disciples who saw economic development as a process involving serious imbalances in the exploitation of resources. First, natural resource endowments explained the formation of nineteenth- and early twentieth-century industrial districts. Today geographical concentrations of scientific and creative knowledge are the key resource. But these require a support system, ranging from major injections of basic research funding, to varieties of financial investment and management, and specialist incubators for economic value to be realized. These are also specialized forms of knowledge that contribute to a serious imbalance in the distribution of economic opportunity.

The key question is whether the techniques of cluster building can be learned and promotional policies implemented to offset the natural imbalances in the distribution of these specialized knowledge resources. Developing on the idea of multi-level governance and policy-making, *Knowledge Economies* reviews cases where national governments working intelligently with regional, local and, in Europe, supra-national governance organizations, have been able to implant clusters in places that previously did not have them. Learning about the nature of clusters, and from experiences in developing them with the help of policy intervention, will assist the process of strengthening existing ones, developing new ones and revitalizing older ones. In the process, the goals of regional equity and competitiveness should be enhanced.

Philip Cooke is Professor of Regional Development and Director of the Centre for Advanced Studies at the University of Wales Cardiff. He is also editor of the interdisciplinary journal, *European Planning Studies*.

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Abbreviations

BMBF	Ministry of Education, Science, Research and Technology (Germany)
BTH	Biotechnology Centre Heidelberg
CAE	Cambridge Advanced Electronic
CNOC	Company Network Operations Command Centre
DKFZ	(Helmholtz) Cancer Research Centre
DTI	Danish Technological Institute
ERBI	Eastern Region Biotechnology Initiative
ERP	Enterprise Resource Planning
EU	European Union
FE	further education
FISPA	Finnish Science Park Association
HE	higher education
HI	Heidelberg Innovation GmbH
ICT	Information and Communication Technology
IDB	Industrial Development Board
IPO	initial public offering
IPR	intellectual property rights
IRTU	Industrial Research and Technology Unit
IZB	Biotechnology Innovation Centre
KP	Kleiner Perkins
LEDU	Local Economic Development Unit
MDA	Multimedia Development Association
MIT	Massachusetts Institute of Technology
MMI	Molecular Machines and Industries
MNC	multinational corporation
MPI	Max Planck Institute
NEIS	New Economy Innovation System
NIC	Newly Industrialized Country
NISPF	Northern Ireland Science Park Foundation
NIST	National Institute of Standards and Technology
NRW	North Rhine-Westphalia
OECD	Organization for Economic Cooperation and Development

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PCB	printed circuit board
PCI	Italian Communist Party
POP	point of presence
PSI	Italian Socialist Party
R&D	research and development
RIS	Regional Innovation System
RITTS	Regional Innovation and Technology Transfer Strategies
RLB	Rover Learning Business
ROI	Republic of Ireland
ROW	Rest of World
RTZ	Rechrheinisches Technologie Zentrum
SBIR	Small Business Innovation Research
SME	small and medium-sized enterprise
SONET	Synchronous Optical Network
TBC	Technology Business Council
TEC	Training and Enterprise Council
TEKES	Finnish Technology Development Centre
TI	Texas Instruments
TMT	technology, media and telecoms
TPZ	Future Technology Programme
TTN	Technology Training Network
TVEP	Thames Valley Economic Partnership
VC	venture capital
VTT	State Technical Research Centre (Finland)

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1 Clusters, collective learning and disruptive economic change

Introduction

This book explores a particular economic phenomenon of our time, the emergence and development of industry *clusters*, asking the question why this kind of industrial organization reappeared in the advanced economies after it had more or less disappeared in the mid-twentieth century. It sets that question in the framework of a much larger one that has troubled many development economists, regional scientists and politicians with a concern about social and geographical inequality since Malthus first asked Ricardo why some nations are rich and others poor. This larger question was investigated recently and not entirely satisfactorily answered by David Landes (1998) who explained it in terms of the presence or absence of a cultural will to 'live for work'. Tautology apart, to live for work entails some things that this book is also interested in, namely, capabilities of learning and innovation as key economic instruments. These two concepts are at the heart of the idea of a 'knowledge economy'. But what Landes and others, like Fukuyama (1995; 1999) regard as normal, that is, individualistic competition in an ordered, economic equilibrium where thrift and honesty are justly rewarded, the argument that develops over the next eight chapters takes as abnormal. The knowledge economy consists of fragmentary 'knowledge economies'. This is for three key reasons concerning, first, *disequilibrium* or economic and social imbalance, which is not presumed to be unusual but quite the contrary. Second, *collaborative* economic action, is presented here as the most important organizational aspect of modern capitalism, but also one that has been vital to market economies from the start, despite the presumption in much economics that only individuals matter. While, third, the *systemic* nature of strategic competitiveness in the capabilities of specific groups of private and public actors to produce and implement actions based on consensus is of more importance than individual opportunism.

These are not particularly original points of divergence from orthodoxy. They are shared widely among a wide range of more heterodox thinkers who are interested in the social economy and take an evolutionary perspective on economic change, influenced particularly by the ideas of Joseph Schumpeter about the causes of such change. As is well known, Schumpeter was interested

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in *entrepreneurship*, but became even more interested in understanding innovation as a process that certain kinds of entrepreneur facilitated. Hence, he also fell into the trap of focusing on disruptive economic change as an effect of heroic individual genius. This was the legacy of the influence of Nietzsche's philosophy on his work, as is shown in Chapter 2. That this never really left him is testified to by the displacement of entrepreneurial heroism from the individual innovator to the R&D engineer in the large corporation, where his studies in the USA led him to conclude the modern wellsprings of innovation lay. In this book the real sources of contemporary innovation are shown residing in neither the individual entrepreneur nor the research laboratories of large firms but in networks of social relationships between such organizations and others of consequence to the discovery being sought and commercialized. Revealing the circuitry of knowledge economies is a complex task because it means finding out how the processes of knowledge generation and transfer to the point of exploitation function.

Recent research on what are popularly called 'new economy' industries like Internet content provision show the importance of knowledge networks and the very high value within them of enterprise support contacts, notably varieties of investment manager, 'venture catalyst', and 'incubation' or early-stage venture capitalist (Cooke, 2000; Zook, 2000; Keeble and Nachum, 2001; Sternberg, 2001). These are valued most for their scarce management expertise, despite a common assumption that it is their investments that count most. High, localized correlations between such businesses and services outweigh those between dot.coms and scientific or technological labour. However, occasionally the circuitry can be illuminated by exploring how it doesn't function or ceases to function when it once did. Much of the research that helps to do this is discussed in Chapters 7 and 8. Proving the negative is more difficult than demonstrating the positive, and researching failed cases is far less glamorous or marketable than disclosing 'new industrial spaces' which is why there is less material to call on to explain failures. Nevertheless, the book explores some in the homeland of industry clusters, the 'industrial age' districts near Manchester and Birmingham in the UK.

What the book tries to show as convincingly as possible is that clusters are crucial to economic imbalance, that they rest upon collaboration of a generally non-market-destroying type that is simply essential for modern economic organization, and that clusters have systemic organizational characteristics that go against much economic orthodoxy. For example, in Norton's (2000) book on the 'new economy,' he draws on Micklethwait and Woolridge's (2000) book which summarizes the economy culture of Silicon Valley as conveying a sense of loyalty to the place rather than the firm. This is expressed in such practices as reinvestment in the community, collaboration and 'tolerance of treachery'. The last of these lends a certain Hobbesian flavour to the composition and provokes a query about what is often said to be a key character of clusters in such places, their high ratio of trust in business transactions. Yet it is consistent with the thesis that *knowledge is in the networks* because each move in the interactive

innovation process requires learning from others than those involved in the preceding move. So dropping a partner, competing against them for a contract, but maybe returning to them for its implementation, or for a future contract bid are not seen as bad form. On the contrary, these are the means by which the wellsprings of creativity flow and a key source of the 'spillovers' (Anselin *et al.*, 1997) that knowledge economies need and clusters supply. Recognition of the need to reproduce that characteristic is captured in the practice of reinvesting individual wealth generated back into the community, often as business angel investment. But collaboration is a key means by which that wealth is accumulated in the first place.

This brings us to the geographical dimension of clustering for learning, knowledge transfer, collaboration and the exploitation of spillovers. The argument here is that clusters are geographically localized and this causes imbalances between local areas that have them and those that do not. This has repercussions upwards to regions within countries and between countries themselves when the clusters in question have sufficient economic weight. London's financial cluster and Silicon Valley's Information and Communication Technology (ICT) cluster have a disproportionate impact on the trade balances of the UK and the USA. Italy's cluster areas in its north-central belt are far more prosperous than the Mezzogiorno region where they do not exist, something which is reversed in Germany where the south with automotive and ICT clusters is richer than the north whose 'industrial age' clusters are in decline.

Because clusters are focused geographical settings where industry specialization occurs, they develop external economies of scope and scale that it was once thought only single, large firms could manage. Modern ICT assists the routine part of this such as transmission of software, databases, designs and other forms of codified knowledge. But proximity in a cluster offers the opportunity for tacit knowledge exchange or 'treacherous' learning that may be hindered in large firms by 'group-think' and corporate culture. This is what accounts for the observation by de Geus (1997) that the average age of most large firm identities is around forty years. Large firms that do not conform to that fate change themselves, like Nokia, and survive much longer. So, in general, under contemporary knowledge-intensive market and competitiveness conditions it pays to be in a cluster or to simulate the kind of synergies from corporate re-design and re-invention that cluster networks supply.

This brings us to a key point about knowledge economies and their definition. Clearly, all human economic activity depends upon knowledge so, in a trivial sense, all economies are 'knowledge economies'. But because knowledge cannot be possessed in the way, for example, gold can, it can be appropriated by anyone capable of using it. This is despite the fact that it must be protected by patents. These after all are mainly a means for securing some economic return to invention rather than keeping knowledge confidential. There are three key issues: first, knowledge ages and is superseded by new knowledge that ideally requires what Johnson (1992) calls 'creative forgetting', namely, the stowing away of redundant knowledge and the learning of new. This can be a long and

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painful process, an illuminating, failed example of which is given in Chapter 7 where the massive gap between management rhetoric about the imperative to become a learning organization at the Rover car company and its actual practices in the succeeding decade bears witness to at best management inadequacy and at worst, deep managerial cynicism of a kind that typically accompanies inability to learn how to implement actions arising from new knowledge. Second, the kind of knowledge that is frequently high value nowadays is scientific, including social scientific. This is not new existentially but its scale and economic penetration are. Thus, so-called ‘scientific management’ was practised at Ford plants in the first quarter of last century, ultimately proving fatal to craft-based production methods in the car industry. Innovations from the Gilchrist-Thomas to the Bessemer processes and beyond in steel-making were scientifically knowledge-intensive, but new knowledge of electric arc production, for example, meant steel did not need to be produced mainly in ever-expanding works but in more localized, customized mini-mills where economies of scope (variety) could outweigh those of scale. This arose from the interaction of scientific knowledge about production and social scientific about management and markets.

A good example of an ‘old economy’ industry that has become more scientifically ‘knowledge-embedded’ is food production. It is shown in Chapter 6 how important agricultural research institutes in East Anglia continue to be to the development of agro-food businesses in the UK, not least in their questionable contribution to the application of biotechnology to this industry. In a more wide-ranging analysis of the embedding of scientific research in a specific food industry value-chain, Smith (2000) and colleagues mapped the nine key stages in the Norwegian chain and related these to their knowledge-content and knowledge suppliers. For preparation of raw materials, processing, preservation and packing thirteen different private and public laboratories were engaged. For hygiene and food safety, eleven, including some of those involved in preparation, etc., were involved, and for quality control, logistics, marketing and sales, eleven, again including some used in previous stages, were found to be knowledge suppliers. Thus the food industry in Norway and conceivably elsewhere in comparably developed economies is knowledge-intensive and relies on this characteristic to be competitive. But, as Smith points out, it is not a particularly research and development (R&D) intensive industry and its workforce is not in itself directly processing scientific knowledge, making as Castells (1996, p. 17) puts it: ‘the action of knowledge upon knowledge itself as the main source of productivity’. The modern food industry is thus knowledge-using but not knowledge-creating, it learns but does not necessarily tutor scientifically and this must be one of the reasons why it is placed, and possibly misplaced, in the low-technology manufacturing category of the OECD (1999) index of ‘knowledge-based industry’.

Thus, third, knowledge economies are not defined in terms of their use of scientific and technological knowledge, including their willingness to update knowledge and ‘creatively forget’ old knowledge through learning. Rather, they