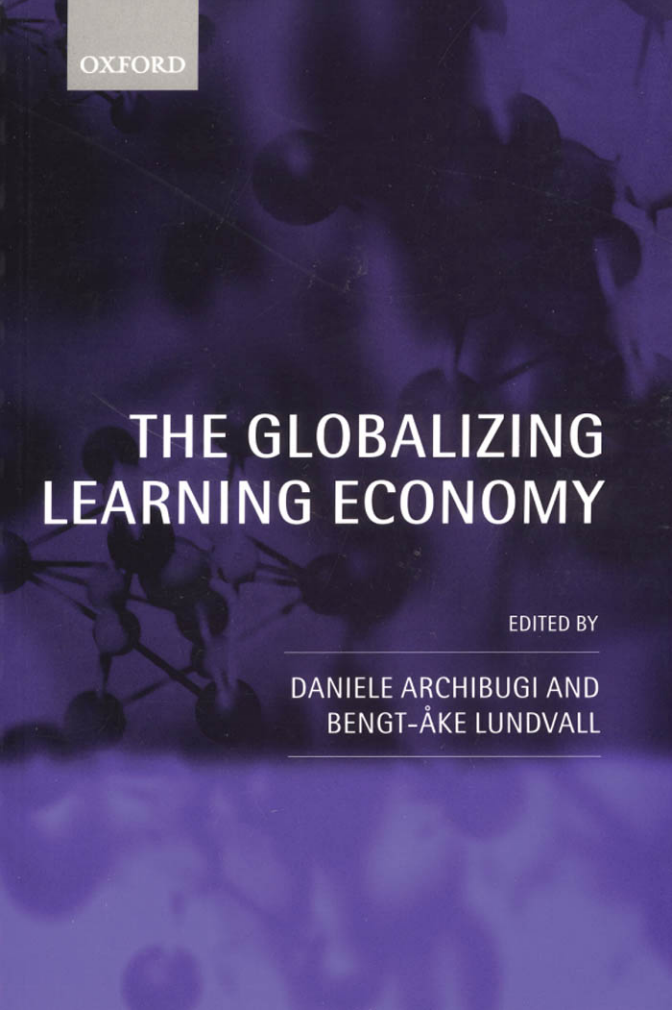
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THE GLOBALIZING LEARNING ECONOMY
EDITED BY
DANIELE ARCHIBUGI AND
BENGT-ÅKE LUNDVALL

The Globalizing Learning Economy

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Edited by
Daniele Archibugi
and
Bengt-Åke Lundvall

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Preface

This book reflects work pursued in the first generation of the European Commission's programme on socio-economic research TSER (Targeted Socio-Economic Research). It represents an attempt to contribute to one of the fundamental aims of TSER in the Fourth European Framework Programme, i.e. to let the results of socio-economic research feed into the knowledge base of public policy in Europe. TSER was the first major European effort to support and co-ordinate research in the field of social science and it supported research in three different areas: evaluation of science and technology policy options; social exclusion and inclusion; and, finally, education and training. This book is based primarily on research pursued under the first of these headings.

In selecting projects and contributors for this volume we had as a major criterion that they would contribute to the understanding of major new trends affecting the conditions for policy making in general and innovation policy in particular. This book is therefore addressed to students, scholars, policy makers, and others interested in understanding what are the major new challenges related to globalization and learning societies—and what can be done about them. We have preferred to use the title *The globalizing learning economy* rather than the more in vogue expression 'The global knowledge-based economy' because we want to emphasize that we are still a long way from a truly global economy and that there are still vast differences among countries, regions, and social classes in terms of the exploitation of the available knowledge. Moreover, what connotes the present era is not only the intense use of knowledge but also a learning process characterized by both knowledge creation and knowledge destruction—sometimes forgetting is a prerequisite for knowledge creation.

This book should give readers a feeling of optimism by pointing to the enormous potential in developing human resources in connection with new technologies and new forms of organization. It should, at the same time, raise big warning flags signalling that the globalizing learning economy may not be sustainable if left to itself. The challenge of growing social, regional, and global disparities, along with the environmental challenge, may undermine natural and social capital that are key inputs and prerequisites for the learning processes on which the whole system is founded. We also point out that in important respects Europe still seems to be unprepared to adapt successfully to the rapidly changing landscape. Several chapters highlight weaknesses of Europe in areas that are crucial for future well-being. A major policy effort at the European, national, and regional levels is required to allow the Old continent to run on a par in the new global economy.

The analysis of most single chapters is based on large research projects involving interdisciplinary teams from many different European countries and taking place over a period of two to three years. In this book the reader gets the results from such large-scale research projects in a condensed form and with emphasis on the fact that it is *targeted* research. We have asked authors to emphasize the mapping of what they see as the most important new socio-economic trends in their field of research and to reflect upon policy implications at the European, national, and regional levels. Methodological problems and internal academic debates are important but they are discussed elsewhere.

The contributors broadly share an institutionalist perspective on the economy but they are not necessarily in agreement when it comes to interpreting what is happening and which policy measures should be preferred. The chapters are written by scholars with different disciplinary backgrounds, even if most of the authors are economists, sociologists, or organization theorists. We believe that the extreme specialization in academic work, as well as in policy making, needs to be compensated for by efforts to reintegrate different elements of knowledge. We are convinced that a lack of overview on how different pieces of knowledge are connected to each other and a lack of insight in how different policies interact in shaping reality are factors that undermine the sustainability of the globalizing learning economy. If anything, we should have liked to include expertise with an even broader set of perspectives and disciplinary backgrounds to capture the new social and economic trends.

The idea for this book came out of a major meeting held in Brussels on 28–30 April 1999, the 'European Socio-Economic Research Conference', which was devoted to the presentation of some of the most important results of the studies promoted by the European Commission. The majority of the papers were already available in advanced drafts then, but to generate a reasonably coherent book required additional efforts from the contributors. We are of course happy to be able to get so many interesting contributions from colleagues who, we know, are very busy and very much in demand as speakers and writers. The fact that they joined this effort and were willing to go through several rounds of revisions of their chapters may be taken as a tribute to the status of the TSER-programme. We wish, however, to thank them for their patience.

We want to address special thanks to Christopher Freeman, who was unable to join the conference but who let us have a presentation which is now a chapter of this book. Many of the authors in this volume owe him a lot in terms of intellectual and moral inspiration and he, together with Carlota Perez, was one of the first economists who told us that the IT revolution would fundamentally change our societies and the workings of the economy, long before 'the new economy' appeared as a standard concept in the columns of the business press.

We are very grateful for support from a number of EU officials connected to the TSER-programme and Directorate-General for Science, Research, and Development. First of all, we would like to thank Virginia Vitorino, who was active in preparing and organizing the meeting in Brussels, 28–30 April 1999, and who provided substantial help in the follow-up resulting in this book. We are also grateful to Director, Achilleas Mitsos, and Head of Unit, Andrew Sors, for their support for the initiative. Interesting debates with Ronan O'Brien and Peter Fisch have also been helpful in designing the project. We have also benefited from the insights and suggestions of our colleagues Cristiano Antonelli, Yannis Caloghirou, and François Chesnais.

All through this process we have depended very much on the assistance from Marcela Bulcu and Cinzia Spaziani in Rome and Dorte Køster in Aalborg. We owe them red roses for their kind support and many thanks for their professional work in preparing the typescript for the publisher. David Musson of Oxford University Press should be thanked for his early interest in this project, his positive and critical encouragement, but also for his tolerance in accepting our flexible deadlines. Sarah Dobson and Sally McCann should also be thanked for their patience in the preparation of the typescript. Our somewhat hectic working life would be terribly boring without the love and inspiration from Birte and Paola.

Daniele Archibugi and Bengt-Åke Lundvall

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List of Abbreviations

BETA	Bureau d'Economie Théorique et Appliquée, Université Louis Pasteur, Strasbourg, France
BRITE/EURAM	European Commission's Specific Research and Technological Development Programme in the Field of Industrial and Materials Technologies
CAP	European Common Agricultural Policy
CEC	Commission of the European Communities
CRAFT	European Commission's Specific Programme of Research and Technological Development in the Field of Industrial and Materials Technologies
CREI	Centre de Recherche en Economie Industrielle, Université Paris 13, Paris, France
CRIC	The ESRC Centre for Research on Innovation and Competition, UK
CSD	Commission for Sustainable Development
CSO	Central Statistical Office, UK
CTA	Constructive Technology Assessment
DBF	Dedicated Biotechnology Firms
DISKO	Danish Innovation System Research Project
DRUID	Danish Research Unit for Industrial Dynamics
DTO	Duurzame Technologische Ontwikkeling: Dutch Programme on Sustainable Technology Development
ECB	European Central Bank
EEC	European Economic Community
EFTA	European Free Trade Agreement
EIMS	European Commission's European Innovation Monitoring System
EMU	European Monetary Union
ESPRIT	European Strategic Programme for Research and Development on Information Technologies
ESRC	Economic and Social Research Council, UK
EU	European Union
EUREKA	European Research Coordination Agency
EUROSTAT	Statistical Office at the European Communities
FDI	Foreign Direct Investment
GATT	General Agreement on Trade and Tariffs
GDP	Gross Domestic Product

GNP	Gross National Product
HDTV	High Definition Television
ICT	Information and Communication Technology
IMF	International Monetary Fund
INRA/SERD	Institut National de la Recherche Agronomique / Sociologie et Economie de la R&D, Grenoble, France
IPTS	European Commission's Institute for Prospective Technological Studies, Seville, Spain
ISI	Fraunhofer Institute for Systems and Innovation Research, Karlsruhe, Germany
ITU	International Telecommunications Union
JIT	Just in Time Production
JRC	European Commission's Joint Research Centre
KBNO	Knowledge Based Networked Oligopolies
KIBS	Knowledge Intensive Business Services
LOK	Danish Project for Management, Organizations, and Competencies
M&A	Mergers and Acquisitions
MERIT	Maastricht Economic Research Institute on Innovation and Technology, The Netherlands
MNE	Multinational Enterprises
MTA	Material Transfer Agreements
NEPP	National Environmental Policy Plan, The Netherlands
NIC	Newly Industrializing Countries
NMT	Nordic Mobile Telephony Standard
OECD	Organization for Economic Cooperation and Development
RACE	European Commission's Specific Research and Technological Development programme in the Field of Communication Technologies
RMNO	Dutch Advisory Council for Research on Nature and Environment
R&D	Research and Development
RTD	Research and Technological Development
SME	Small and Medium Sized Enterprise
SPRU	Science and Technology Policy Research Unit, Sussex University, UK
TEP	The OECD Technology/Economy Programme
TMR	European Commission's Training and Mobility for Research Programme
TSER	Targeted Socio-Economic Research Programme of the European Commission
UMIST	University of Manchester Institute of Science and Technology, UK

UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational Scientific and Cultural Organization
UNWCED	United Nations World Commission on Environment and Development
VROM	Physical Planning and the Environment, Ministry of Housing, The Netherlands
WIFO	Osterreichisches Institut fur Wirtschaftsforschung: Austrian Institute of Economic Research
WTO	World Trade Organization

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Introduction: Europe and the Learning Economy

Bengt-Åke Lundvall and Daniele Archibugi

> Both the pace and the acceleration of innovation are startling; nay terrifying. . . .No-one can predict the . . .range of skills which will need to be amassed to create and take advantage of the next revolution but one (and thinking about the next but one is what everyone is doing. The game is already over for the next).
> (Bob Anderson, Director, Rank Xerox Research Centre, Cambridge Laboratory, 'R&D Knowledge Creation as a Bazaar Economy', paper presented at OECD–IEE Workshop on Competition and Innovation in the Information Society, 19 March 1997)

The New Economic Context

The title of this book—*The Globalizing Learning Economy*—evokes probably the two most significant aspects of contemporary economic and social life. On the one hand, there is growing agreement that knowledge is now at the very core of economic welfare and development. Nations, regions, industries, and firms with a faster rate of growth are those which more successfully manage to generate and apply knowledge. The crucial role of knowledge is now preached by a variety of academic, business, and policy sources. The OECD, for example, has consistently stressed the move towards a *knowledge-based economy* (OECD 1996; Foray and Lundvall 1996). However, we have preferred to refer to a slightly different concept, that of 'learning economy' (Lundvall and Johnson 1994; Lundvall and Borrás 1998) because we believe that this may capture even better the dynamics of our age. The concept is based upon the hypothesis that over the last decades an acceleration of both knowledge creation and knowledge destruction has taken place. Individuals and institutions need to renew their competencies more often than before, because the problems they face change more rapidly. And at the same time the segments of society that are affected by accelerating change have grown considerably. Therefore, in a wide set of economic activities what constitutes success is not so much having access to a stock of specialized knowledge. The key to success is, rather, rapid learning and forgetting (when old ways of doing things get in the way of learning new ways). Narrowly defined skills may actually even hamper rather than support economic success.

On the other hand, we also refer to the so-called globalization. In recent years the inter connections between geographically different parts of the world have considerably increased and this has also multiplied learning opportunities. But globalization is not a completed process. In some areas, such as markets for financial assets, it has developed very far, while in others more related to competence building and innovation national borders still remain crucial (Archibugi and Iammarino in this volume). Neither does the globalizing process provide advantages to all social groups and regions and it does not automatically reduce disparities. While some parts of the economy are at the core of the current trends, others have been marginalized. We have therefore preferred to refer to a 'globalizing' rather than to a 'global' economy to stress that the current state of the world remains far from one characterized by a trully global economy and society. Actually, the globalizing process contains dangers as well as opportunities and there are individuals, groups, regions, and nations which are not benefiting from the available potentialities and experience a worsening in their current well-being.

It is important to emphasize how the 'learning' economy and the 'globalizing' economy are strictly connected. It is obvious that knowledge and learning have always been a crucial component in human systems, but we should also ask why and how they have become more important in our age. One answer is connected to the opening of new scientific discoveries and technological innovations, but this alone would not be able to explain why knowledge and learning have become so crucial for economic success. A circular process has taken place. On the one hand, the development of an integrated world economy has allowed the acquisition of information, expertise, and technology at a faster pace and often at lower costs than in the past (see Archibugi and Iammarino in this volume). On the other hand, the current phase of globalization has been nurtured by a generation of new technologies. The major technological advances of the last quarter of a century have in fact occurred in fields which allow the production, communication, transmission, and storage of information. Information and Communication Technologies (ICTs) have in other words acted as the material devices to allow globalization to occur. Finance, production, media, and fashion would not be as global as they are today without the generation of new technologies. In this sense, the 'learning' and 'globalizing' dimensions of the world economy strongly reinforce each other (see Archibugi and Iammarino 1999).

An important element in this new context is that competition, as well as learning, has become more global and more intense in most parts of the economy. This is true especially in markets related to information technology: they are at the same time the carriers for the transmission of new knowledge, those where the rate of change is faster and those where competition has become extreme. But the production of traditional manufactured products such as textiles, toys, and ships has also experienced a more intense competition and substantial parts of these industries have moved out of Europe to

other parts of the world. Service related activities such as shipping and software engineering are getting more and more exposed to global competition. Now also traditionally protected and regulated areas (telecommunications, collective transport, public utilities, health, and education), are becoming strongly exposed to competition.

There is little doubt that the breakthrough in information technology has had a major impact both on learning and globalization. Christopher Freeman (1984) and Carlota Perez (1983) signalled very early on that we were in the midst of a technological revolution that, after a period of institutional adaptation, might turn the world economy from a downturn to a long upswing. It is interesting to note that the scepticism they met a decade ago among standard economists now tends to be drowned by enthusiastic and somewhat uncritical references to 'the new economy' as based on information and communication technology by some of the same economists. The work done by Freeman and Perez on long waves and techno-economic paradigms is useful also in demonstrating that it is not the first time in history that the world has been through dramatic change that increases the need to learn and adapt. The industrial revolution and the different transformations connected to earlier technological revolutions were also dramatic in these respects. What might be different in this period is the extreme rate of change in certain areas related to the production and use of ICT and the breadth of the impact across regions as well as social groups (for an assessment of the 'new economy' on Europe, see Soete in this volume).

Other major driving forces have been political. The most critical political reform was the deregulation of currency policy and of international capital flows. After this first step had been taken it was almost unavoidable that the pressure for deregulating other activities would increase. For instance, the monetarist idea that macroeconomic policy should focus on monetary stability and leave the rest to the market found material support in the free movement of capital. The success of a specific policy package now had to be judged not so much by its impact upon a set of nationally prioritized economic political goals but rather by the more or less speculative reactions of international mobile capital.

Some of the deregulation initiatives have been intertwined with and motivated by radical changes in information technology. This is obviously true for mass media and telecommunications and it is also becoming the case for other areas such as education and health services, where the explosive expansion of the use of the Internet challenges the old ways of providing these services. Nevertheless, it is important to realize that the development has been quite strongly determined by policy choices. The perception that national and international policy making has been without influence on a predestined globalizing process is false and it might also be dangerous.

It is false because the design of national and international policies and institutions affects the rate, direction, and consequences of globalization. It

is dangerous because abdicating from political responsibility and leaving the weakest segments of global and national society to carry the full burden of unhampered globalization leaves a lot of space for aggressive, populist, political movements, as European history has already taught once. In other words, the 'new economy' needs strong public policies in order to keep the polity working.

Learning as Social Process

In this volume we argue that the learning economy calls for new institutional set ups and new policy strategies at the level of the nation state and that of the European Community. One major conclusion is that not only is there a need to rethink specific policies related to, for instance, education, social issues, and industrial development, it is even more important to combine these specialized policies into holistic and coherent strategies. While knowledge production and policy making, through decades, have been characterized by growing specialization and by narrowing the fields of responsibilities for policy makers, the learning economy calls for lateral thinking and for a reintegration of separate perspectives and strategies. It is of special importance to take into account the importance of the social and ecological dimensions when considering innovation policy in the learning economy. This is because growth in the learning economy feeds upon social capital and that, if left to itself, it tends to undermine the very same social capital that it feeds upon.

Know-how is typically learnt in something similar to apprenticeship relationships where the apprentice follows his master and relies upon him as his trustworthy authority (Polanyi 1958/1978: 53 *et passim*). 'Know-who' is learnt in social practice and some of it is 'learnt' in specialized education environments. Communities of engineers and experts are kept together by a variety of linkages and networks such as reunions of alumni, professional societies, know-how trading among professional colleagues (Carter 1989). It also develops in day-to-day dealings with customers, sub-contractors, and independent institutes. Larger business communities exchange significant information which constitutes a vital input into their production process (on this, see Mytelka's chapter in this volume).

All this exchange of know-how will not be possible in a purely competitive economy. The learning economy thus needs a lot of trust in order to be successful. And, as Kenneth Arrow has pointed out, 'trust cannot be bought: and if it could be bought it would have no value whatsoever' (Arrow 1971). The fundamental role of trust raises strong doubts about how to interpret the standard assumption in economic theory that the most efficient economy is one where individuals act as 'economic animals' who *calculate* the outcomes of all alternatives in order to select the one which is best for themselves. *In the*

learning economy the importance of the ethical dimension and social capital increases enormously. Little can be learnt and information cannot be used effectively in a society where there is little trust.

The most immediate benefits of intensified competition and accelerated change and learning are growing productivity, lower prices, and a higher level of consumption. Another more local benefit is that the employees of innovative and flexible organizations may earn a premium or at least avoid bankruptcy and unemployment. But there is also a clear and strong tendency towards polarization in the learning economy, as stressed in Schienstock's chapter in this volume. The distribution of the benefits and costs of economic development has become more uneven during the last decade, with the low-skilled of the labour force as the major losers (see OECD 1994: 22 *et passim*). Within Europe the catching up of the poorest regions has slowed down in this period (Fagerberg *et al.*1997). At a global scale inequality between rich and poor countries has increased (see Freeman in this volume, World Bank 2000).

In the learning economy, there is a growing tension between the process that excludes a growing proportion of the labour force and the growing need for broad participation in the change process. It is not obvious that, in the long run, a learning economy can prosper in a climate of extreme social polarization. This is why there is a growing need at all levels of society to combine elements of the 'old new deal' with a 'new new deal' that puts the emphasis on a more even distribution of skills and competencies and especially on the capability to learn (Lundvall 1996).

Another, even broader, problem is that the speed-up of change puts a pressure on traditional communities. It contributes to the weakening of traditional family relationships, local communities and stable workplaces. This is important since the production of intellectual capital (learning) is strongly dependent on social capital. 'Social capital'—the social capability of citizens and workers to collaborate and share knowledge and information without too much friction—is not easily re-established if once devaluated. How new forms of social capital can be created and accumulated is a major issue in the learning economy. This is a major issue especially in the context of European integration since the formation of social capital has been so strongly connected to the national welfare states. To find ways of re-establishing the social capital destroyed by the globalization process is a major challenge for Europe.

The Impact of the Transformation

The focus of this book is on how 'innovation policy' needs to be designed in the new context. By 'innovation policy' we refer to a broader set of policies than are normally included in this concept and we will also try to take into account how other policy areas influence or are influenced by innovation (see

Edquist's and Lundvall's chapters in this volume). This approach reflects the fact that we see the present split of responsibilities among different institutions (such as ministries, directorates, commissioners, and other public agencies acting at the regional, national, or European levels) as one reason why it is so difficult to develop effective European strategies that counter the negative impact of globalization and exploit the positive opportunities it offers.

In Figure 1, some of the crucial aspects of the globalizing learning economy are illustrated with a simple model, where transformation pressure is linked to innovation and organizational change and to the costs and benefits of change. Through this model we can also see how different policy fields interrelate. In what follows we shall identify some of the strategic variables at each level and take into account how they have changed in the transformation to a globalizing learning economy.

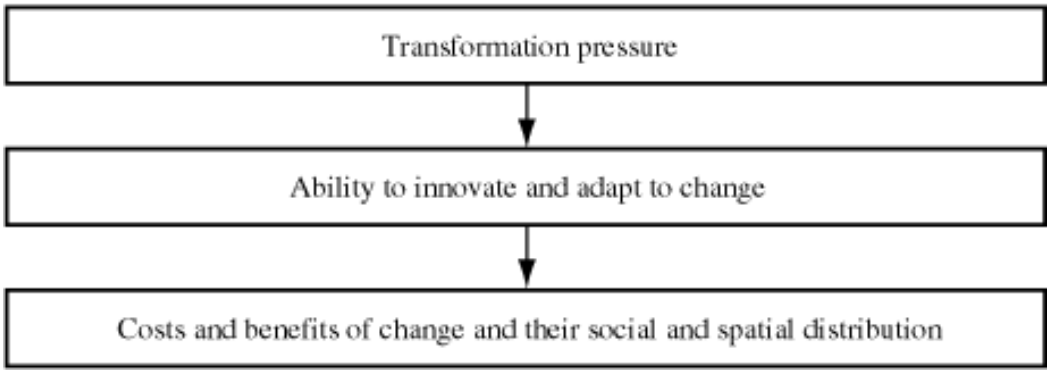
Transformation Pressure

One of the most fundamental factors affecting the transformation pressure is *technical change*. New technological opportunities in the form of new products and new processes affect firms in different ways. They offer significant advantages but also new threats. A second major factor is the *competition regime*. New entrants into markets and extensions of markets bringing in new competitors located elsewhere are factors that increase the transformation pressure. The role of ownership and finance in managing the firms affects the intensity but also the direction of the transformation pressure. Finally the *macroeconomic stance* affects transformation pressure. For instance, a situation characterized by deflationary policies and an over-evaluated currency rate implies strong transformation pressure, as do aggressive trade union wage policies.

The Building Up of Transformation Pressure

The development and widespread use of new technologies and especially of information and communication technologies have transformed such fundamental aspects of the economy as time and space. The wider set of

Fig. 1. The Basic Model



competitors in world trade also reflects deregulation of trade and international financial flows as well as transport technologies that make it less and less expensive to move commodities and people over long distances. Privatization and deregulation increase the transformation pressure on parts of the economy that have so far been sheltered. These are the main factors that have increased the transformation pressure. To this should be added mechanisms of cumulative circular causality. These reflect selection mechanisms in product and labour markets that favour change-oriented organizations and individuals and thus increase the transformation pressure further.

It is difficult to see what mechanisms within the economic sphere could halt this tendency. The full impact of information technology has yet to be felt: new entrants into world trade are on their way and further deregulation still lies ahead in most countries and are promoted by international organizations such as the OECD and IMF. The main limits to the process might be 'exogenous' and have to do with increasing costs in terms of potential social and environmental crises that might trigger popular resistance. The growing, if still modest, attention given to ethical, environmental, and social issues in big firms may reflect an insight that such developments, in the absence of both external regulation and self-restraint, might threaten the sustainability of the economic environment.

Ability to Innovate and Adapt to Change

A key to successful innovation is to have a strong knowledge base including an R&D capacity and a well-trained labour force (on the impact of new technologies on employment and skills, see Vivarelli and Pianta 2000). But as indicated by the concept 'innovation system' many different agents, organizations, institutions, and policies combine to determine the ability to innovate. Adaptation to change can take many forms and this is the subject of ongoing debates on economic policy. *Flexible labour markets* may be at the core of adaptation in some innovation systems while others adapt more through *functional flexibility* within organizations. *The creation of new firms* may be a key to adaptability and innovation in some systems while others rely more on *innovating and reorienting the activities of existing firms*. Increasingly important is the introduction of *learning organizations* and *network formation* as a response to a growing transformation pressure.

New Demands on the Ability to Innovate and Adapt to Change

The new demands on the ability to innovate reflect a new mode of knowledge production and give rise to a need to rethink most of the institutions and organizations that constitute the knowledge infrastructure. The new context puts a premium on interactivity within and between firms, and

between firms and the knowledge infrastructure. These changes are reflected in new and more stringent demands regarding the qualifications of employees and management. The ability to combine abstract reasoning with social skills in communication and co-operation, including interdisciplinary cooperation, is now more important than before. The delegation of responsibility to employees is a response to the fact that rapid learning can take place only if the working environment is democratically organized. Services, and especially knowledge-intensive services, tend to become much more important, both in their own right and for overall industrial dynamics (see Tomlinson, in this volume. For an assessment of the innovative potential of the service industries see Evangelista 2000). These changes relate both to innovative and to adaptive capabilities. The characteristics of the innovative firm are not identical but they are overlapping with those of the functionally flexible firm (see Coriat, in this volume). The kind of external network relationships most conducive to innovation are also similar to those that favour flexible response.

Costs and Benefits of Change and Their Social and Spatial Distribution

The different forms of adaptability characterizing an innovation system will distribute the costs and benefits differently. Firms integrated in successful and dynamic networks may prosper when the transformation pressure increases while firms operating in formerly protected areas but now becoming exposed to new competitors will have to fight for their survival. The spatial distribution of costs and benefits will reflect regional and national abilities to innovate and to adapt to change. The nature of the transformation pressure may favour the particular institutional set ups prevalent in some innovation systems and inhibit others. What might be an ideal set up in one period may not be so in the next, and it usually takes decades rather than years fundamentally to reorient regional and national systems of innovation.

More Uneven Social and Spatial Distribution of the Costs and Benefits of Change

Data seem to indicate that, on balance, the distribution of benefits and costs has become more uneven during the last decade, at least within the OECD area (see respectively Schienstock and Freeman, in this volume). Profit shares have grown at the cost of wage shares in all parts of OECD since the middle of the 1970s (OECD 1994: 22). Earning differentials between skilled and unskilled workers have grown in the Anglo-Saxon countries and differences in employment opportunities between more and less skilled labour categories have increased in those, as well as in the other European countries (OECD 1994: 22–3). TSER research demonstrates that the differences in

income between rich and poor regions in Europe remained substantial through the 1980s (Fagerberg *et al.*1997).

It is important to note that the nature of the costs of change are quite different for those leading and pushing the process of change and those lagging behind. This is true for people as well as regions. People who are frontrunners may experience stress, a shortage of time, and work overload, while laggards may experience exclusion from the core of the economy and be relegated to passive consumption of mass-produced entertainment. In socio-economic terms there might be a trade off between extreme demands on the learning capability of the workforce promoting competitiveness and the costs represented by the fact that more people get excluded from active participation in the labour market. Another set of costs arising from rapid change and which now need to be tackled are those relating to global and local environmental problems: new industrialization and the intensification of transport increasingly threaten the basic conditions for human life (see Meyer-Krahmer, in this volume).

On the Importance of Feedback

The linear type of model presented above may be realistic for small regions and organizations since they have very limited impact on the transformation pressure to which they are exposed. But for units of a certain size it is important to understand the feedback between the three different levels. Starting from the bottom of Figure 1 there is a need to take into account how the distribution of costs and benefits affects the ability to innovate and adapt to change. An uneven distribution will typically create a strong negative attitude to change among those who register only the costs and negative aspects of change. If there are high degrees of insecurity among individuals they will tend to oppose change. This is one of the reasons why social cohesion is crucial for the learning economy.

The second feedback mechanism goes from the ability to innovate to the transformation pressure. Increasing the ability to innovate means building more flexible organizations and a selection of people and institutions that are change-oriented. This gives rise to a further increase in the transformation pressure. If there opens a wide cultural split between a change-oriented cosmopolitan élite and a defensive majority, social capital and learning will be undermined. Leaving social cohesion to be repaired by the nation states, *ex post,* and focusing the European integration exclusively on increasing the transformation pressure and on enhancing innovative capabilities may not be a sustainable strategy in the learning economy.

Fig. 2. Knowledge Management In the Learning Organization

Innovation Policy in the New Context

Since innovation is strongly related to competence building at the firm level, we need to define the different roles of innovation policy by taking this as the starting-point. In Figure 2 we have sketched three major sources that firms may draw upon when building and renewing their competence.

The first source refers to hiring and firing in the labour market. The actual pattern of mobility of labour between regions, sectors, and firms, and the training efforts within and outside firms are crucial for how the hiring and firing mechanisms affect competence building at the firm level. The second source refers to internal competence building. Here the organizational set up of the firm is critical for its capability to learn. R&D investments and the investment in the training of employees are also important. Finally, firms will increasingly draw upon external sources of competence. These can originate from other firms operating as customers, suppliers, and competitors (Pavitt 1984; Von Hippel 1988; Archibugi *et al.*1991). They may also be knowledge institutions such as laboratories, technical institutes, and training centres. Consultancy firms and other knowledge-intensive business service firms tend to become increasingly important as suppliers of competence. Science-based firms need to get into very close forms of interaction with universities (see Conçeicão and Heitor in this volume).

Traditionally, innovation policy has been thought of mainly as responsible for creating a public knowledge infrastructure and possibly creating links between this knowledge infrastructure and the firms. Another element of innovation policy has been firm incentives to invest in R&D through, for instance, tax subsidies. Finally, innovation policy may have focused on protecting the knowledge produced by private agents while in specific fields, such as agriculture, the main focus has been on diffusing knowledge. There has been agreement that there is a need for a public responsibility in relation to basic education and the functioning of labour markets but the criteria for designing these policies have only marginally referred to the impact on competence building and innovation in the private sector. There is still a long way to go before management and governments have fully responded to the need for strategies that take an integrated view of the three sources of competence building. There is a need to do so at the level of the firm, social partners, and governments.

Building Learning Organizations and Integrating Strategies of Competence Building at the Level of the Firm

If we ask ourselves how widespread is innovation among firms we will find that, contrary to what was predicted by Schumpeter, the number of innovating firms is substantial. Of course, not many of them are able to generate radical innovations but, from a public policy perspective, this seems to be less

important than to create a vital fabric of innovating firms. The recent generation of surveys devoted to technological innovation, promoted by the OECD and the European Commission, have however shown that there is a substantial share of firms, both in the manufacturing and in the service industries, which do not innovate regularly (see Evangelista, Sandven, Sirilli, and Smith 1998). This has relevant implications for public policies since it calls for actions able to increase the number of firms active in technological innovation. Not only can firms innovate more, but more firms can innovate.

Equally important is to link product and process innovations to organizational change. Recent research linking organizational forms to innovation shows that there is a strong synergy between the introduction of new forms of organization and the performance and innovative capacity of the firm (Lundvall 1999; and Lundvall and Nielsen 1999. See also, in this volume, Coriat's chapter). Establishing the firm as a learning organization characterized by decentralized responsibility, team work, circulation of employees between departments, and investment in training has a positive impact on a series of performance variables. Flexible firms are characterized by higher productivity, by higher rates of growth and stability in terms of employment, and they are more innovative in terms of new products. The research cited above also shows that success in terms of innovation is even greater when such a strategy is combined with active networking in relation to customers, suppliers, and knowledge institutions.

But we also find that, so far, there is only a small minority of all firms (10–15%) that have introduced the major traits of the learning organization. There is an enormous unexploited reserve of economic competitiveness, especially in manufacturing and business service sectors in Europe. In some other sectors such as construction, agriculture, and transport, the efficacy of building learning organizations can be fully exploited only after a period of de- and re-regulation. Our conclusion is that a new kind of *integrated competence building strategy* is needed and that such a strategy should take into account how to combine the three different major sources of competence building: hiring and firing, internal competence building, and networking and alliances (see Figure 2).

Firms differ in how strongly they emphasize each of these elements both between and within national innovation systems. Japanese firms have emphasized internal competence building, while most high-tech firms in Silicon Valley depend on learning through high inter-firm mobility of employees within the industrial district. Hewlett Packard is one US firm that has given strong emphasis to internal competence building but it is now moving towards a compromise strategy with more openness to hiring experienced employees from other firms. In Denmark the institutional set up of the training system and labour market institutions promotes networking among firms and high mobility in the labour market, making it attractive for firms to locate in 'industrial districts'.

There is no single optimal strategy in this respect even if the relative success of IT-based firms in the US and the weakening of the Japanese firms might be interpreted as an indication that high inter-firm mobility of labour is an advantage in the learning economy context. Under all circumstances, management needs to be aware of its priorities in this respect and the different mechanisms need to be attuned to each other so that the firm can become an efficient competence creating system.

In this context, it is important to take into account that labour markets and education systems still have strong national characteristics. Strategies covering multinational operations need to take into account such differences—it is not possible to have one single global knowledge management strategy that neglects local and national specificity. This is true especially for Europe, where there is a multitude of quite distinct national labour market models.

Industrial Relations and the Role of Trade Unions in the Learning Economy

When Danish managers were asked about what factors stimulated or hampered the movement towards learning organizations, many of them referred to shop stewards (*tillidsmænd*) as a positive factor and only a small minority mentioned them as raising barriers to organizational change. This indicates that trade unions at the central and local level may be a positive factor when firms need to cope with the new challenges of the learning economy. The relative strength of organized labour in Europe may be regarded as a positive factor in global competition—at least potentially.

Giving workers and their representatives the right incentives to participate positively in building learning organizations may be a question of creating a minimum of security in processes of restructuring—in Denmark the unemployment support level, and its duration, has done so (in spite of high inter-firm mobility Danish workers express less worries of increased insecurity in their job situations than do workers in other European countries with much less labour mobility—see OECD 1997: 132).

The fact that access to learning capability is what constitutes success among the members of trade unions should affect the priorities of the trade union movement. When demanding shorter working hours they could combine such demands with requiring real access to skill upgrading for their members. Agreements between business and labour on the development of new forms of work organization and skill development become more and more important for both parties.

There is a risk that old priorities lead to short termism on both sides. Obtaining nominal wage increases for union members whose skill position is stagnating may be highly counterproductive to the long-term interests of those represented. On the business side, routine lamenting on tax levels and government regulation might get in the way of long-term considerations regarding the transformation of training systems and labour market

institutions. Organizations on both sides may need to take on the task of convincing their members that the advent of the learning economy involves a new game to be played according to new rules.

A special new responsibility which affects both sides is that of coping with the growing tendency towards social exclusion and not least the exclusion of workers of foreign origin. There is a need at the central level for trade unions to focus on the upgrading of the learning capability of those segments of workers who have narrow skills and to find ways to shelter those segments of the workforce (older unskilled workers) that cannot take part in the learning race. In general, trade unions need to be prepared to develop new kinds of solidarity that focus on the redistribution of learning capabilities.

Management also has a responsibility for this problem. Our research shows a strong Mattheus syndrome in the human management strategy of most firms: it is primarily those with extensive training that are offered even more training within firms. It is tempting for firms to focus skill upgrading on those who are rapid learners and leave the rest to public training programmes. In the light of a growing scarcity of new entrants into the labour market and the need for broad participation of employees in learning organization, this might need to change in the future. Under all circumstances, co-ordinated efforts between business and labour to reduce social exclusion are necessary to make the remaining tasks of governments manageable. Also in the field of industrial relations there is a need for reintegrating functions and responsibilities. Traditional interests in terms of pay, working time, and job security must be linked to and assessed in relation to competence building and the distribution of learning capabilities. Again, European traditions of concertation between government, business, and labour may prove to be a comparative advantage if there is a willingness on all sides to take up these challenges.

The Need for a New Type of Policy Co-ordination at the European Level

As shown by Fagerberg (in this volume), the European economy is lagging behind in some of the most important aspects of the new learning economy. To bridge the gap is therefore a European imperative. There is a growing consensus on the need to focus on long-term competence building in firms and in society as a whole. At the same time, the prevailing institutional set up and global competition tend to give predominance to short-term financial objectives in policy making. At the institutional level this is reflected in the fact that ministries of finance have become the only agency taking on a responsibility for co-ordinating the many specialized area policies. Area-specific ministries tend to identify with their own ‘customers’ and take little interest in global objectives of society.