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Why the New Economy is a Learning Economy

by

Bengt-Åke Lundvall

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Bengt-Åke Lundvall

Department of Business Studies
Aalborg University
Fibigerstræde 4, 9220 Aalborg Ø
e-mail **bal@business.aau.dk**

Abstract
In this paper it is shown that the intense focus on the new economy reflected real change as well as 'hype'. The basic reason why new economy-growth could not be seen as sustainable is that introducing advanced technologies can only take place successfully when it is accompanied by organizational change and competence-building among employees. Any strategy that gives technology an independent role as problem-solver is doomed to fail. Danish data of a unique character are used to demonstrate that the key to economic performance is to promote learning at different levels of the economy. In the conclusion it is argued that there is a need for a new type of knowledge and learning oriented Keynesianism in order to get close to the kind of growth rates characterizing the high days of the new economy adventure in the US.

Key words: New economy, competences, knowledge

JEL Codes: O12, O31

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Introduction

One interesting difference among different social science disciplines is their respective willingness to recognize that 'a new era has arrived'. Historians are skeptical because they can always remember that what most of us see as new has been seen before. Economists belonging to the neoclassical mainstream school share this skepticism because they work with general tools and with tools that are not easily applied to qualitative change. Management theorists operating as consultants have the opposite interest – if they can convince customers that we have entered a new era they have also created a market for new management tools. In this paper, we will accept the idea of a new era as our working hypothesis. We will criticize the concept of the new economy for its simplistic understanding of what is going on but we share its basic assumption that the widened and deeper use of ICT represents a fundamental change in the economy and society.

When I started to work at OECD in 1992 I tried to convince the Secretary General (Jean Claude Paye) and his chief of staff (John Llewellyn) that ICT was bringing fundamental change into the working of the economy. I also argued that the OECD-economists no longer could allow themselves to neglect this fact and leave it to a handful of IT-experts in the organization to reflect upon its broader implications. To begin with, the response was skepticism until one day (as far as I remember it happened in 1994) they came back converted to 'the new economy' after a meeting in Washington with Alan Greenspan. Since then 'the new economy' has established itself at the very center of the OECD-discourse. The OECD-ministerial meetings in 2000 and 2001 both had 'economic growth in the new economy' as their major theme (OECD 2000; OECD 2001).

Here we will argue that it is useful to rethink the concept 'the new economy' in Chris Freeman's and Carlota Perez's analytical schemes as a shift in techno-economic paradigm (Perez 1983; Freeman and Perez 1984). Seen in this light the real challenge is much broader and more difficult than that signaled by the new economy. The important message is that today there is an enormous untapped growth potential that could be mobilized to solve social and economic problems if our societies in institutional reforms and organizational change that promote learning processes.

Defining the new economy

While Chris Freeman and Carlota Perez emphasize the difficulties with passing from one techno-economic paradigm to another, the new economy-discourse, as pushed by Alan Greenspan and others, emphasizes the productivity enhancing effects of ICT. The acceleration in productivity growth is assumed to lie behind a new kind of macroeconomic development where long term growth goes on undisturbed by inflation and uninterrupted by recessions. You might say that this is 'the end of history applied to macroeconomics'.

There is also the other side of the new economy discourse referring to a new family of firms whose characteristics are assumed to signal the future. These firms are typically producing Internet services or other advanced knowledge-intensive products and services. They have been presented as the 'role model' for all firms. Absence of trade unions, focus on stock options instead of wage increases, e-commerce instead of snail-commerce combined with the youthfulness of the entrepreneurs have been seen as elements signaling the future. The expectations about their future growth and profitability have certainly been 'irrationally exuberant'. They have been at the very core of the financial bubble in the US.

The two parallel discourses have reinforced each other not only as ideological messages but also in their interplay in the real economy. The macro discourse, and the laxity of monetary policy it allowed for, stimulated speculation in the stock market and directed the speculation toward 'new economy-stocks'. The increase in the value of NASDAQ-stocks tended, until the bubble burst, to bolster growth in demand from households.

ICT and productivity growth

One weakness with the macro discourse is that it has never been made quite clear how one jumps from the assumption of higher productivity growth at the micro level to the assumption of eternal stable growth. The 'transmission mechanism' has not been made explicit. Ceteris paribus, a speed up of productivity growth will certainly help to keep inflation down for a period. But in the long run the impact on inflation will certainly depend as much on the behavior of financial markets, firms, trade unions and raw material producers.

Further, there have been little discussion about the consequences of the fact that the productivity increase has been very unevenly distributed in the economy. If the productivity increase primarily takes place in sectors producing investment goods or consumer goods could, for instance, make a major difference for what kind of economic growth pattern we should expect.

To assume the effect from wider use of ICT to be more or less eternal stable growth may be characterized as 'economic political hybris' and Greenspan has certainly been one of those guilty preaching this sermon in the 90s. He did send out cautioning signals from time to time – as in December 1996 -when he warned against 'irrational exuberance' in stock markets. But these warnings were drowned in the optimistic signals he also sent out.

Another critical issue is if the assumptions regarding the positive productivity impact of ICT was at all to the point. Actually, a very different view can find support in historical and empirical analysis. Paul David has made one of the most important contribution to explaining the Solow-paradox – 'we see computers everywhere but in the productivity statistics'. At the 1990 OECD-seminar bringing together leading experts on technology and growth to debate the causes of the productivity slow-down he draw a parallel to the slow and uneven productivity impact of the diffusion of electricity in the industrial system (David 1991). He argued that the period of institutional and organizational adaptation always was long for a radically new technology.

The Danish experience

At about the same time as the OECD-conference (1990) I was involved in summarizing the results from the so-called PIKE-project where the objective was to explain *a fall in manufacturing productivity* 1984-86 in Denmark. We found the most prominent explanation of this extreme version of the Solow paradox at the firm level and it certainly had to do with the implementation of ICT. We found that firms that introduced ICT *without combining it with investments in the training of employees, with change in management and with change in work organization got a negative effect on productivity growth that lasted several years* (Gjerding et al 1992). These results were confirmed later on (with much more detail and precision) by the Danish Ministry of Business and Industry (Ministry of Business and Industry, 1996, pp. 94-99).

The alternative perspective indicated by Paul David's analysis and the Danish studies points into a very different direction than the new economy-hypothesis. Paradoxically it may be argued that *as*

long as the economy remains new it will be much more difficult to obtain productivity growth than in an old economy. In OECD-countries the highest rates of productivity growth ever were those registered in the 60s when the OECD economies already had moved far ahead on the Fordist scale intensive trajectory. The very maturity of the technologies used made the rapid growth of productivity possible.

The fact that in recent years high productivity rates have been registered predominantly within the sectors producing ICT reflects that *for these sectors the ICT is not representing a new but rather an old and well-established paradigm*. And, for Silicon Valley and some of the Asian NICs the absence of 'old economy'-sectors has been a key factor making it possible to rapidly transform the 'new economy' sectors from being 'new' to becoming 'old'.

This is one reason why it is adequate to call the current era for 'a learning economy' (Lundvall and Johnson 1994; Archibugi and Lundvall 2001). What is at stake is the capacity of people, organizations, networks and regions to learn. Learning to cope with and use the full potential of the new technologies is, in a sense, to transform them from being new to being old.

The OECD evidence of a new economy

Given this background it is not surprising that OECD has had great difficulties in finding evidence in growth and productivity data for the existence of a new economy. Out of 26 OECD countries there was an acceleration of growth only in a minority of 10 from the 80s to the 90s. Among these, the only big ones where the US and Canada and the increase in growth rates for these two countries were miniscule (OECD 2001, p.7). In 9 out of 17 listed countries 'multifactor productivity' accelerated. Again the increase in the US was very small. The UK and Spain experienced the most dramatic fall in multifactor productivity growth while the five countries with the most significant acceleration were Finland, Australia, Ireland, Canada, Sweden and Denmark (OECD 2001, p. 8).

It should also be considered that the US productivity data have been inflated by new statistical practices. The level of registered productivity growth in the US and elsewhere increasingly reflects attempts made to take *quality increases* into account. These 'corrections' are especially important when it comes to assess the real value of new generations of computers. Such corrections based on the concept of 'hedonic indexes' may be meaningful for consumer goods – the consumer may be willing to pay for extra capacity (big and rapid cars) even when they cannot use it (because of lack of parking space and because of speed limits) – consumers have the privilege to enjoy irrational pleasures. Their meaningfulness when the users are professional organizations is much more debatable. What makes a 'real difference' for professional users is the value of the computer in actual use. It is not obvious that an increased potential that cannot be realized because of lack of skills and old forms of organization should be taken into account as increasing the value of the product.

Beyond the hype?

The title of the 2001 OECD report is 'The new economy: Beyond the hype'. I find this rather misleading since 'the hype' has played a major role in shaping the actual dynamics of the new economy over the last couple of years especially in the US. It has certainly affected the kind of up-turn we have seen. And the 'hype' will play a role also in determining how difficult it will be to establish a new upswing after the bubble has burst.

A whole industry of media has been built around promoting popular shareholding and those working in this industry have a strong vested interest in promoting hype to the extreme. Business journals have produced enormous amounts of success stories. Ordinary people have got hooked on buying shares – some of them for the same reasons as they engage in gambling and lotteries. Naïve policy makers used young new economy-entrepreneurs as 'wise men' asking them to be their guides into the promising but uncertain e-future. Even sober social democrats in the Nordic countries have been captured by this hyping wave.

One major result of all this was the spectacular rise in high tech shares in the US as well as in Europe. In its turn this rise contributed to the illusion of rapidly growing wealth among households and created the basis for growth in private consumption and a reduction of savings ratios in the US. In this sense, the hype is one of the factors explaining the relative success of long term growth in the US. Without the hype growth rates would have been more modest.

Keynesianism for rich people?

When speculative bubbles burst in Asia or Latin America there is quick agreement in international financial institutions, such as the IMF that at the root of the problem are fundamental structural and institutional weaknesses that need to be corrected before any macroeconomic stimulation policy could be made effective. It is interesting to note that when there is a 'hype bubble' in the US no such critical insights are forthcoming. There is no request for 'structural reform'. Instead the burst of the bubble triggered strong demands for expansionary monetary policies and even for expansionary finance policy. This is actually the opposite of the cure that has been imposed upon Asian and Latin American bubble economies.

Another interesting aspect of the debate on macroeconomic policy is that while Keynes recommended expansionary policies primarily because he was worried about workers losing their jobs and ending in misery, the present concern is more with speculative capitalists losing some of their capital. When the bubble began to burst there was a queue of financial experts, normally quite critical to active government intervention, who asked for reductions in interest rates. In the financial pages increases in unemployment rates were actually welcomed since they signaled that it was possible to move ahead with more expansionary monetary and financial policies that might at the end give a boost in profits without causing inflation.

A question of dramatic importance is how far monetary policies are at all effective in a period characterized by a combination of extreme uncertainty and low inflation rates. When inflation is high there is ample room to get very low and even negative real interest rates. As the Japanese experience indicates, it is much more difficult to avoid the liquidity trap in a situation with deflation. It will therefore be interesting to see if the interest rate reductions in the US will result in the stimulation aimed at. A popular complement is to reduce taxes in order to give a financial stimulus to the economy. Again, the Japanese example gives rather limited ground for optimism regarding the effectiveness of such a policy. If uncertainty is strong both in the household sector and among investors the main result may be an increase in savings rather than an increase in effective demand.

This would leave us with classical Keynesian policy in the form of public investment. Building roads and bridges with public funds may have a real impact but the ideological unwillingness to expand public expenditures is strong. Perhaps the US promotion of the Star War program should be

seen as an alternative to building Keynesian Pyramids. The military meaningfulness is difficult to see when the potential for small-scale terrorism and biological warfare are considered. But, of course, it would give a complementary injection of effective demand for the now suffering high technology sectors. And in the US it might be easier to create a strong alliance around such a policy than one that focused on environmental or social problems.

The hype and the speculative bubble have resulted in a situation where old monetarist recipes tend to come into disrepute and where Keynesian ideas are taken aboard in the US. The European Bank with its loose connection to national government seems to be especially slow to adapt to the new reality. Also, in the more structural policy field Europe tends to misinterpret the reality of the new Economy in the US.

What about the US success?

One major argument for pushing for a neo-liberal model of the new economy and to call for 'structural reform' (meaning primarily a weakening of the protection of workers) has been the assumption that the US-economy performs better than the major European economies and Japan (it is neglected that the most successful countries in the nineties have been small and socially homogenous countries with strong welfare states and equal distributions of income). Therefore it is important to reflect upon how far the relative US-success in terms of high and stable growth reflects that its market dominated institutional set up is especially conducive to the effective use of ICT.

The major reason for slow growth in the UK in the 50s in terms of volume as well as productivity was, according to Kaldor, that it had emptied its reserves of labor in agriculture before the rest of Europe and Japan. I believe that ample access to labor on the supply side and Kaldorian dynamics may go a long way in explaining the non-inflationary US-growth in the 90s. On the demand side the major factor has been the unique position of the dollar and the US financial market. This unique position created the room for the expansionary demand policy that was over layered by the hype and the financial speculative dynamics.

On the supply side there have been factors making expansion possible without labor market bottle-necks. At the bottom of the skill pyramid, the easy access to a 'hidden' reserve of non-employed illegal immigrant workers has made non-inflationary expansion possible in the service sector. At the top of the skill pyramid, the unique position of the US-university system has attracted bright and hard working young people from all over the world to science and engineering studies. This has reduced the barriers for rapid growth of the ICT-producing sectors that have a higher than average growth in terms of both volume and productivity.

If this analysis is correct, the idea of using the US as 'a benchmark' for Europe implies much more ambitious policy strategies than those debated today in Europe. Stimulating more entrepreneurship, venture capital and numerical flexibility in the labor market will not challenge the US hegemony in the global financial system and it will not make the university system a competitive alternative to what US can offer today. If these challenges should be taken up the focus should be moved to the role of an emancipation of the European financial markets and university system. Much more ambitious and less ideological approaches to the European Bank and the European Research Area would be called for.

Back to the Solow paradox

In order to develop a 'no-regret' policy strategy where the potential of ICT is realized it is useful to. go back to the Solow-paradox and ask once again why the growth performance of 'the new economy' is so weak in spite of great and promising technological opportunities. The response would have to take into account the complexities reflected in the Perez-Freeman techno-economic paradigm analysis. It would call for a much more critical assessment than OECD has produced so far. OECD remains handicapped by its ideological prejudices in favor of private ownership, unregulated markets and against collective and solidarity-based solutions.

There are some minor openings in new direction in the OECD-reports but they tend to be drowned by the standard sermons. For instance 'getting fundamentals right' has in earlier documents only referred to macroeconomic stability while in the latest report it is referred to as 'fundamental economic and *social* stability' and in the ensuing analysis there are some considerations about distributional issues. But these considerations end up with references to the UK as a model and to its 'make work pay'-programs. The fact that the Nordic countries with their highly egalitarian societies come out as successes while the UK appears as the outstanding looser according to OECD's own ranking is not at all reflected in the policy recommendations.

The fact that the 'new economy'-discourse has been so strongly infiltrated by a general ideological pro-market and anti-government stance may actually be one reason why the Solow paradox will be valid also for the new communication and media technologies and for internet services. A more pragmatic approach would have recognized that collective initiatives and regulations are necessary to make sure that there is a certain quality in the content of what is distributed through the new media. The historical success of the radio and television might have been less impressive if service content had been left completely to private market competition.

Europe's next step

The degree of competition in telecommunication, ample access to venture capital and a culture of entrepreneurship have at EU-gatherings been seen as the envy of European countries but a more sober analytical effort should be made to see what their real long term impact upon economic growth is. Most policy prescriptions are double edged with negative side effects. For instance, there might be too much as well as too little individual entrepreneurship given the general institutional framework. When 'entrepreneurship' has become a holy cow in popular economic discourse it has as much to do with ideology as with concerns for economic growth and well-being.

More important than stimulating a great number of new firms that tend to disappear and primarily bring with them a temporary misallocation of resources – as illustrated by the many internet entrepreneurs who now have become unemployed or ordinary wage earners – is the transformation of existing organizations. This intuition was behind the ambitious title of the book 'Europe's next step' edited by Andreassen, Coriat, Hertzog and Kaplinsky (Andreassen et al 1995). Recent research in the IKE-group in Aalborg gives a unique opportunity to link organizational change at the workplace level and product innovation to job creation in the whole economy. For further information on the data and the project see (Lund and Gjerding 1996; Lund 1998; Lundvall 2002).

Employment development in static and dynamic firms

In what follows we will compare two the aggregate employment in two types of firms (see the box below for definitions). Dynamic firms are characterised by the fact that they combine more advanced organisational traits with market related innovations. The static firms are characterised by traditional form of organisation and low activity in terms of market related innovation. The firms have been characterised on the basis of data from 1993-95. To begin with we examine the ability of the two types of firms to create jobs during the period 1992-97.

Table 1. Employment in respectively dynamic and static firms 1992-97.

	Nov. 92	Nov. 94	Nov. 96	Nov. 97
Dynamic firms	70.227=100	103.5	103.5	106.6
Static firms	24.983=100	99.7	96.0	93.4
Entire DISKO subset	137.445=100	103.0	101.4	102.5

Source: Lundvall 2002, p.181.

Table 1 shows that firms that combine new forms of organisation with the introduction of new products 1993-95 create much more jobs than those that do neither. Between 1992 and 1997 there was a total gain of about 3400 jobs in the subset of all DISKO-firms. In the same period there was a gain of about 4.600 jobs in the dynamic firms and a loss of 1650 in the static firms in this period. Again it is worth noting that the divergence between the employment trends is modest to begin with but that it keeps growing as time goes by. This might reflect that radical change in technology and organisation has a positive impact on performance only after a period of organisational learning. The data show that the dynamic firms were much more successful in creating jobs than the static firms in Denmark in the 90s.

The data set also makes it possible to divide the work force into a core work force and a more loosely attached work force. Our criterion for belonging to the core is full-time continuous employment in the firm for more than one year and a maximum degree of unemployment of 15 per cent during the calendar year in question. The use of this criterion means that the 'more loosely attached' employees make up about one third of the DISKO subset for the year 1994.

Table 2. Share of core work force in dynamic and static firms 1994.

	Dynamic	**Static**	**All firms**
Share of core work force	66.8%	60.7%	64.3%

Source: Nielsen 1999, IDA data combined with DISKO survey.

Table 2 shows that the core work force makes up a larger percentage in the dynamic firms than in the average for all firms.

Thus it is characteristic, that the dynamic firms—the firms that have implemented extensive organizational and technical changes—have less pronounced cyclical variation in employment and that they have a larger core work force. To the extent that the share of the labor force employed in dynamic firms grows – and this is a tendency in Denmark both because more firms introduced new organisational traits and because the dynamic firms increase their employment - we should, everything equal, expect a certain reduction in the very high Danish labour market mobility. This would in itself function as a stabilizing factor in relation to the cyclical development in the entire economy.

Another important issue is to what extent the movement towards learning organisations tends to contribute to the polarisation in the labour market between skilled and unskilled workers. In order to analyse this issue it is relevant to take into account also the competition pressure. A strong transformation pressure may be expected to expose unskilled workers more than skilled workers. Therefore table 3 includes only unskilled workers divided in four groups reflecting the type of firm they belong to. Firms have been grouped according to how they have responded to question about the change in competition pressure they experienced 1993-95 and according to if they belong to the category of dynamic or static firms (Lundvall and Nielsen 1999).

Table 3. Employment of unskilled workers in dynamic and static firms 1992-97.

	Nov. 92	Nov. 94	Nov. 96	Nov. 97
Strongly increased competition				
Dynamic firms	16.500=100	100.3	96.9	102.1
Static firms	4.218=100	92.3	81.9	75.0
Somewhat increased or milder competition				
Dynamic firms	11.262=100	101.5	98.5	102.0
Static firms	5.862=100	99.3	97.0	93.5

Source: IDA data combined with DISKO survey.

Table 3 shows that the dynamic firms in the longer run (between 1992 and 1997) were able to compensate for the negative impact on employment of much stronger competition. The strongly exposed dynamic firms did as well as those less exposed for intensified competition. But most interesting, the table shows massive job losses (25% over five years) for unskilled workers in those firms exposed to much stronger competition that neither used new forms of organisation nor introduced new product. More highly developed organizational forms does not in itself make the unskilled workers more vulnerable. They are, however, vulnerable to strongly increased competition on their product markets. Unskilled workers that work in firms and industries strongly exposed to competition where the opportunities or ability to engage in change are limited are the ones most strongly at risk for losing their jobs. Policies aiming at promoting competition need thus

to be combined with policies enhancing the capability to innovate and introduce organisational change.

Box 1: The Disko-data and the distinction between static and dynamic firms

The data to be presented here emanates from a big project on the Danish innovation system – DISKO. In 1996 we made a survey addressed to 4000 firms in the private sector – services as well as manufacturing firms – and we got responses on technical innovation, organizational change and competence building from around 2000 firms. The questions focused especially on what kind of changes the firms had introduced in these areas in the period 1993-95.

Then we linked register data on employment for the same firms to the qualitative information1990-94. Recently we have been able to update the employment data for the survey firms until 1997. There are some technical difficulties involved since the surveys were addressed to 'firms' as legal units while the employment data refer to 'production units' that may constitute a part of a 'firm'. To solve this problem we linked the questionnaire addressed to a specific firm to the register data referring to the biggest of the production units belonging to the firm. Since we are considering change in employment rather than levels of employment this should not undermine the validity of the analysis.

On the basis of the survey data we developed a classification of firms in which we combined their degree of organizational development with their activity in terms of the development of products and markets. In this way, we could differentiate between firms that did not meet either demand (we characterize these as 'static' firms), those who met one of the two demands ('flexible' and 'innovative' firms, respectively) and finally those that met both demands (these we characterize as 'dynamic'). In the following discussion, in order to maintain a certain degree of clarity, we shall concentrate on comparing the two extremes—that is, the static and dynamic firms—with each other and with the average of all the firms in the survey.

The most important results from the DISKO-data analysis are:

- That firms introducing new products and new forms of organization characterized by functional flexibility (dynamic organizations) create more jobs than the average firms. The positive impact on employment works itself out over a period of 3 years.
- That dynamic organizations create more stable jobs (the core labour force is bigger)
- That both these results hold also for unskilled workers.
- That there are job losses for unskilled workers both in static and dynamic organizations but the massive job losses for this category of workers take place in those organizations exposed to intensified product competition that do not engage in technical innovation and organizational change.

These results tend to support the basic assumption behind 'Europe's Next Step' and they point to whole new set of policies that have much more to do with organizational change – establishing learning organizations – than with just accelerating the diffusion of information technology (Coriat 2001; Nyholm et al 2001). As long as Nasdaq was booming and everything beginning with 'e' was

believed to bring us into economic paradise it was not easy to get policy makers to listen to such a message but after the bursting of the bubble things might have changed somewhat.

Summing up

The current situation of extreme uncertainty can easily develop into global economic stagnation and the traditional stimulation policies might be either blocked by ideological and institutional barriers (the anti-inflation stance of the European Central Bank) or limited in impact because of the low inflation rates. In this situation it might be useful to start to thinking about a new kind of Keynesianism where public expenditures aim at upgrading human resources and promoting organizational change. The Danish data presented here indicates that the socio-economic rate of return on investments in adult training and organizational change is especially high in this period characterized by ample unexploited technological opportunities. Therefore what has been assumed to be 'a new economy' should rather be seen as an era where the demand for a new type of economic policy is especially strong. To agree on defining and the implementing such a new type of economic policy will probably prove to be as difficult as it was in the 1930s.

Bibliography

Archibugi, D. and Lundvall, B.-Å. (Eds) (2001), *Europe in the Globalizing Learning Economy*, Oxford University Press.

Coriat, B. (2001), 'Organizational innovation in European firms: A critical overview of the survey evidence', in Archibugi, D. and B.-Å. Lundvall (eds.), *The Globalizing Learning Economy*, Guildford and King's Lynn: Oxford University Press, 195-218.

Freeman, C. and Perez, C. (1984) 'Long waves and new technology', *Nordisk Tidsskrift for Politisk Ekonomi*, 17: 5-14.

Lund, R. (1998), 'Organizational and innovative flexibility mechanisms and their impact upon organizational effectiveness', *DRUID Working Paper* 98 (23), Department of Business Studies, Aalborg: Aalborg University.

Lund, R. and A.N. Gjerding (1996), 'The flexible company, innovation, work organisation and human resource management', *DRUID Working Paper* 96 (17), Department of Business Studies, Aalborg: Aalborg University.

Lundvall, B.-Å.(2002), Innovation, growth and social cohesion: The Danish model,Cheltenham, Elgar Publishers.

Lundvall, B.-Å and B. Johnson (1994), 'The learning economy', *Journal of Industry Studies*, Vol. 1, No. 2, December 1994, 23-42.

Lundvall, B.-Å. and P. Nielsen (1999), 'Competition and transformation in the learning economy – the Danish case', *Revue d'Economie Industrielle* 88, 67-90.

Ministry of Business and Industry (1996), *Technological and organisational change*, The OECD Jobs Strategy, Country Report, Denmark, Copenhagen: Ministry of Business and Industry.

Nyholm, J., L. Normann, C. Frelle-Petersen, M. Riis and P. Torstensen (2001), 'Innovation policy in the knowledge based economy: Can theory guide policy-making?', in Archebugi, D. and B.-Å. Lundvall (eds.), *The Globalizing Learning Economy*, Guildford and King's Lynn: Oxford University Press, pp. 253-272.

OECD (2000), *A new economy; the changing role of innovation and information technology in growth*, Paris: OECD.

OECD (2001), *The new economy: Beyond the hype, Final report on the OECD growth project*, Paris: OECD.

Perez, C. (1983) 'Structural change and the assimilation of new technologies in the economic and social system', *Futures* 15: 357-75