

**Increased flexibility, innovativeness and human
resource development as a response to increased
competition**

Bengt-Åke Lundvall
Poul Thøis Madsen
Frank Skov Kristensen
DISKO-project
Department of Business Studies

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Summary

During the last couple of years an intensification of competition has forced many Danish firms to introduce organisational forms which promote flexibility and innovative capability. These firms have moved toward forms of organisation which include job rotation and integration of functions. This has been accompanied by changes in the content of work and in the demand for qualifications. The firms which register a sharper competition increase their demand for all kinds of skills but especially for skills having to do with responsibility and autonomy on the one hand and capability to co-operate and communicate inside and outside of the firm on the other hand.

The firms reporting strongly intensified competition experience a reduction in routine work and a decrease in the degree of specialisation of skills and functions. They invest somewhat more strongly in human resources but the differences in this respect are less marked than when firms are asked about their demand for skills. Other major impacts of intensified competition are respectively the increase in the proneness to develop and introduce new products and respectively a closer co-operation with customers and sub-contractors.

The analysis has implications both for economic policy and economic theory and it gives rise to a number of research questions to be answered in the future work of the DISKO modules. In policy terms the analysis points to the need to combine competition policy and policies to promote flexibility and innovativeness with policies focusing on human resource development. In terms of economic theory the analysis points to the relevance of a Dahménian evolutionary perspective where the transformation pressure affects different developments blocks differently. So far, the results give strong support to the hypothesis that the economy has entered a new phase of economic development which can be characterised as a 'learning economy' (Lundvall&Johnson, 1994, and Foray&Lundvall, 1996).

Intensified competition and the search for increased flexibility and innovativity

Bengt-Åke Lundvall
Poul Thøis Madsen
Frank Skov Kristensen

Introduction

A classical theme in industrial economics is the possible trade off between static efficiency and innovative capability. To a certain degree this discussion has its roots in Schumpeter's late contributions on big firms as being the most efficient in promoting science-based innovation. The idea that a high degree of industrial concentration tends to promote innovation was stated most strongly by Galbraith. The debate was later followed up by a multitude of empirical tests of RD-intensity in firms of different size. The main result of these studies was that R&D-intensity was growing with size until an upper limit were the intensity started to fall again. Many of these studies addressed the issue of innovation and competition only indirectly since the connections between size and market concentration and between R&D-intensity and innovative activity are at best indirect.

Recent contributions in this field can be grouped into two categories. On the one hand, Schumpeterian oriented economists (such as for instance Dosi, Malerba, Nelson and Winter) have insisted on the fact that there is a two-way relationship between innovation and competition. They typically work with models where both innovative activities and industrial structures are treated as outcomes of evolutionary processes.

On the other hand some economists with neo-classical roots (such as Geroski) have tried to test directly if innovations are positively or negatively correlated with high degrees of market control. His results are that the intensity of competition on average has a positive impact on innovation but that technological opportunity might be a more important factor than the competition regime. Actually, his analysis confirms that the relationships between innovation and competition goes both ways.

In what follows we will tackle the issue of competition and innovation in a different way. First, the empirical analysis is based on survey data. Second, we focus on changes in the intensity of competition. Third, we relate these changes to organisational change as a way to obtain a higher degree both of flexibility and innovativity. In what follows we will give some brief reflections on these peculiarities.

Competition, innovation and flexibility

Innovation is not the only important aspect of dynamic economic performance. Among economists close to the realities of business it has been generally accepted that the last decade has given a competitive advantage to firms with a high degree of *flexibility* when it comes to react to an increasingly turbulent environment. In the present context we are going to analyse how the change in the competitive pressure relates to changes in terms of both flexibility and innovativeness.

It is important to note that the emphasis is on change. Actually, it might be argued that an analysis which focuses on changes in the intensity of competition is more relevant for policy issues than an analysis comparing the intensity of competition across sectors (or their structural characteristics in terms of concentration ratios) at a given point in time. The fact that sectors characterised by intense competition perform well is no guarantee that an *increase* in the intensity of competition will lead to an improvement in performance in sectors which have been sheltered from competition.

This focus on change and industrial transformation has precedents in the tradition of Nordic economists. The major Swedish Schumpeterian economist Erik Dahmén has developed an original and unique analytical model where he analyses how different 'blocks of development' react differently when confronted with a stronger pressure for change (Dahmén, 1988). His historical analysis shows, for instance, that one and the same development block may be characterised with a positive potential for transformation in one historical period and with a negative in another. The analysis pursued below may be regarded as a first step toward developing a Dahménian perspective on Danish industrial development in the 90's.

The analysis, presented here, is so far based mainly on data from the DISKO firm survey on organisational change and innovation but it will as far as possible be supplemented with register data reflecting the pressure of competition and its change over time. Especially interesting will it be to link the survey data to the so-called IDA-data on employment dynamics and the demand for skilled and unskilled labour. The survey data demonstrate that firms meeting a stronger competition tend to move towards more flexible and innovative forms of organisation. The data also indicate a strong correlation between increasing competition in a sector and a movement towards a more skill-biased recruitment of personnel.

This relationships can be tested more directly when IDA-data are linked to the survey data.

Caveats

There are a number of caveats to be made in this context. The most important has to do with the direction of causality. Third factors such as for instance the richness of the pool of technological opportunities may be driving innovation as well as intensifying competition.

A second point has to do with the kind of innovations captured by our questionnaire. Since the majority of all firms indicate that they introduce product innovations it is safe to say that the majority of these innovations are incremental rather than radical technological break-throughs. This should be kept in mind when comparing the results with other studies where the focus is on more important and science-based innovations. At the same time it is important to note that for a small and open economy as the Danish where most of the new technologies will be developed abroad and then adopted and adjusted to local needs these incremental forms of change might be the most important for long-term competitiveness.

A third point to be made is that we can capture the changes provoked in the surviving firms but not to what degree the increasing pressure of competition has resulted in firms closing down. This is important because it must be taken into account before jumping to normative conclusions. An important next step is to combine the analysis with IDA-data in order to see employment developments in the different sectors.

Fourthly, the analysis should be supplemented by register data which are indicators for the pressure of competition and its change over time in different parts of the economy. Ideally such data should be presented at a very disaggregated level so that the common traits of well defined product markets were captured. Such data do not exist as register data and the number of responses in our survey, even if high as compared to many other studies, set a limit to how far we can go in terms of disaggregation before the number of observations in each category gets too small for analysis.

Most firms report increased competition pressure

Of all firms (1869 firms) 40% report that the competition pressure has been strongly increased in the last couple of years (these will be referred to as *C-firms*), 33% that it has increased somewhat (these will be referred to as *A-firms*) while only 24% report no change or a milder competition pressure (these we refer to as *S-*

firms) and 3% report that they do not know. It could be argued that the high average positive response on this question should not be taken too seriously since firms might have a general tendency to report intensified competition (as farmers' tend to complain about the weather).

Still the responses can be used for analytical purposes if they reflect real differences between firms and across sectors (if farmers from the regions where the weather was worse complain the most). A break-down to the most disaggregated level (111 sectors) and an inspection of the data at this level shows that at least for the sectors where you have supplementary information the response pattern makes sense. The reported intensification of competition is at its lowest for firms belonging to the construction sectors and this is compatible with the fact that these are sectors where the average rate of return has been continuously growing during the first half of the 90s (Erhvervsredegørelsen 1996, p.399). Intensified competition is reported most frequently in the traditional, labour intensive and import-intensive manufacturing product areas such as clothing and textiles as well as in the production of telecommunication components. The first type of sectors is obviously sensitive to international competition and the Danish currency revaluation may be one major factor behind intensified competition while telecommunication components is one of the areas where a decisive effort has been made to deregulate in order to increase competition (Erhvervsredegørelsen 1996, p. 300).

As we get more detailed and more up-to-date register data on market structure and rates of return it will be possible to make more systematic tests of the reliability of the responses on intensification of competition. It would also be quite useful to get a clearer picture of which are the factors that may cause an intensification of competition. Among these are certainly the international competition, including new entrants from the Far East as well as exchange rate movements. Another factor might be the entrance of new major players in services areas such as banking, insurance etc. Privatisation of public sector activities and deregulation of private activities may dramatically change the competition pressure for sectors which have so far been rather sheltered in this respect.

Competition pressure and organisational change

Firms experiencing a much stronger competition pressure (*C-firms*) do introduce organisational change at a much higher rate than those which do not register any change or even respond that competition

has been weakened through the last couple of years (*S-firms*). The firms in between (*A-firms*) which report some increase in the rate of competition position themselves in between the two groups.

Table 1: Proportion of firms responding positively to the following question: 'Has the firm carried through important organisational changes during the period 1993-95?'

N=1869	C-firms	A-firms	S-firms	All-firm
Yes	63.53%	54.26%	31.29%	52.27%
	122	104	60	100

Source: Question 1 in The Disko survey on organisation and qualifications at the firm level.

Table 1 confirms that there is a strong positive relationship between intensified competition and the proneness to introduce organisational change. The proportion of firms introducing organisational change is double as high in the firms experiencing a strong intensification as it is in the S-firms which did not report any increase in the intensity of competition.

The objective of introducing organisational change in the C-firms

The fact that firms introduce organisational change more frequently when facing an intensification of competition does not tell us in which direction they change the organisation. It might be a defensive change cutting down employment and focusing on production efficiency or a change towards a more flexible and innovative organisation. In the questionnaire we asked firms which had introduced organisational change about their objectives to do so. Here we shall analyse if there are any differences in these respects between the three categories of firms. In table 2 we have constructed a simple index showing how the response 'to a high degree' deviates from the average of the whole population of firms which have introduced organisational change (977 firms).

Table 2: Proportion of firms responding high extent to the following question: 'Have the organisational changes primarily had as their objective to strengthen:'

N=977	C-firms	A-firms	S-firms	All-firm
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The effectiveness of daily work	69.07% 109	59.21% 93	56.52% 89	63.36% 100
The ability to adapt to more turbulent surroundings	59.96% 122	42.30% 86	31.16% 63	49.33% 100
The ability continuously to develop new products and services	34.75% 120	26.89% 93	14.49% 50	28.86% 100
	N=472	N=331	N=138	

Source: Questions 2 a, c and d in The Disko survey on organisation and qualifications at the firm level.

Table 2 shows that a large proportion of all firms (63%) give a high priority to obtaining a higher degree of efficiency in daily operations as a motive for organisational change. This does not single out the C-firms so strongly from the rest, however, as do the objectives of adaptability and innovativeness. It is interesting to note that the group of firms meeting a stronger competition tends to focus both on flexibility and innovativeness. Some firms in this group will try to obtain both at the same time while others might put the major emphasis more strongly on one of the two objectives. (When comparing the organisational characteristics for firms emphasising respectively innovativeness and flexibility firms turned out to be quite similar but distinct from firms only emphasising everyday efficiency as an objective).

In what direction do the C-firms change their organisation?

In the survey, firms were asked if they had expanded the use of certain practices and organisational techniques. Here we shall compare the C-firms with the rest of the firms concerning the direction of change. This is illustrated in table 3.

Table 3 Proportion of firms responding 'yes' to the following question: 'Has the firm extended its use of the following organisational traits during the period 1993-95?'

	C-firms	A-firms	S-firms	All-firm
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Delegation of responsibility	63.25% 111	58.36% 102	46.48% 81	57.23% (N=1653)
Cross occupational working groups	55.38% 106	55.75% 107	43.39% 83	52.19% (N=1029)
Quality circles/groups	51.78% 108	48.56% 101	42.51% 89	47.93% (N=845)
Integration of functions (e.g. sales production/service, finance)	51.98% 113	48.40% 105	31.97% 70	45.91% (N=1222)
Wages based upon quality and results (not piece time wage)	43.62% 102	45.99% 108	36.88% 86	42.69% (N=855)
Job rotation	46.84% 112	45.14% 107	27.40% 65	42.00% (N=781)
Systems for the collection of proposals from employees	48.38% 118	36.89% 90	34.07% 83	41.10% (N=978)

Source: Questions 8 a-g first part in The Disko survey on organisation and qualifications at the firm level. N refers to the total number of responses to the question. N varies because the questions are addressed only to the firms which have introduced the practice in question before or after the period referred to.

Table 3 shows that in general the C-firms are more prone to introduce all the different new forms of organisational techniques than the S firms. It is interesting to note that the difference is especially marked when it comes to the use of job rotation and the integration of functions. These are some of the core characteristics of the flexible and innovative organisation. The analysis reinforces the hypothesis that increased competition drives firms toward more flexible forms of organisation. (The fact that wage systems based on quality does not follow the usual pattern in its ordering between the C- and the A-firms is in a sense comforting because it shows that there is no automaticity in the results.)

Competition and innovation

How about the impact on innovation? In the questionnaire firms were asked if they had introduced new products or services in the period 1993-95 disregarding minor improvements of existing products. More than half of the firms signalled that they had introduced new products and given the character of the whole population this indicates, as already mentioned, that many of the innovations referred to are minor and incremental rather than major and radical.

In tabel 4 we can see how the C-firms behave with respect to product innovation as compared to the other two categories.

Table 4: Proportion of firms responding 'yes' to the following question: 'Has the firm introduced new products/services during the period 1993-95 when excepting minor improvements of existing products?'

N=1869	C-firm	A-firms	S-firms	All firms
New. prod	63.66%	55.74%	30.39%	51.69%
	123	108	59	100

Source: Questions 20 in The Disko survey on organisation and qualifications at the firm level.

Table 4 demonstrates that the firms experiencing an intensified competition are much more prone to develop new products. As indicated in the introduction to this section this might reflect that rich technological opportunities has a positive effect both on the intensity of competition and the rate of innovation. Even so it is difficult to avoid the conclusion that there is a positive causal relationship going from changes in the intensity of competition to the innovativeness of firms. To innovate is one major way of reducing the pressure on profits emanating from increased competition.

The change in the content of work

In the questionnaire a series of questions refers to changes in the content of work and in demand for skills. In what follows we will compare the C-firms with the other firms in this respect. The basic assumption is that the observed shift in the demand in the direction of more skilled personnel reflects an acceleration in the rate of change and a sharpening of competition.

Table 5 shows an interesting pattern regarding the change in the content of work. First, in general there is an increase in work tasks which are demanding in terms of work related qualifications.

Table 5: Proportion of firms responding 'more' and 'less' to the following question: 'Has the content of work changed for the employees during the period 1993-95 regarding:'

Work cont.	C-firms	A-firms	S-firms	All firms
1. Work autonomy	63.93	57.70	41.40	55.38
	3.10	4.10	3.40	3.48
	130	89	78	100

2. Co-operation with management	56.93	49.02	31.97	47.30
	5.38	5.08	4.54	5.19
	116	106	77	100
3. Occupational qualifications	52.76	49.51	34.92	46.71
	6.73	6.72	5.22	6.42
	107	101	92	100
4. Co-operation with colleagues	53.03	46.23	27.89	43.71
	4.98	6.07	3.63	5.24
	128	91	92	100
5. Contact to customers	49.39	41.97	29.02	40.98
	4.31	5.08	2.49	4.17
	117	84	119	100
6. Specialisation	32.71	29.84	27.89	30.18
	19.11	14.75	7.71	14.61
	83	98	175	100
7. Contact so sub-contractors	34.72	26.23	17.46	27.02
	5.52	6.39	5.22	5.72
	133	87	71	100
8. Contact to other firms	24.09	19.02	13.15	19.37
	5.52	4.59	4.31	4.92
	111	105	77	100
9. Routine content of work	6.33	6.07	9.30	6.85
	34.72	32.79	16.55	29.87
	79	81	245	100

Source: Questions 20 in The Disko survey on organisation and qualifications at the firm level. The index combines differences between proportions indicating more with differences indicating less in each category. For instance a value of 133 for C-firms regarding contact to sub-contractors is obtained by dividing 34.72/27.02 by 5.52/5.72 and multiplying it by 100.

But even more important for the whole population is general qualifications such as autonomy and co-operation with management. None of these are the factors which distinguish the C-firms from the rest most clearly, however. C-firms stand out as characterised by a much stronger reduction in the demand for routine work and more and more of their tasks relate to communication inside and outside the firm. Also, in many C-firms the need for specialisation is reduced. Together this gives a picture of a change in the work process where a more dynamic environment puts a premium on the capability to absorb change and to interact with others in coping with change. In this context individual experts who are not prepared to adapt to new conditions and to communicate with peers with different kinds of expertise

will not be very useful. The focus is on learning rather than on knowledge-intensity in specific fields.

The change in the demand for skills in the C-firms

In the survey firms were explicitly asked about the change in demand for skill during the period 1993-95 in four dimensions: Vocational qualifications, ability to co-operate and communicate, ability to readjust to change and, finally, responsibility and quality consciousness.

Table 6: Proportion of firms responding 'larger' to the following question: 'Has the firm changed the demands when recruiting employees during the period 1993-95 Regarding:'

N=1869	C-firms	A-firms	S-firms	All firms
Responsibility and quality consciousness	72.14 117	65.57 106	42.40 69	61.80 100
Ability to readjustment	63.66 122	54.59 105	32.43 62	52.06 100
Ability of co-operation and communication	62.05 121	54.43 106	31.75 62	51.15 100
Vocational qualifications	56.39 123	45.74 99	31.07 68	46.01 100

Source: Questions 13 a-d in The Disko survey on organisation and qualifications at the firm level.

As can be seen from table 6 the factors came out in the opposite order when we asked firms if the specific kind of qualification had got a larger importance. Table 6 shows that for the whole population there is a strong increase in the demand especially for general competences in terms of responsibility, flexibility and capability to communicate for the whole population. It also shows that the more strongly firms have experienced increased competition the more prone they are to point to a need for more qualifications in all these respects. The intensity in the increase of the demand for the C-firms is especially strong in relation to more flexibility and more emphasis on communicative abilities. This pattern of response gives strong support to the hypothesis that intensified competition is a major force behind a shift of demand for labour toward more skilled workers and especially toward a

workforce which can adapt to a rapidly changing environment by being responsible, able to communicate and co-operate. ¹

Driving forces behind the change in the content of work

Table 7 is an attempt to determine what are the forces which drive the change in the content of work. Are the driving forces different for the C-firms as compared to the average?

Table 7: Proportion of firms responding 'high extent' to the following question: 'To which degree have the following conditions contributed to changes in work content of the employees during the period 1993-95?'

N=1869	C-firms	A-firms	S-firms	All firms
1. Sharper Competition	54.24 180	18.52 61	9.30 31	30.2 100
2. Introduction of new technology	37.55 134	26.39 94	17.91 64	28.1 100
3. Need for better contacts with customers.	35.13 149	18.52 78	12.70 54	23.6 100
4. Better possibilities for development of new products or services	18.98 146	9.67 74	7.94 61	13.0 100
5. Need for better contacts with sub-contractors	16.15 166	7.05 73	4.08 42	9.7 100
6. Demands and wishes from the Employees	13.19 136	7.54 78	6.58 68	9.7 100

Source: Questions 11 a., b, c, e, f, and h in The Disko survey on organisation and qualifications at the firm level. Questions d and g were excluded from the analysis because they can not easily be treated as causal factors on par with the rest of the factors.

Table 7 shows that for the whole population of firms intensified competition is the single most important factor affecting the content of work. This supports strongly our analytical perspective. New technological opportunities both in terms of process technology and in terms of a greater potential for new products are also important

¹ The fact that the shift in the demand for labour is not mainly for more skilled people but rather for workers with a high learning capability is emphasised in the recent OECD analysis of Technology, productivity and job creation, where it is stated that '...technical change is less biased against certain types of skills than against the inability to learn.' (OECD 1996, p. 9).

factors in affecting the content of work and so is the need for a closer interaction with customers.

That the C-firms stand out in their emphasis they give to intensified competition can be taken as a confirmation of a high degree of consistency in the response patterns of the interview persons. But also when it comes to all the other factors the C-firms are much more prone to point them out as being of major importance. The over all picture is one where new technology and more turbulent markets go hand in hand with and reinforce the dominant factor which is intensified competition in reshaping the content of work.

There is a stronger emphasis on increased possibilities to develop new products in the C-firms and this gives some support to the proposition that increased technological opportunities promote competition. But still only 19% of the C-firms point to this as a major factor. More important for the C-firms is new process technology which is referred to by almost 40%. These data do not support an interpretation where the intensification of competition is regarded as caused mainly by increased technological opportunities. Especially in a small open economy it is reasonable to assume that the intensity of competition tends to be exogenously rather than endogenously determined.

Do C-firms give a high priority to investments in human resources?

Given the emphasis given to changes in the content of work and in the demand for skills in the C-firms it is interesting to analyse how and to what extent C-firms engage in human resource development. Table 8 presents the proportion of firms which say that skill development is of decisive importance. It shows a marked difference between the C-firms and the rest.

There is a very strong connection between the need felt for continuous training and intensified competition. This result is compatible with the hypothesis of the learning economy where it is assumed that an acceleration in the rate of change intensifies competition and makes the capability to learn at the level of the firm and the individual the key factor in determining competitiveness.

Table 8: Proportion of firms responding 'Decisive' to the following question: 'How important is it for the firm's competitiveness that the employees continuously develop their skills?'

n=1869	C-firms	A-firms	S-firms	All firms
Decisive	38.49	25.25	17.46	28.30
	136	89	62	100

Source: Question 14 in The Disko survey on organisation and qualifications at the firm level.

We can also analyse how C-firms prioritise different ways of increasing the skills of the employees. In Table 9 the alternative modes have been ordered after the priority given to them by the whole population of firms.

Table 9: Proportion of firms responding 'Great' to the following question: 'How great importance do the following conditions have for the management's efforts to secure that the employees continuously develop their skills?'

n=1729	C-firms	A-firms	S-firms	All firms
By solving working tasks	55.21	46.10	42.33	48.64
	114	95	87	
By giving time for sparring with management/other employees	32.95	22.88	22.22	26.60
	124	86	84	
By prompting co-operation and network across divisions and groups	31.95	24.75	20.11	26.14
	122	95	77	
By organising the work in teams	29.67	22.54	21.59	24.81
	120	91	87	
By educational activities tailored to the firm's needs	27.10	24.41	22.49	24.75
	109	99	91	
By long-term educational planning	22.54	17.46	12.17	18.22
	124	96	67	
By standard courses	13.27	11.86	7.94	11.68
	114	102	68	
By planned job rotation	9.27	5.59	5.82	7.11
	130	79	82	

Source: Question 15 a-h in The Disko survey on organisation and qualifications at the firm level.

Table 9 shows that informal forms of competence building (learning-by-doing, team-working, sparring with management etc.) are more frequently emphasised by all firms than separate courses (tailor made courses or standard courses). It is interesting to note that the C-firms emphasise all forms of training more strongly than the rest but that the difference is the least when it comes to the more formalised forms of training. This indicates the importance of building a 'learning organisation' when confronted with intensified competition. Some of the more demanding measures such as planned job rotation and long term educational planning which are only mentioned by a small minority of all firms are quoted much more frequently by the C-firms.

How much do C-firms actually invest in education and training?

An interesting question is if the very strong emphasis on continuous training among the C-firms is reflected in the actual efforts made by these firms to invest in human resources. The fact that they experience a more intensified competition may by itself put strict limits on the budgets which can be allocated to education and training even if the need was fully realised in the firm.

In tabel 10 we have presented results for those of the firms which introduced organisational change in the period 1993-95 regarding if they did combine organisational change with specific efforts to train and educate employees. Are the firms driven to change their organisation by intensified competition more or less prone to invest in training as compared to firms introducing organisational change for other reasons?

Table 10: Proportion of firms responding 'yes' to the following question: 'Have any of the employees got education/continuous education as a consequence of organisational change?'

n=977	C-firms	A-firms	S-firms	All firms
Yes	63.77	58.31	51.45	59.26
	108	98	87	100

Source: Question 3 in The Disko survey on organisation and qualifications at the firm level.

There is some tendency that the firms which introduce organisational change under the pressure of intensified competition are more prone to combine organisational change with education and training than the rest. But the tendency is not as strong as the

indicated change in demand for skills among the C-firms. As mentioned above the fact that C-firms are coming under intensified competition and therefore confronted by more narrow budget restraints might be a factor which delimit their capability to invest in human resources as compared to the needs they experience. But it might also be a reflection of the fact that C-firms have been more successful in establishing 'learning organisations'.

Table 11 shows the proportion of all firms - not only those which have introduced organisational change - in the different groups which have had more than half of their total workforce in some kind of formal training for the years 1995-96.

Table 11: Proportion of firms responding 'More than half' to the following question: 'How large part of the firm's employees has taken part in internal or external course or educational schemes in 1995 or 1996?'

n=1869	C-firms	A-firms	S-firms	All firms
More than half	42.40	44.75	29.02	39.49
	107	113	73	100

Source: Question 16 in The Disko survey on organisation and qualifications at the firm level.

Table 11 shows that firms experiencing more intense competition are more prone to give access to education and training but the differences are less systematic and clear than those registered in for instance table 8 above where firms were asked to indicate the priority they give to continuous development of skills.

Table 12: Proportion of firms responding 'More than 5 days' to the following question: 'On average how many working days per year do various employee groups use for education?'

n=1609	C-firms	A-firms	S-firms	All firms
Top management	37.57	34.85	25.44	33.56
	112	104	76	100
Middle management	39.31	39.93	29.53	37.02
	106	108	80	100
Workers	27.50	26.32	20.47	25.47
	108	103	80	100

Source: Question 18 in The Disko survey on organisation and qualifications at the firm level.

Table 12 shows the same pattern as table 11. For all categories of personnel the C-firms tend to allocate more time to education and training than the average firm but the differences to the A-firms are small. The difference is most clear for training of management itself but even here differences are not dramatic.

There are two possible interpretations which are compatible with the patterns observed in the last sections of this chapter. One is that there might be some underinvestment in education and training especially in the C-firms when confronted with the needs. An alternative interpretation is that C-firms on average have been successful in their efforts to build 'learning organisations' where new competences and qualifications are built through the everyday activities making the need for formal training less strong. This is an important issue which can be tackled in the case-studies.

Cooperation and competition

Intensified competition implies an environment which is changing rapidly and markets which are demanding both in terms of rapid response and in terms of new products. In such a context there might be a strong pressure to develop network relationships with customers, subcontractors and other organisations. In table 13 and 14 we have showed how the C-firms change their relationships to different actors. In table 13 firms responding 'high extent' when it comes to establish closer co-operation has been sorted out and here the focus is on the two partners most often referred to by the firms: Customers and subcontractors.

Table 13 Proportion of firms responding 'high extent' to the question 'To which extent has the firm developed a closer co-operation with the following actors during the period 1993-95?'

n=1869	C-firms	A-firms	S-firms	All firms
Customers	54.10 147	29.51 80	20.41 56	36.70 100
Sub-contractors	29.61 145	15.57 76	12.47 61	20.39 100

Source: Questions 26 a and b in The Disko survey on organisation and qualifications at the firm level.

Table 13 indicates a very strong relationship between the intensity of competition and the intensity of co-operation between firms. Increased competition goes together with an increase in the

intensity of cooperation especially with customers and sub-contractors. This is not trivial and it raises important analytical and policy issues. How can firms which increasingly base their competitiveness on competence and skills protect their knowledge-base while entering into close network relationships.

Table 14: Proportion of firms responding 'High extent' or 'Some extent' to the question: 'To which extent has the firm developed a closer co-operation with the following actors during the period 1993-95?'

n=1869	C-firms	A-firms	S-firms	All firms
Customers	90.57 112	85.25 105	63.04 78	81.11 100
Sub-contractors	70.39 114	63.11 102	34.8 56	61.64 100
Educational institutions	30.69 118	28.20 108	15.87 61	26.06 100
Consultants	23.83 107	25.91 116	15.64 70	22.31 100
Public Authorities	22.07 114	19.34 100	15.19 79	19.31 100
Knowledge centres such as universities and technological institutes	18.30 115	17.2 108	10.65 67	15.95 100

Source: Question 26 a-f in The Disko survey on organisation and qualifications at the firm level.

Table 14 extends the analysis to other actors which are less frequently referred to and includes responses saying 'some extent' to the question about increased co-operation. In all categories the C-firms are more prone to establish closer co-operation than the average firm. It is interesting to note that the differences are greatest for 'Educational institutions' and for 'Knowledge centres such as universities and technological institutes'. This indicates that in a long term dynamic perspective their role might be more important than what is indicated by average data for the whole population on the relationships between firms and such institutions.

These data and the observations made earlier indicate that the intensification of competition triggers simultaneously a wave of organisational change within the firm, product innovations and stronger linkages and more communication especially with users and subcontractors. In earlier work we have pointed to the close connection between user-producer interaction and product

innovation (Lundvall, 1988 and Lundvall (ed.), 1992) and argued that these micro relationships are among the most critical in constituting separate national systems of innovation. The analysis pursued here gives a strong impetus to move ahead with the analysis of inter-firm relationships and product innovation planned to take place in module 2.

Conclusions

We have already referred to a number of important implications of the results reported in this chapter. Here we shall focus on the interpretation of organisational change as a process and a policy issue.

The analysis shows that organisational change is promoted by an intensification of competition and that the resulting move is one towards a more learning organisation where there is less room for routine work and rigid interdivisional splits. One outcome is a stronger demand for skilled labour and for continuous upgrading of human resources.

The triggering role of competition has several interesting implications:

- for firms which live a life sheltered from competition it is not self-evident that a move toward a flexible and innovative form of organisation is attractive or necessary.
- there is no reason why firms which have adopted a flexible and innovative organisation should be more successful in terms of the private rate of return since firms following more traditional organisational trajectories on average are less exposed to competition.²
- there might be an under-investment in human resource development especially in the C-firms experiencing most strongly the intensification of competition.
- everything equal, intensification of competition reinforces the polarisation of the labour market affecting the relative position of the less skilled employees negatively.

² This is probably part of the explanation of why the analysis made by the Danish Technological Institute shows a good performance (measured as an increase in profits) for the least dynamic firms (Erhvervsfremme Styrelsen 1996, pp.33 et passim). It would be interesting to introduce variables reflecting the regime of competition and changes in the intensity of competition in the analysis to see if this changes the picture.

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- to strengthen the capability to learn of all parts of the work force and especially of the least skilled becomes of critical importance to avoid polarisation.
 - to design incentives which make it attractive to firms, and especially for C-firms, to engage in upgrading the skills of the least skilled parts of the workforce may be the key problem for policy makers.

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