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The flexible company
Innovation, work organisation and
human ressource management

by
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Abstract
This paper analyses the DISKO survey data on 1,900 firms within the Danish private business sector in terms of an index which classifies the surveyed firms according to smaller and higher degrees of flexibility. The classification reveals a number of important differences between more or less flexible firms. The more flexible firms tend to combine technical and organisational innovation to a larger extent than the less flexible firms and consequently are more inclined to employ new work organisation principles based on the delegation of authority, intrafirm horisontal and vertical integration, and the development of human resources. Similarly, the more flexible firms exhibit a larger inclination to extend their extraorganisational cooperative relationships. Finally, there is a strong positive correlation between increasing degrees of flexibility and increasing firm size, measured in terms of full-time employees.

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Keywords
Organisational learning, innovation, flexibility

JEL classification
D83, L2, M10, O30

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Contents

1. Introduction

The present paper presents some of the results from a Danish survey on organisational and technical innovation in 1,900 Danish private business firms. The survey is part of a larger project on the Danish national system of innovation[1], coordinated by the industrial economics research unit at the Department of Business Studies at Aalborg University and financially supported by the Danish Ministry of Business and Industry.

Based on an index which assesses the degree of flexibility at the level of the firm, the present paper analyses the flexibility of firms in terms of technical innovation, work organisation, human resource management and the firm's external relationships. Following upon an outline of the theoretical and empirical background of the DISKO project, section 3 describes the survey design and sample, while section 4 presents the index by which the degree of flexibility is assessed. It is stressed that we do not propose to define *the* flexible firm as such, but instead prefer to speak about degrees of flexibility, i.e. firms are characterised as being more or less flexible. Sections 5-9 analyse how the flexibility index correlate with the survey results on technical innovation, work organisation, human resource management, external relationships, and organisational change. This analysis is undertaken with respect to sectoral affiliations and firm size, whenever relevant to the interpretation of the index. In doing so, we mainly distinguish between five industries, i.e. manufacturing, construction, transportation, finance and business services, and trade, hotels and restaurants. Furthermore, the respondents are divided into three groups according to firm size, i.e. firms with less than 50 employees, firms with 50-99 employees, and firms with at least 100 employees. Finally, section 10 provides some concluding remarks and proposes a few lines of future analysis. For reference to specific frequencies and questions, please consult the appendix.

2. Theoretical and empirical background

Two recent theoretical and empirical developments within the field of innovation economics form the basis of the investigation reported in the present paper: The conceptualisation of national systems of innovation (NSI), and the increasing interest in organisational innovation.

The NSI concept appeared in the late 1980s as the result of a number of theoretical and empirical efforts to describe how the innovative performance of firms are determined by the interaction between social, economic and technical institutions at the national level (Freeman, 1987, 1988; Andersen & Lundvall, 1988; Lundvall, 1988; Nelson, 1988). Following upon these

1. Det *D*anske *I*nnovations*S*ystem: *Ko*mparativ analyse af udfordringer, styrkepunkter og flaskehalse (DISKO). In English: The Danish Innovation System: Comparative analysis of challenges, strengths and bottlenecks. The project is outlined in section 2. The project is part of the activities that take place within the Danish Research Unit for Industrial Dynamics (DRUID), and further information on the project and its DRUID role can be obtained at the internet address www.business.auc.dk/druid.

initial contributions, two major editions appeared in the early 1990s, representing two approaches that differ with respect to how they define and understand the role of institutions. The first approach (Lundvall, 1992) describes the national system of innovation as a social system and tries to combine evolutionary and institutional theorising. Innovation is analysed as the outcome of cumulative causation in learning that "takes place in connection with routine activities in production, distribution and consumption" (Lundvall, 1992a, p.9), and considerable emphasis is placed on institutions as social guide-posts for human interaction that bridge tacit and codified knowledge. The second approach (Nelson, 1993) describes the national system of innovation as "a set of institutions whose interactions determine the innovative performance (...) of national firms" (Nelson & Rosenberg, 1993, p.4), and defines institutions as institutional actors, e.g. firms, research laboratories and government bodies. Although it shares the idea of cumulative causation in learning processes, the second approach places less emphasis on social interaction and is more occupied with the role of and the interplay between dominant institutional actors.

During the recent years, it has been extensively argued that the internationalisation of firms and the globalisation of economies tend to diminish the importance of national systems. Although this is recognised and accepted by NSI researchers, they argue that it is important to retain the focus on the national level. First, the fact that national systems may overlap regarding productive and innovative activities, and that many institutional actors are becoming transnational, does, actually, emphasise the importance of understanding the working of national systems. We must ask ourselves to which extent the concept of national systems make sense today (Nelson & Rosenberg, 1993). Furthermore, to the extent that the internationalisation of firms and the globalisation of economies represent a new institutional order, it is important to understand the old model in order to affect the ongoing transition (Lundvall, 1992a). Second, national systems "still play an important role in supporting and directing processes of innovation and learning" (Lundvall, 1992a, p.3), and it appears that technical and organisational knowledge generated within a specific national context is difficult to transfer to another national context. In this sense, we may speak of institutional learning within national boundaries (Kogut, 1991; Johnson & Lundvall, 1992).

Since the occurrence of innovation economics as a discipline of its own, the emphasis has been on technical innovation, i.e. product or process changes. However, although this primary focus remains, the recent years has witnessed an increasing interest in organisational innovation, both as a factor conditioning and conditioned by technical innovation. From the perspective that innovation is an interactive process of learning, innovation economists are beginning to pose the question of how learning takes place in an organisational context. This does not mean that organisational issues have been absent within innovation economics. For instance, organisational issues entered the study of why some innovation projects succeed while others fail already in the late 1960s and early 1970s (Rothwell et al., 1974), and the concept of organisational rationality in terms of routines was prominent in the evolutionary approach to innovation economics (Nelson & Winter, 1982). But the main focus has been on *inter*organisational dynamics, and *intra*organisational

dynamics has mostly been absent. However, during the late 1980s the intraorganisational perspective gradually entered the focus of attention of some innovation economists (Clark & Starkey, 1988), to some extent based on the concepts of economies of scope (Jelinek & Goldhar, 1983), a second industrial divide (Piore & Sabel, 1984) and firms being flexible although they specialise (Miles & Snow, 1986).

An important aspect of this theoretical development has been the idea that firms have to provide a match between technology and organisation in order to make technical innovation successful (Gjerding, 1996). The importance of a technology-organisation match has been argued both in cases of comparative analysis across countries (Haywood & Bessant, 1987; Tyre, 1991), across multi-unit national firms (Leonard-Barton, 1990) and in relation to more general theorising on high technology (Gupta, 1988; Bessant & Buckingham, 1989; Zairi, 1992). To some extent, the approach has been Schumpeterian in the sense that the technology-organisation match is perceived as evolving through creative tensions (Leonard-Barton, 1988) that create pressures for change, and the concept of exnovation has been used in order to designate a process of creative destruction at the level of the firm (Clark & Staunton, 1989).

From the perspective of Danish innovation economists, the technology-organisation match became an issue during the 1980s where the Danish economy experienced a peculiar variation of the business cycle. In the midst of an economic boom where production, investment and employment grew at extremely high rates, labour productivity declined. Manufacturing labour productivity even grew at negative growth rates for three years during 1984-86. Why? A large research project (PIKE) undertaken in the years of 1987-90 suggested that the Danish economy suffered from severe tensions of structural change at the levels of economy, sector and firm (Gjerding et al., 1992).[2] Taking as its point of departure the fact that high technology diffused very rapidly throughout the Danish economy (Kallehauge, 1990), a survey of 337 manufacturing firms investigated the types, causes and effects of high technology implementation (Gjerding & Lundvall, 1990). It appeared that problems of accommodating the work organisation and securing the necessary qualifications of the labour force had been extremely important and might explain a substantial part of the decline in labour productivity.

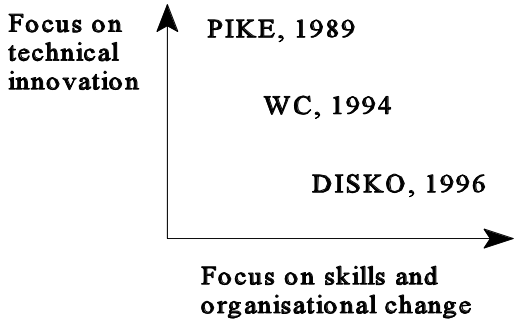
In 1994, the Danish Welfare Commission (WC) initiated a survey on 514 manufacturing firms. While aimed at reaffirming the PIKE findings on the diffusion and implementation of high technology, the WC survey also investigated the diffusion of various work organisation principles and the

2. The PIKE project, headed by Bengt-Åke Lundvall and Björn Johnson with the co-operation of Lars Kallehauge, Poul Thøis Madsen and Allan Næs Gjerding, was rather broad in the sense that it combined national and global perspectives in the investigation of the productivity mystery, undertaking analysis at the macro, meso and micro levels. The project has been reported in a number of books and articles, however mostly published in Danish. Gjerding et al. (1992) describe the major findings in English, and Gjerding (1996, ch.8) compares the survey results to similar surveys in a Danish context. PIKE is an abbreviation of "*P*roduktivitet og *I*nternational *K*onkurrence*E*vne", i.e. productivity and international competitiveness.

interplay between technical and organisational change.[3] It appeared that high productivity growth occurred in firms which combined technical innovation and organisational change at the levels of management and work organisation, and that technical innovation related to high technology is skill-biased (Nyholm, 1995). In consequence, the occurrence of performance problems, defined as the gap between potential and realised productivity levels, may be attributed to organisational problems and insufficient exploitation of technical possibilities (ibid., p.17).

While the PIKE survey, primarily, preoccupied itself with technical innovation, the WC survey explicitly included the aspects of organisational change and labour skills. In consequence, the focus gradually changed from technical innovation to the technology-organisation match. As compared to the initial PIKE survey, the survey described in this paper has rotated the picture somewhat, as exemplified in figure 1. This reflects that the survey does not aim at verifying the findings of the previous studies. These findings are accepted and defined as our point of departure. Instead, the DISKO survey focusses more specifically on the issues of new work organisation principles and changes in the intrafirm demand for labour skills.

Figure 1. *Change in focus of some Danish innovation surveys*



Before describing the design and sample of the survey, it may be appropriate to add a few words on the organisational context of the survey, i.e. the way in which the survey enters the DISKO project and is expected to contribute to our understanding of the Danish national system of innovation. The purpose of the DISKO project is to analyse, from an international comparative perspective, the strengths and weaknesses of the Danish innovation system and to point out the new challenges which the system have to meet. The fields of analysis are selected on the basis of previous investigations and coordinated with similar undertakings at an international (primarily OECD) level, as in the case of the survey. The point of departure is the assumption that the national system of innovation must be described and understood in terms of the "learning economy" (Foray & Lundvall, 1996). In order to operationalise the analysis of the different aspects of the Danish NSI, the project is organised in five modules: Module 1, *The firm*, focusses on the problems of realising the benefits from high technology and the ability of the individual firm to develop new products and dynamically adapt to global demand changes. Furthermore, it delves into the external barriers for growth in small and medium sized companies. The survey described in this paper is an important part of module 1. Module 2, *Interfirm relations*, investigates why Danish companies are reluctant to establish co-operative relationships and take part in network

3. Gjerding (1996, pp.206-13) compares the main findings in the PIKE and WC surveys.

arrangements. Module 3, *Infrastructure and bridging institutions*, analyses the role of the major institutional actors associated with the dissemination of science-based knowledge throughout the Danish NSI and tries to explain why Danish companies to a comparatively small degree utilise research results and codified knowledge emanating from universities, knowledge centres and technology institutes. Module 4, *Growth, specialisation and structural change*, adopts a sectoral perspective and highlights the development of productivity, export specialisation patterns and user-producer relationships across the Danish private business sector as compared to a number of OECD countries. Finally, module 5 on *Synthesis and policy implications* combines the results and outlines some implications for national and international policy-making bodies.

3. The survey: Design and sample

The survey is based on a questionnaire that aims at tracing the relationship between technical and organisational innovation in a way that permits an analysis of new principles for work organisation and their implications for the use and development of the employee's qualifications in the Danish private business sector. The questionnaire was submitted to a national sample of 4,000 firms selected among manufacturing firms with at least 20 full-time employees and non-manufacturing firms with at least 10 full-time employees.[4] Furthermore, all Danish firms with at least 100 employees were included in the sample, i.e. a total of 913 firms. In sum, the questionnaire was mailed to 1,316 manufacturing and 2,684 non-manufacturing firms at the end of April 1996 followed by a reminder at May 29th and telephone interviews with top managers in non-responding firms during June. The resulting numbers of respondents were 684 manufacturing and 1,216 non-manufacturing firms, corresponding to response rates of, respectively, 52% and 45%. The resulting response rate of 48% for the total sample is acceptable when you compare the distribution of response rates across industries and the sample representativity, cf. table 1. In addition, the collected data are supplemented by official register statistics on the responding firms comprising economic performance, the employees' educational level and other relevant information.[5] Overall, the survey yields a satisfactory coverage of the Danish private business sector at a medium level of aggregation.

4. The primary sector was excluded from the sample, i.e. agriculture, forestry, fishing, extraction of natural resources and other types of similar activities.

5. However, only a few of these data are included in this paper. At the present point of time, the registered data on economic performance do not cover the years of 1995-96 for which data are still at a preliminary stage in the Danish national accounting statistics. When the data on 1995-96 have been finally prepared, they will be added to the survey databank.

The questionnaire is designed to cover four main topics, cf. figure 2: The use, and change of use, of various principles of management and work organisation; changes in the content of work and the demand for qualifications; innovation in terms of new products, processes and markets; and changes regarding the degree of co-operation with extra-firm actors and the intensity of competition faced by the firm. The official register statistics included in the survey databank creates the opportunity to measure the performance effects of the relationships portrayed in figure 2.

Figure 2. *The issues of the DISKO questionnaire*

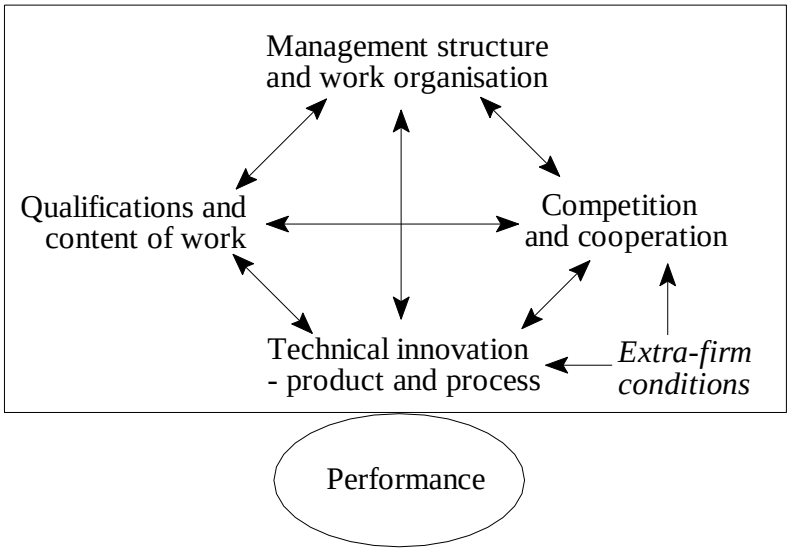


Table 1. *Response rates, and the share of the number of firms and full-time employees held by the respondents within their specific industry*

		Representativity		
Industry	Response rate, %	No. of firms, %	Share of full-time employees, %	N
Food, beverages, tobacco	45	27	50	70
Textile, clothing, leather	41	18	29	39
Wood products, paper, printing, publ.	53	23	45	86
Chemical and petroleum	62	34	49	83
Non-metallic mineral products	50	24	57	28
Basic metal, fabricated metals	54	27	48	314
Furniture and other manufacturing	50	21	42	64
Construction	42	11	12	255
Car retailing, auto repair, gas stations	46	13	15	115
Wholesale and agencies, except cars	51	14	17	334
Retailing and repairs, except cars	42	12	10	164
Restaurants and hotels	44	8	16	46
Transportation	42	15	17	134
Financing and insurance	57	n.a.	n.a.	12
Dwellings	47	16	26	17
Business services	48	9	14	139

The survey data are still subjected to ongoing analysis, and a number of investigations are being planned. Currently, the DISKO findings are being compared to the findings of a similar Swedish survey (NUTEK, 1996) to which the DISKO project is linked, and a link to similar surveys currently being planned in Norway and Finland has been established. The research groups engaged in these Scandinavian investigations have applied for financial support from the Nordic Council of Ministry in order to make a joint Nordic publication in due time. Furthermore, a study of labour market dynamics is being initiated. The aim of this study is to combine the survey databank with the Danish IDA databank.[6] The IDA is serviced and maintained by the official Danish Statistics,

6. Integreret Database for Arbejdsmarkedsforskning (Integrated Database for Labour Market Research).

and in a DISKO context it offers the opportunity to trace changes at the level of firms regarding the number of employees, the composition of the labour force, job entries and closures, turnover of employees, and information on wages and salaries.[7] Finally, in the near future, the survey data will be analysed with respect to industrial clusters within the Danish NSI. The analysis will focus on seven clusters that have previously been identified and researched by a number of scholars under the auspices of the Danish Council for Industrial Development.[8]

At present, a number of case studies are being prepared. Among the respondents, 30 firms have been selected for visits and interviews. The purpose of these site interviews is to get a real-life perspective on some of the puzzles and findings that appear from the questionnaire. In each case, the interviews will take as their point of departure the specific responses from the firm in question, and it is expected that the line of interviewing will differ accordingly from case to case. Seven interviews are being planned for each case, i.e. interviews with the top manager, two departmental heads, and two white collar and two blue collar employees.

4. Defining the flexible firm

The overall impression from the DISKO survey is that the group of respondents is, in many cases, dichotomised. For instance, regarding question 1 on whether the firm has undertaken major organisational changes during the period of 1993-95 or not, 52% answer in the affirmative while 47% report that they have not, cf. appendix 1 (and table A2 in appendix 2). At the same time, 44% report that the firm has changed its management structure, and more than half of the firms have extended their use of group work, have delegated authority, and have experienced an increase in the work autonomy of their employees. Furthermore, about one half of the firms have introduced new products or services during the period of 1993-95 apart from minor improvements of existing products or services, and new production techniques in one form or another has been introduced by a little less than half of the respondents. It appears that new flexible forms of work organisation have found their way into many firms, and that a considerable number of firms exhibit innovative behaviour. Yet, a large number of firms seem satisfied with their current organisational structure or are paralysed by inertia. The overall picture is mixed, and in order to penetrate the dichotomised

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7. The novelty of data in the IDA database is the same as for the register statistics mentioned previously, i.e. the most recent IDA data cover 1994.

8. In fact, this research project, which was undertaken in 1994-95 with the participation of several Danish research units, identified eight “resource groups”, or clusters: Food; dwelling and construction; health and medicine; transportation and communication; consumer products; leisure and turism; energy and environment; and services. A resource group is a set of industries functionally interlinked in order to provide a set of interrelated products and services that in many cases represent an important source of international trade specialisation. The firms and industries within a resource group are mutually dependent and often face similar strategic challenges. The DISKO sample represents an aggregation into seven clusters.

structure we have found it important to develop a measure which can discriminate between firms with more or less inclination to change.

The focus on "change" is, however, not on directions of change but on principles of work organisation, human resource management and technical innovation which are associated with combining organisational flexibility and innovative capability, i.e. intra- and interorganisational response mechanisms that evidence economies of scope. The concept of economies of scope has come to signify cases and instances where the mass production trade-off between flexibility and efficiency vanishes because economies of scale apply to cases other than large production batches. At the industry level, this may imply a process of downsizing, although the empirical evidence is far from conclusive (OECD, 1996). At the firm level, it may imply that overall production planning becomes more centralised while production operation and planning at tactical levels become more decentralised; in consequence, learning by doing is gradually supplemented by learning in operational planning (Gjerding, 1996). At the inter-organisational level, the tendency points towards customised or custom-oriented production of products and services in conditions of a shortening of product life-cycles; thus, the importance of feed-back from extraorganisational communication and information is enhanced, and learning by using and interacting (Rosenberg, 1982; Lundvall, 1988) becomes even more vital as a source of competitiveness.

The descriminating measure on which the present paper reports reflects the flexibility of the internal structure of the firm and its explicit adaptation to changing markets and technologies. Flexibility is perceived in terms of employee responsibility and the improvement of skills, as in NUTEK (1996), and in terms of process innovation and flexible response patterns designed into new products and services, as underlined by the management literature (e.g. Thompson & Strickland, 1983; Noori, 1990). In consequence, the flexibility measure abstracts from internal numerical flexibility and focusses on the combination of internal functional flexibility and external flexibility in the sense of organisational and technical innovativeness, where organisational innovativeness is interpreted as both changes of work organisation and the development of employee skills.[9]

As a broad working definition of flexibility, we employ the following: *Flexibility is the capacity based on learning structures and processes to respond with new products and technology to a changing environment.* Our working definition is operationalised into a flexibility measure which distinguishes between smaller and larger degrees of flexibility, where a firm is seen as more or less flexible to the extent that it fullfills the criteria outlined in table 2. The result is an index on flexibility with values in the range of 0-14, and the distribution of the 1,900 respondents is close to the bell-shaped normal distribution, cf. figure 3. The value of the index is closely related to whether or not the firm has undertaken major organisational changes, i.e. the majority of the most flexible firms has, in fact, experienced major organisational changes during the period of 1993-95, cf. table A2 in the appendix. For instance, at least 80% of the most flexible firms have undertaken organisa-

9. Some refer to the development of employee skills as "people innovation", e.g. Zaltman et al. (1973).

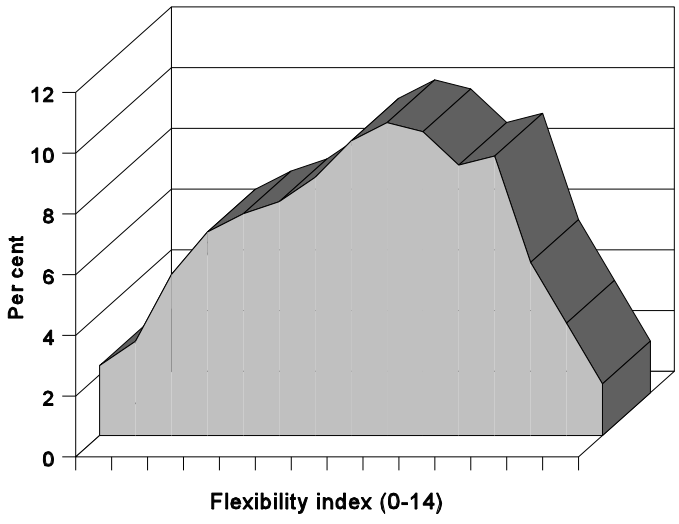
tional change as compared to only 7-14% of the least flexible firms.[10]

Table 2. *The DISKO flexibility index, based on a set of 14 questions*

Internal flexibility factors	Question	External flexibility factors	Question
Delegation of responsibility	6e	Introduction of new	
Employees' own planning of work	5b	products/services	20
Employees' own control of work	5c		
Rotation between functions	12c	Exports to foreign	
Integration of functions	6f	customer groups	22b
Continued vocational training	12e		
Educational activities tailored to firm	15g	Introduction of new technology	
Long-term educational planning	15h	Information and communica-	
Cross-occupational working groups	6a	tion technology	23a
Quality circles/groups	6b	Other forms	23b

Numbers in the question columns refer to the DISKO questionnaire, cf. the appendix 1.

Figure 3. *The distribution of the respondents according to the flexibility index, percentages, N = 1,900*

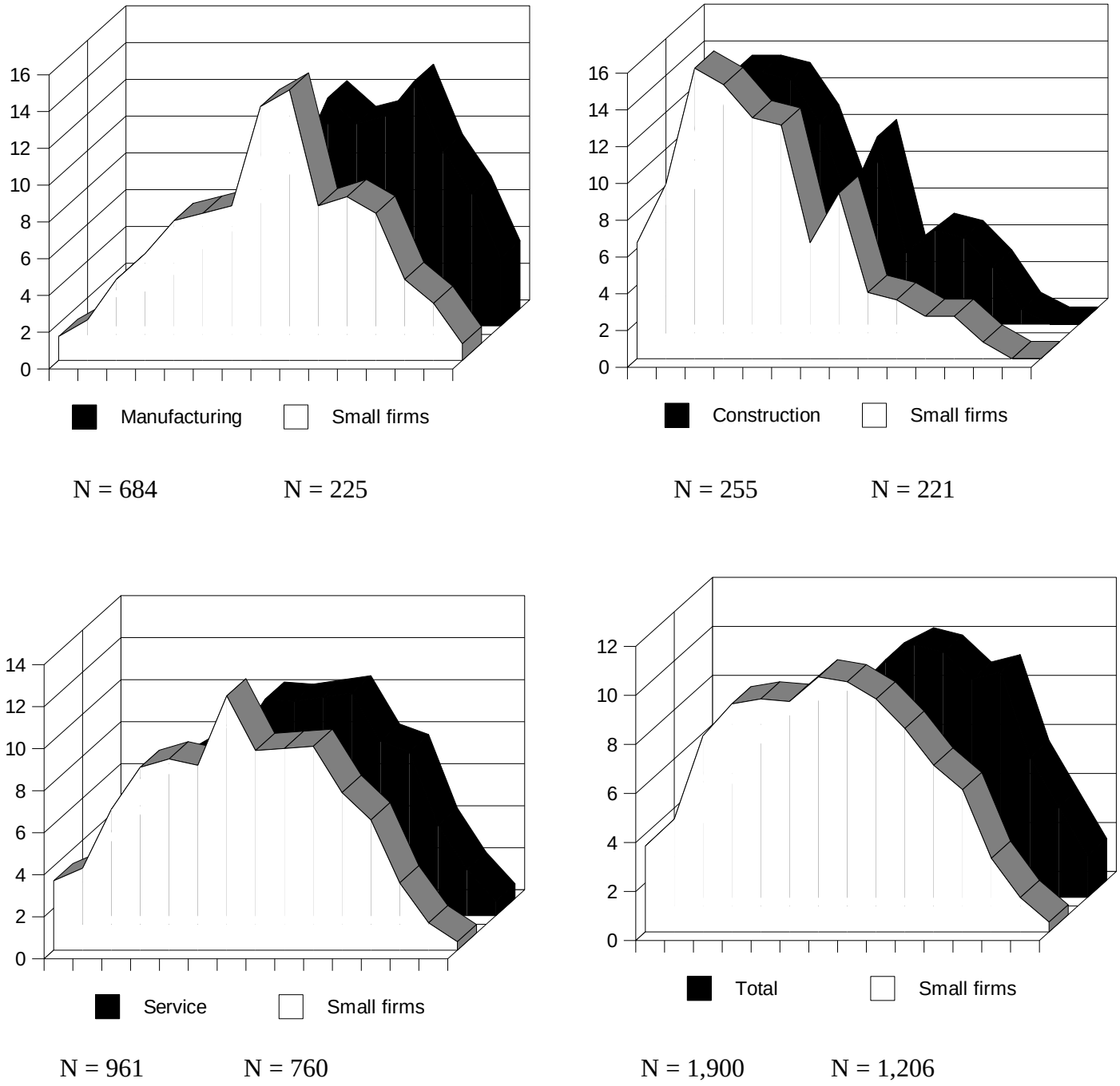


The almost normal-sized distribution does, however, reflect differences regarding sectoral affiliations and the size of the responding firms. First, the group of manufacturing respondents has a larger amount of flexible firms than the group of non-manufacturing respondents. The average index value within the manufacturing group is 8.7 as compared to 6.3 in the group of non-manufacturing respondents, and this difference is parallel to previous findings within the OECD member countries (OECD, 1996, p.8).

10. A simple linear regression, where the index value is the dependent variable and the percentage frequency on major organisational changes is the independent variable, yields $Y = -0.59 + 0.15X$ with $R^2 = 0.98$.

Second, it appears that large and medium-sized firms are flexible to a larger extent than small firms, irrespective of the sectoral affiliation. This finding is shown in figure 4 which compares the distribution of all respondents and the distribution of responding firms with less than 50 employees. The sectoral sample which includes all firms are exhibited as a black shadow, while the sectoral sample that includes only firms with less than 50 employees are shown as a white area in the forefront of each diagram. In all cases, the white area is skewed to the left, as compared to the shadow.

Figure 4. *The distribution of respondents according to the flexibility index, all respondents (black area) and respondents with less than 50 employees (white area)*



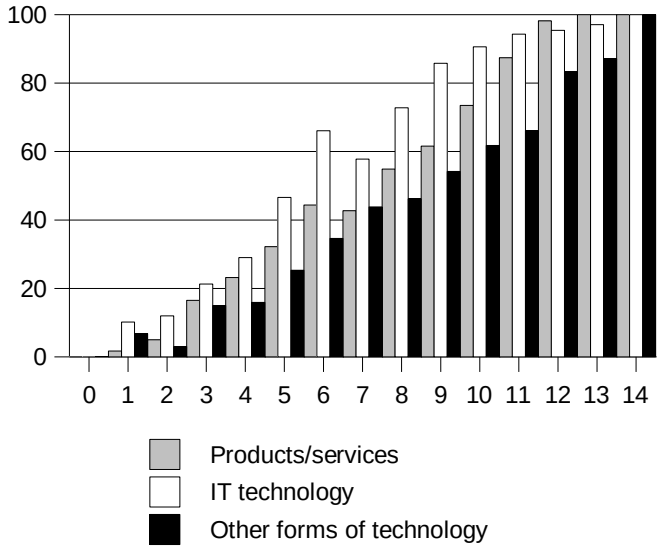
The manufacturing firms tend to have higher index values than the non-manufacturing firms since the proportion of large and medium-sized firms is comparatively higher in the group of manufacturing firms. In contrast, the construction firms tend to have smaller values than the manufacturing

and service firms since the proportion of large and medium-sized firms is comparatively smaller. Finally, the difference between the service and the manufacturing sectors diminishes in the case of small firms where the average index values become, respectively, 6.3 and 7.2.

5. Combining technical and organisational innovation

As an effect of the definition of the flexibility index, the most flexible firms are more likely to have engaged in technical innovation in the sense of new products/services and technology. This is the case, cf. figure 5 which reports on the data in table A1. Following the argument of section 2, we might expect that technical innovation is closely related to organisational change, and it appears from the DISKO survey that 68% of the firms which have undertaken major organisational changes in the period of 1993-95 have also introduced new products and/or services, apart from minor improvements of the existing ones; in comparison, the corresponding figure for those firms which have not undertaken major organisational changes is only 34%. Furthermore, 79% of the firms which undertook major organisational changes have introduced new technology based on information and communication technology, and 55% introduced other forms of new technology. The corresponding figures for those firms which did not undertake major organisational changes are 47% and 32%, respectively[11]. As pointed out in the previous section, there is a strong correlation between flexibility and the tendency to undertake major organisational changes, and, in conclusion, the most flexible firms are also those firms which combine technical and organisational innovation to a larger extent than the less flexible firms.

Figure 5. *Technical innovation, apart from minor improvements of existing products*



Regarding the purposes for combining technical and organisational innovation, 2/3 of the firms which have undertaken major organisational changes report that organisational change to some or a high extent took place in order to strengthen the ability of the firm to continously develop new

11. Gjerding (1996a) presents an overview on the differences between those firms which undertook organisational changes during 1993-95 and those firms which did not.

products/services and renew the firm's knowledge base.[12] A large number of firms renewed their products/services in order to attract new customers, i.e. 78% of these firms report that the new products/services were used to conquer new customer groups at the Danish market, while 49% point to the similar effect on domestic markets (question 22). These innovative efforts are linked with closer user-producer interactions. In fact, 3/4 of the respondents point out that they to some or a high extent has developed closer co-operation with customers in the period of 1993-95, and the proportion of respondents that answer in the affirmative is extremely high in the case of firms which have undertaken organisational change (90%, cf. Gjerding, 1996a) and in the case of the most flexible firms, cf. table A8.[13]

The close relationship between flexibility, the combination of technical and organisational change, and the closer co-operation between the firm and its customers, reflect that large and medium-sized firms score higher values at the flexibility index than small firms. Firm size is positively correlated with most of the features that characterise the most flexible firms, i.e. the larger the firm, the higher the propensity to develop new products/services and to do so in order to conquer new customers, especially on the global market. Furthermore, the larger the firm, the higher the propensity to introduce new process technology and to co-operate with customers. Finally, the importance of firm size is quite clear in the case where organisational change is undertaken in order to strengthen the ability of the firm to develop new products and services.[14]

The importance of sectoral affiliations is less clear in the case where organisational changes have been undertaken in order to strengthen the ability of the firm to develop new products/services and the knowledge base of the firm. However, sectoral affiliations are important in a number of respects. With the exception of financing, the manufacturing sector has, to a larger extent than the remaining sectors, introduced new products/services and processes based on information and communication technology. Furthermore, the manufacturing sector does, to a larger extent than the other sectors, introduce other forms of new technology. Finally, the manufacturing sector is more focused on conquering new customer groups at the global market by introducing new products, and it has, to a larger extent, developed closer co-operation with customers. Since the manufacturing sector scores comparatively higher at the flexibility index, the sectoral affiliation contributes to the explanation of the differences between more and less flexible firms reported above.

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12. Question 2 of the DISKO questionnaire, cf. appendix 1.

13. Similarly, 3/5 or more of the most flexible firms observe that there has been an increase in contact between employees and customers during 1993-95, while the corresponding figure is quite small among the least flexible.

14. The importance of firm size to the distribution of answers is reported in Gjerding (1996b). In this paper we distinguish between small firms (10-49 employees), medium-sized firms (50-99) and large firms (100+).

6. Principles of work organisation

Regarding the internal flexibility factors, the flexibility index is build upon a number of features which characterised the respondents at the time of data collection. These features have in common that they reflect the intra-organisational state of affairs, i.e. they describe the work organisational structure rather than the direction of organisational change.[15] However, the questionnaire contains a number of questions on work organisational changes during the period of 1993-95. Similarly, the respondents are confronted with questions on changes of work content, demand for qualifications and human resource management. By supplying a description of the organisational structures that govern the organisational processes of learning and change, the flexibility index provides us with an analytical framework for analysing the changes in intra-firm relations which have taken place. This is the topic of sections 6-7 which deal with the survey data on work organisation and human resource management. While the present section 6 primarily deals with changes of the content of work and the demand for qualifications, section 7 presents some data on human resource development within the responding firms.

Regarding the observed changes in the *content of work*, we may take, as our point of departure, the observation that the employees' autonomy has increased in more than half of the firms during 1993-95, cf. table A3 (question 10 in appendix 1). At the same time, work specialisation has increased in about 1/3 of the firms. However, only 7% of the respondents point to an increase in the routine content of work, while 1/3 report that the routine content has decreased. Furthermore, nearly half of the firms pay more attention to vocational qualifications, an observation which may be expected from the observations on work autonomy and specialisation. In essence, these frequencies point to an alignment between flexibility and specialisation (cf. also Gjerding, 1996a), and this tendency appears to be stronger in the large and medium-sized firms than in the small firms, since the observations pointed out are positively correlated with firm size.

As pointed out previously, firm size and the flexibility index value are strongly correlated, and as could be expected from this correlation, the observations just described are positively correlated with the value of the flexibility index, cf. table A3. Among the most flexible firms, 1/3 or more report an increase in specialisation, while one half or more point to a decrease in the routine content of work. This development differs from the experience of the less flexible firms where fewer experienced an increase in specialisation, while the routine content of work appears to have remained fairly stable when we compare the frequencies of increase and decrease. The demand for vocational qualifications has increased in 2/3 or more of the flexible firms as compared to 1/5 or less among the least flexible firms, and the same is true for the increase of work autonomy. Accordingly, increases in the co-operation between employees and management and among the employees themselves are reported by far more of the most flexible firms than of the least flexible

15. None of the questions which deal with organisational changes during the period of 1993-95 have been employed in the construction of the index.

firms, as appears from table 3.

Table 3. *Observed increases in co-operation between employees and management (e-m) and among the employees themselves (e-e) in terms of the flexibility index during the period of 1993-95, percentage numbers of firms*

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
e-m	6.8	8.5	13.0	21.3	25.4	30.1	40.1	43.2	55.4	56.3	63.5	71.3	72.2	84.3	90.6
e-e	6.8	8.5	12.0	18.1	23.2	30.1	39.5	36.8	46.7	54.7	58.2	64.4	69.4	80.0	90.6

A number of factors have contributed to these changes in work relations, as appears from table A4 which depicts the answers of those respondents who indicate that the factors mentioned in question 11, cf. appendix 1, have contributed to changes of work content to a high extent during 1993-95. A need for achieving greater flexibility is the most often mentioned factor, and it appears among more than half of the most flexible firms. The occurrence of intensified competition, the introduction of new technology and the need for better contacts with customers are reported by 1/4-1/3 of the respondents and do also differentiate the more flexible firms from the less flexible ones.

The need for greater flexibility by employees and the occurrence of sharper competition are strongly correlated with firm size, as is the need for better contacts with customers. The positive correlation between these conditions and firm size contributes to the explanation of why these conditions are more important to the most flexible firms than to the least flexible firms.[16]

The striking differences between the most and the least flexible firms are also apparent regarding the *demand for qualifications* when recruiting employees, cf. question 13 on the demand for vocational qualifications, the ability to co-operate and communicate, the ability to readjust, and the demand for responsibility and quality consciousness when employees are recruited. Table A5 reports on those respondents who indicate that their demand for the various types of qualifications has become larger during 1993-95, and the picture which emerges confirm the differences between the more and less flexible firms. Once more, these observations can to some extent be attributed to firm sizes, especially in the case of demand for the ability to co-operate, communicate and readjust.

Regarding the sectoral affiliations, the importance of manufacturing firms to the frequencies

16. In the rather few cases where changes have occurred in the less flexible firms, the need for greater flexibility among the employees and the occurrence of sharper competition are the most important, as in the case of the more flexible firms. The remaining possibilities mentioned in question 11 were reported to have been important to a high extent by rather few of the firms.

reported in terms of the flexibility index is present in a number of observations. Manufacturing firms have to a larger extent than non-manufacturing firms experienced an increase in the autonomy of work and a decrease in the routine content of work. Similarly, with the exception of financing, the manufacturing firms report to a larger extent than non-manufacturing firms on sharper competition and greater need for flexibility by employees as conditions for the change of work content. Finally, regarding the demand for qualifications, manufacturing firms are more dominant in reporting on demand for the ability to co-operate and communicate, the ability to readjustment, and responsibility and quality consciousness. One of the reasons why these observations and a sectoral affiliation with the manufacturing sector are positively correlated is that manufacturing firms have, to a larger extent than non-manufacturing firms, undertaken organisational changes during 1993-95 (Gjerding, 1996a). The same can be argued regarding the importance of firm size to the distribution of frequencies on which we have reported in the present section, since the undertaking of organisational changes is positively correlated with firm size. Organisational changes are important in order to understand the differences between the more and less flexible firms. The survey data reveal that organisational change is associated with the delegation of responsibility and the participation of employees, and consequently the more flexible firms have increased their recruiting demands for new relevant qualifications such as the ability for readjustment, co-operation, responsibility and vocational qualifications. These observations lead us to propose the hypothesis that the occupational structure of the firms has changed in the direction of higher levels of education; however, the test of this hypothesis awaits the computer runs on the integrated database for labour market research (IDA), cf. section 3 and footnotes 6-7.

7. Human resource management

According to the answers given to question 14, the continous development of the employees' skills is seen as decisive for the competitiveness of the firm by 28% of the respondents and of great importance for an additional 39%. Among the most flexible firms, the relationship between the development of skills and the competitiveness of the firm is characterised as decisive by approximately half or more of the respondents as compared to only 1/10 or less among the least flexible firms, cf. table 4.

Table 4. *The percentage distribution of firms (%) in terms of the flexibility index (I) according to their opinion that it is of decisive importance for the firm's competitiveness that the employees continously develop their skills*

I	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
%	2.3	5.1	11.0	8.7	14.5	21.9	24.1	24.3	27.2	31.1	37.7	44.8	49.1	54.3	75.0

The survey data disclose large differences between the respondents with regard to the development of human resources, as also evidenced by the flexibility index which includes a number of more formal aspects such as long-term educational planning, but also more indirect learning opportunities that occur as part of cross-occupational work groups and quality circles, cf. tables 2 and A1. Supplementary to the elements which are part of the flexibility index, the survey permits a number of observations on human resource development, cf. question 15. A primary way to secure a continous development of human skills is by means of solving working tasks, i.e. learning by doing, and this is especially important to the less flexible firms. However, a continous development of skills cannot rely on learning by doing alone, but have to be supported by a number of other forms of skills development, such as those measures which enter the flexibility index, as just mentioned. It appears from table A1 that the more flexible firms exploits these measures to a larger extent than the less flexible firms. Regarding the extent to which courses and educational schemes are used for the development of human skills, additional evidence is provided by table A6 which combines questions 16 and 18. As compared to less than 20% of the least flexible firms, it appears that in 60% or more of the most flexible firms more than half of the employees took part in internal or external courses or educational schemes in 1995 or 1996. The duration of such courses is inclined to be longer in the most flexible firms as compared to the least flexible firms, especially in the case of education and training of middle managers. This observation may be explained by the fact that middle managers are to an increasing extent becoming important to the furthering of organisational change, as discussed below. In all cases, the employees participate less often than management in educational activities enduring for more than five days, but this tendency is less marked in the more flexible firms. The propensity of middle managers engaged in educational activities enduring for more than five days is positively correlated with firm size. The same applies in the case of the number of employees that take part in educational activities. However, although large and medium-sized firms to a larger extent than small firms tend to engage their employees in education, they do also to a larger extent utilise educational activities enduring for 1-5 days.[17]

17. The explanation for this observation may be that large and medium-sized firms to a larger degree provide education and training for the peripheral parts of the labour force which, in a Danish context, usually take part in the type of vocational standard courses that are provided by the vocational training centres within a regulatory framework where public subsidies are allocated to five-days courses within a modular structure. The observation made on large and medium-sized firms does also apply to the manufacturing and transportation sectors which are, actually, the largest customers of the vocational training centres.

The subjects of the educational activities, cf. question 17, are shown in table A7. In general, 3/5 of the firms report on courses and training schemes that deal with new technology, and about one half of the respondents mention courses and training schemes on quality management, strategy, market and customer conditions, subjects custom-tailored to the needs of the firm, leadership development, and communication and co-operation. Less important are courses and training schemes on the working environment (2/5) and environmental demands (1/3). A comparison between the most and the least flexible firms reveals that new technology is the most important subject for both groups.[18] However, there are some important differences regarding the remaining priorities. While the most flexible firms emphasise leadership development and quality management, the least flexible firms point to custom-tailored subjects, the working environment, and the combination of strategy, market and customer conditions. These differences can be explained by the fact that the most flexible firms have, to a larger extent, engaged in organisational changes, and, furthermore, it seems reasonable to suggest that the least flexible firms are more focussed upon their markets and mandatory training in working environment issues. This observation is, to some extent, supported by the correlation between firm size and the topics mentioned in question 17. Although the propensity to report on educational activities in relation to all of the topics mentioned in question 17 increases with firm size, the small firms are relatively more inclined to report on custom-tailored subjects, quality management, new technology, and the combination of strategy, market and customer conditions.

8. Interorganisational co-operation

As evidenced above, closer contacts and co-operation with customers are increasingly becoming important, especially in the case of the most flexible firms. The tendency towards closer co-operation with customers is observed alongside the experience of the firms that competition has intensified. The present section investigates the tendency towards closer co-operation with external organisations and its relationship to the reported changes on competition, in terms of the flexibility index.[19]

Out of the total sample of firms, 44% are part of a concern, while 1/5 define themselves as subcontractors, cf. question 27. There is a strong correlation between flexibility and concern relationship, while no correlation is found in the case of subcontractor relationships, cf. table 5. Those firms which are part of a concern have access to a natural partner when it comes to research and educational activities, and it might be expected that this relationship would show itself in fewer

18. In fact, this resemblance is, to some extent, astonishing. According to the flexibility index, the least flexible firms have to a smaller extent introduced new technology during 1993-95. However, training schemes related to new technology is an important issue to these firms.

19. A more thorough discussion on the relationship between competition, flexibility and innovation is found in Lundvall (1996).

contacts with other organisations. Furthermore, it might be expected that the correlation between concern membership and flexibility would imply that the more flexible firms do not differ from the less flexible firms in terms of interorganisational contacts and co-operation. However, this is not the case. On the contrary, the more flexible firms take advantage of extending extra-organisational co-operation to a larger degree than the less flexible firms, cf. table A8.[20]

Table 5. *The firms' relationship regarding concern membership (C) and subcontractor relationship (S) in terms of the flexibility index (I), percentage numbers of firms*

I	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
C	0.0	15.3	16.0	22.1	34.1	33.6	35.8	42.7	46.7	49.5	56.5	66.1	68.5	71.4	75.0
S	13.6	22.0	17.0	19.7	23.9	24.0	18.5	21.6	22.1	16.3	18.2	19.5	20.4	34.3	12.5

First, there is a high propensity to co-operate with customers and subcontractors in both the cases of the more and the less flexible firms, however to a larger extent in the more flexible case. Second, about 1/4 of the firms have developed closer contact with educational institutions during 1993-95, especially in the case of the most flexible firms. Regarding knowledge centres such as universities and technological institutes on which 15% report that they to a high or to some extent have developed closer co-operation, 1/3-1/2 of the most flexible firms respond in the affirmative as compared to less than 5% of the least flexible ones. A similar distribution appears in the case of consultancies. The relationship with public authorities is generally weak among the firms; however, the 1/5 of the firms which report on closer co-operation with public authorities reflect that approximately 1/3 of the most flexible firms engage in such relationships as compared to 5-10% of the least flexible firms. In consequence, although these observations indicate that Danish firms are, to a comparatively high extent, self-supporting, the more flexible organisations tend to break away from this position and seek closer co-operation with external organisations.[21]

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20. Consult question 26 for details on which external organisations are included in the survey.

21. Analysing the PIKE survey data mentioned in section 2 and comparing it to innovation survey data on Danish manufacturing (Kristensen, 1992) at that time, Gjerding & Lundvall (1992) concluded that the Danish manufacturing firms appear as introvert and rely only on external partners in the near business environment, such as customers and suppliers, when it comes to sources of ideas for product and process innovation, and implementation of changes in process technology. The main external sources of ideas for innovation in Danish manufacturing are customers, suppliers of materials and equipment, and competitors, since ideas generated within the firm or within the concern to which the firm may belong seem equally important (Christensen & Kristensen, 1994). This impression seems to hold even in cases where the surveyed firms are aggregated and grouped according to the Pavitt (1984) taxonomy, cf. Christensen & Kristensen (1995).

9. Facilitators, obstacles and performance

Due to problems of computations and the availability of official statistics on performance data, only a single measure of performance has been compiled for the purpose of the present paper, cf. table 6. Ideally, the effects of organisational changes should be measured in terms of lagged performance. Since the DISKO survey delves into organisational changes undertaken in 1993-95, the effects should be measured in terms of performance data on the following years, i.e. 1996 and onwards. However, such data are, of course, not yet available from the Danish Statistics. Instead, for the purpose of the present paper we hypothesise a relationship between the flexibility index and current performance data. This hypothesis is based on the fact that the flexibility index does not reflect directions of change, as far as the internal factors are concerned, but a state of affairs which with some probability is correlated with measures of economic efficiency. Table 6 reveals the compiled performance data in terms of productivity levels, i.e. value added per full-time employee in 1994 figures in the case of manufacturing and 1993 figures in the case of non-manufacturing. The correlation between flexibility and performance is strong in the case of non-manufacturing and slightly strong in the case of manufacturing.[22]

From a theoretical point of view, it cannot be assumed that there is one best way of organising all business firms, as originally evidenced by the contingency theory of the firm (Lawrence & Lorsch, 1967; Galbraith, 1973, 1977). It is possible to achieve good performance by various organisational structures and processes, depending upon the fit between internal and external conditions. Nevertheless, the contemporary changes in markets and technology which increase the importance of economies of scope, customisation and skill-biased technical innovation suggest that some organisational principles may take precedence, i.e. organisational principles which emphasise the delegation of authority, the breakdown of hierarchial structures and the co-operation between the firm-related interested parties within and without the firm. Table 6 support these expectations due to a rather strong relationship between flexibility and productivity.

Table 6. *The distribution of manufacturing (M) and non-manufacturing (S) firms according to value added in DKR per full-time employee in 1993 (S) and 1994 (M) according to the flexibility index (I). 1,000 DKR*

I	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
M	332	346	404	412	416	401	474	445	491	484	477	484	424	517	420
S	440	402	341	390	412	465	461	472	473	475	547	592	585	649	696

22. Regressing the data in table 6 yields R^2=0.51 in the case of manufacturing and R^2=0.83 in the case of non-manufacturing.

The more flexible firms also pay more attention than the less flexible ones to compensation systems which favour performance in the sense that they include payments by quality and results. Such systems, cf. question 6, are found in approximately 2/3 or more of the most flexible firms as compared to less than 1/10 in the least flexible firms, cf. table 7. The distribution depicted in table 7 reflects that payments by quality or result are employed in large and medium-sized firms to a larger extent than in small firms.[23]

Table 7. *The distribution of firms according to the use of payments by quality or results (P) in terms of the flexibility index (I)*

I	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
P	2.3	8.5	8.0	20.5	25.4	32.9	34.6	36.8	39.5	47.9	51.8	55.2	63.9	71.4	75.0

The correlation between flexibility and productivity raises the question of the determinants of organisational changes and the direction of causality. On the one hand, high levels of productivity may promote organisational change by creating organisational slack. This point of view implies that organisational change may be interpreted as slack innovation in the sense of Cyert & March (1963). On the other hand, the preceding sections 2 and 5 imply that organisational change is important in order to secure the long-term survival of the firm and thus promote organisational performance. In essence, the direction of causality runs both ways. The DISKO survey permits some analysis of the intra-organisational factors that have conditioned organisational change and thus long-term performance in the surveyed firms, cf. question 9. In general, the attitudes of both middle managers and employees are seen by the respondents as facilitating organisational development, i.e. approximately one half of the firms observe that the attitudes of middle managers and employees furthered the organisational development of the firm.[24] When it comes to the role of the qualifications of middle managers and employees, the respondents hold a somewhat different impression, cf. table A9. It appears that 19% of the respondents consider the qualifications of middle managers as an obstacle to organisational development, as compared to 13% in the case of the employees' qualifications. Of the remaining entries in question 9, access to knowledge about initiatives in other firms and co-operation with educational institutions are reported by approximately 1/3 of the respondents. Furthermore, 1/4 of the respondents point to co-operation committees and shop stewards as facilitators of change, while 1/5 pay some credit to consultancies. Finally, public support seems to have been fairly unimportant, since it is only reported as a facilita-

23. Similarly, such payments are used to a larger extent in manufacturing, trade, hotels and restaurants.

24. That is, the sum of "much" and "little". In the following, "much" and "little" are lumped together.

tor of change by 13% of the respondents. Comparing the more and less flexible firms, it appears that flexibility is strongly correlated with the attitudes and qualifications of middle managers and employees, co-operation with educational institutions and access to knowledge about initiatives in other firms. The more and less flexible firms differ in the sense that the more flexible firms put a larger emphasis on attitudes than on qualifications, whereas the opposite can be observed in the case of the less flexible firms. This observation is in line with the previous observation that the least flexible firms tend to emphasise mandatory training and custom-tailored educational initiatives.

Regarding the barriers to change, it can be observed that barriers are seldom reported, except in the case of attitudes and qualifications as mentioned previously. In conclusion, the fact that attitudes and qualifications appear as both important facilitators and obstacles stresses the aspects of human resource management as described in section 7 and underlines the importance of giving priority to educational measures and schemes.

In relation to the importance of firm size and sectoral affiliation, the survey data indicate that the importance of middle managers and employees' attitudes and qualifications is relatively higher in the manufacturing sector, both as facilitators and obstacles, and that the qualifications of middle managers tend to be especially important as a facilitator in the case of small and medium-sized firms. Contrary, the large firms are more sensitive to the qualifications of employees, both as a facilitator and as an obstacle.

10. Concluding remarks

This paper has demonstrated the fruitfulnees of measuring flexibility along both internal and external dimensions. The index used for this purpose has been constructed in terms of a defintion of flexibility as the capacity based on learning structures and processes to respond with new products and technology to a changing environment. By differentiating the surveyed firms along a continuum of flexibility, a number of interesting results occur. In this final section we summarises the main results at aggregate levels of analysis.

First, there is a strong correlation between firm size and the firm's position at the flexibility continuum. Similarly in the case of sectoral affiliation. The medium-sized and large firms tend to be more flexible than the small firms, and manufacturing firms tend to be more flexible than non-manufacturing firms.

Second, it was shown that the firms differed with regard to changes in their demand for labour. With increasing degrees of flexibility, more firms were observed to have increased their demand on recruits regarding both vocational and social qualifications. Especially, 75% of the most flexible firms stressed the employees' ability in terms of readjustment, responsibility and quality consciousness, and co-operation and communication. This finding corresponds to the findings of other investigations which have shown increasing demands on soft labour qualifications

among firms which are characterised by flexible forms of organisation. As mentioned previously, the DISKO project will delve further into these issues by the use of official labour market statistics (IDA).

Third, the differences in the demand for labour qualifications are based on differences among more or less flexible firms regarding the extent to which the work content has changed. Among the more flexible firms, routine work has decreased and intra-organisational co-operation increased in far more instances than among the less flexible firms. Parallel to our observations on direct co-operation, we find that a majority of the most flexible firms also point to the importance of co-operation committees and shop stewards as having positive effects on the organisational development of the firm.

Fourth, the surveyed firms exhibit a differentiated pattern in the use of extra-organisational support. On average, 70% do not co-operate with other firms and 75% or more have not developed a closer co-operation with consultancies, knowledge centres, educational institutions, or public authorities during the period of 1993-95. However, correlating these observations with flexibility shows that the more flexible firms have taken advantage of extending their extra-organisational co-operative relationships to a larger extent than the less flexible ones.

Fifth, the firms of the sample find themselves in different competitive circumstances which are strongly correlated with the firms' position at the flexibility continuum. This observation implies that we might analyse the firms as belonging to different typologies. For instance, on the one hand we find a number of firms that exist in stable circumstances, exhibit rather traditional internal organisational relationships and may take advantage of a certain monopoly position which does not stimulate major technical and organisational changes; on the other hand, we find a number of firms that have experienced a much sharper competition during the recent years and follow a dynamic path towards the incorporation of new technology combined with product innovation and a modern type of organisation based on learning and decentralisation. In between these groups are a number of firms which are medium flexible, and some of which have experienced an intensification of competition during the recent years. Although it is to expected that there are many profitable ways to organise depending on the internal and external conditions, we observe a contemporary managerial trend towards less hierarchial and more co-operative relationships at the intra- and inter-organisational levels. At the same time, there seems to be a strong correlation between productivity levels, measured in terms of value added per full-time employee, and flexibility. This observation supports the expectation that an emphasis on learning and innovation combined with flexible features such as the delegation of responsibility and team work are beneficial to organisational performance in the present industrial circumstances.

As argued above, the causal link between performance and organisational change merit some discussion and further analysis. The present paper has investigated on the state of affairs with respect to degrees of flexibility at the firm level within the Danish private business sector during the mid-1990s. The analysis has been mainly static, but the DISKO project will also focus on changes and directions of changes in innovation, technology, organisational structure, perfor-

mance, and the interplay between those factors. This dynamic analysis is the topic for future papers.

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Appendix

Appendix 1: The DISKO questionnaire

This appendix shows frequencies for the total sample in terms of each question.

Appendix 2: The DISKO flexibility index

Table A1. Percentage distribution of 1900 answers (%) regarding total flexibility index (I) and its components/questions.

Table A2. The distribution of firms along flexibility, occurrence of major organisational changes 1993-95, and experiences with a sharpening of competition during recent years.

Table A3. Changes in employees' work content during the period 1993-95 conditioned by flexibility.

Table A4. The relationship between flexibility and elements which have caused changes of employees' work content to a high degree during the period 1993-95.

Table A5. Percentage distribution of the firms according to flexibility and changes in the firms' recruitment demands 1993-95.

Table A6. The extent of education among top management, middle management and supervisors, and employees.

Table A7. The distribution of firms according to flexibility and the subjects of employees' courses or training schemes.

Table A8. Percentage distribution of the firms according to flexibility and whether they have developed a closer co-operation to a high extent or some extent with other firms and institutions.

Table A9. Distributions of firms regarding facilitators and obstacles to organisational change conditioned by flexibility.

The DISKO questionnaire.
Total frequencies, per centage numbers of respondents

ORGANISATION AND MANAGEMENT

1. Has the firm carried through important organisational changes during the period 1993-95?

	Yes	No	Don't know
Mark with X	52,1	46,7	1,3

If No or Don't know, go to question 4

2. Have the organisational changes primarily had as their objective to strengthen:

Mark with X	High extent	Some extent	Small extent	Not at all	Don't know
a. The effectiveness of the daily work	63,3	29,2	2,4	2,5	2,5
b. Co-operation and coordination across the organisation	50,5	32,7	6,5	5,5	4,7
c. The ability to adapt to more turbulent surroundings	49,2	31	10,3	4,9	4,6
d. The ability continuously to develop new products/services	28,9	36,4	17,4	11,5	5,9
e. The ability continuously to strengthen and renew knowledge and know-how	27,7	37,8	17,3	11,3	6,0
f. Other objectives	14,7	9,9	4,4	15,5	55,4

3. Have any of the employees got education/continuous education as a consequence of organisational changes?

	Yes	No	Don't know
Mark with X	59.0	40.4	0.6

By "employees" is understood all employed except the top management

4. Have changes of the firm's management structure taken place during the period 1993-95?

	Yes	No	Don't know
Mark with X	43.6	55.8	0.6

5. Who in the firm organise and follow-up upon work done by employees who have no real management responsibility when the question is about:

Mark with X. More answers are allowed	The employee her/himself	Supervisor/ Middle manager	Top management
a. Daily planning of work	50,3	38,5	10,4
b. Weekly planning of work	27,9	54,6	15,2
c. Follow-up upon working tasks	21,5	57,7	18,8
d. New working areas	10,5	34,6	51,8

6. Does the firm use any of the following ways of organising work?

Mark with X	No	Yes Kindly mark how			
		Below 25%	25-50%	Above 50%	Don't know
a. Cross occupational working groups	45,2	27,4	13	9,2	5,1
b. Quality circles/groups	54,9	19,1	9,0	9,9	7,2
c. Systems for the collection of proposals from employees (not quality circles/groups)	47,6	18,1	7,3	19.0	8,0
d. Planned job rotation	58,3	22,2	7,1	6,6	5,7
e. Delegation of responsibility	11,6	22,3	23,3	39,5	3,3
f. Integration of functions (e.g. sales, production/service, finance)	34,7	29,4	14,4	13,2	8,3
g. Wages based upon quality or results (not piece work)	54,3	16,4	7,0	15,6	6,3

By 'planned job rotation' is understood that job rotation which has been planned by the management (in contrast to job rotation introduced on the employees' own initiative).
By 'integration of functions' is understood that some of the functions get closer to each other by information.

If Yes, go to question 8

7. Are there plans about introducing some of these organisational traits?

Mark with X	Yes	No	Don't know
a. Cross occupational working groups	5,9	84,0	10,0
b.Quality circles/groups	9,3	79,3	11,4
c. Systems for the collection of proposals from employees (not quality circles/groups)	13,0	74,0	13,0
d. Job rotation	8,6	79,2	12,2
e. Delegation of responsibility	17,0	73,4	9,6
f. Integration of functions (e.g. sales, production/service, finance)	9,7	78,1	12,3
g. Wages based upon quality and results (not piece work)	14,5	71,4	14,1

8. Have the firm extended its use of the above mentioned organisational traits during the period 1993-95, or do you have plans for the near future about an extended use?

Mark with X in both boxes	We have extended the use during 1993-1995			We have plans for an extended use during the near future		
	Yes	No	Don't	Yes	No	Don't
a. Cross occupational working groups	52,1	35,4	12,0	28,9	35,7	35,5
b.Quality circles/groups	47,9	35,5	16,6	27,1	36,3	36,6
c. Systems for the collection of proposals from employees (not quality circles/groups)	41,0	42,8	16,2	26,4	37,7	35,8
d. Job rotation	42,0	43,0	15,0	29,7	34,4	36,0
e. Delegation of responsibility	57,1	33,3	9,6	37,0	34,8	28,1
f. Integration of functions (e.g. sales, production/service, fi-	45,8	39,4	14,8	31,8	36,7	31,5
g. Wages based upon quality and results (not piece work)	42,7	41,1	16,2	29,3	37,2	33,6

9. To which extent have the following factors furthered or hampered the organisational development of the firm?

Mark with X Furthering/hampering	Furthered		Hampered		Neither - nor	Not rele-	Don't know
	Much	Little	Much	Little			
a. Attitudes of middle management and supervisors	23,7	24,6	5,5	11,0	18,6	8,3	8,3
b. Qualifications of middle management and supervisors	17,7	23,4	4,8	14,4	22,1	8,7	9,0
c. Attitudes of employees without real management	19,3	26,7	4,2	12,7	22,7	5,3	9,1
d. Qualifications of employees without real management responsibility	13,6	27,0	2,6	10,8	29,6	5,9	10,4
e. Co-operation committee	7,7	18,5	0,6	1,5	22,8	37,5	11,4
f. Shop stewards	6,9	17,0	1,8	3,7	24,3	34,6	11,8
g. Qualifications of the firm's consultants	8,0	14,7	0,7	1,3	14,6	48,2	12,4
h. Public support measures	3,8	9,0	0,9	0,7	18,2	55,6	11,7
i. Access to knowledge about initiatives in other firms	7,4	25,5	0,4	1,2	26,2	24,4	14,9
j. Co-operation with educational institutions	7,6	21,8	0,4	1,2	24,6	32,0	12,4

QUALIFICATIONS AND CONTENT OF WORK

10. Is the content of work changed for the employees during the period 1993-95 regarding:

Mark with X Types of tasks and job de-	Changed in the direction of				
	More	Less	Unchanged	Not relevant	Don't
a. Work autonomy	55,4	3,5	37,6	1,0	2,5
b. Weight upon occupational qualifications	46,7	6,4	42,6	1,5	2,8
c. Specialisation	30,2	14,6	47,9	3,2	4,2
d. Routine content of work	6,8	29,2	55,0	4,3	4,6
e. Contact to customers	41,0	4,2	47,4	4,3	3,2
f. Contact to subcontractors	27,0	5,7	53,3	10,2	3,8
g. Contact to other firms	19,4	4,9	64,2	9,6	4,0
h. Co-operation with	43,6	5,2	46,3	1,7	3,2
i. Co-operation with management	47,3	5,2	42,9	1,2	3,5

By 'subcontractor' is understood another firm/single person who according to an order from your firm deliver a good/service which becomes a part of one the products/services which is produced in your firm.
This definition means that many service firms do not have subcontractors and therefore have to answer 'not relevant'.

11. To which extent have the following conditions contributed to changes in the work content of the employees during the period 1993-95?

Indicate degree of importance. Mark with X	High extent	Some extent	Small extent	Not at all	Don't know
a. Sharper competition	30,2	39,5	12,5	13,0	4,8
b. Better possibilities for the development of new products or services	13,0	35,1	19,7	22,5	9,7
c. Introduction of new technology	28,1	35,7	14,4	16,4	5,5
d. Need for greater flexibility by employees	31,4	37,2	11,5	14,5	5,4
e. Need for better contacts with customers	23,6	32,8	15,8	21,0	6,8
f. Need for better contacts with subcontractors	9,7	25,1	23,5	31,9	9,8
g. Better possibilities for stimulating the development of the employees' qualifications	14,2	40,7	18,1	18,4	8,4
h. Demands and wishes from the employees	9,7	40,3	23,8	18,8	7,4

12. To what extent does the firm use the following possibilities to ensure that the personnel resources are in accordance with the needs of the firm?

Indicate degree of importance. Mark with X	High extent	Some extent	Small extent	Not at all	Don't know
a. By recruitment	51,0	36,0	7,7	2,9	2,5
b. By dismissals	14,3	31,6	33,8	16,0	4,4
c. By moving personnel around between different work functions	12,3	38,3	25,4	19,9	4,2
d. By regulation of working time (overtime, flex-time, distribution of work etc)	13,6	34,6	23,7	24,0	4,1
e. By continued vocational training	18,2	41,5	22,8	14,2	3,3
f. By co-operation with other firms or outsourching to other firms or individuals	6,6	24,1	24,6	39,0	5,8
g. By other measures	2,0	6,3	9,3	36,4	46,1

13. Have the firm changed the demands when recruiting employees during the period 1993-95 regarding:

Indicate whether the demands have been larger,smaller, unchanged or are of no importance Mark with X	Larger	Unchanged	Smaller	Not important	Don't know
a. Vocational qualifications	46,0	48,4	1,9	1,3	2,4
b. Ability of co-operation and communica-	51,1	44,1	1,0	1,1	2,7
c. Ability to readjustment	52,1	42,2	1,2	1,4	3,1
d. Responsibility and quality conscious-	61,8	34,0	0,7	0,8	2,6

14. How important is it for the firm's competitiveness that the employees continuously develop their skills?

Indicate degree of	Decisive	Great	Some	None	Don't know
	28,4	39,4	24,7	4,3	2,6

If 'no importance' or 'don't know' - mark with X and go to question 16.

15. How great importance do the following conditions have for the management's efforts to secure that the employees continuously develop their skills?

Indicate degree of importance. Mark with X	Great	Some	Small	None	Don't know
a. By solving working tasks	48,7	41,3	3,3	1,8	4,4
b. By giving time for sparring with management/other employees	26,7	48,2	13,5	6,0	4,6
c. By planned job rotation	7,2	24,2	22,7	28,1	6,9
d. By organising the work in teams	24,8	35,0	15,2	14,6	6,2
e. By prompting co-operation and network across devisions and groups	26,1	32,8	13,0	15,4	6,8
f. By standard courses/educational schemes (e.g. vocational schools and AMU-centres)	11,7	32,6	24,2	21,4	6,2
g. By educational activities tailored to the firm's needs	24,7	32,3	14,6	16,9	6,6
h. By long term educational planning	18,2	32,8	17,6	18,6	7,2
i. Other measures	2,8	6,2	4,9	18,9	52,1

16. How large a part of the firm's employees has taken part in internal or external courses or educational schemes in 1995 or 1996?

Mark with X	None	More than half	Less than half	Don't know
	10,8	39,5	46,7	3,1

If None or Don't know, go to question 19

17. Which subjects have these courses or training schemes dealt with?

Use only X if the answer is yes.	Who arranged the course/training scheme in question?						
	The firm itself	Vocational schools, AMU-centres and VUC-centres	Universities, business schools etc.	Employer and wageearner org.	External consultants	Others	Don't know
a. Strategy, market and customer conditions	37,8	6,3	5,8	10,9	31,8	5,9	1,5
b.New technology	31,9	16,0	4,7	7,1	29,4	10,2	0,6
c.Communication, co-operation etc.	34,3	15,1	4,4	10,2	30,2	4,2	1,5
d.Quality management	39,7	18,1	2,1	10,0	25,0	3,5	1,5
e.Working environment	26,9	20,7	1,3	25,3	16,2	6,2	3,4
f.Environmental demands	26,4	14,7	2,4	22,8	20,1	8,7	4,9
g. Leadership development	27,4	4,0	7,5	15,9	38,8	5,1	1,2
h. Subjects custom tailored to the firm's needs	35,6	16,2	2,4	5,6	31,4	7,0	1,8

If the firm is a part of a concern which arranged the above mentioned educational scheme a X is set for 'the firm itself'.

18. At the average, how many working days per year do various employee groups use for education?

Mark with X	1-5 days	More than 5 days	Not relevant
a. Top management	56,9	33,6	7,6
b. Supervisors and middle management	54,1	37,0	7,0
c. Employees witout real management responsibility	62,9	25,5	9,9

19. According to your experience how much importance do the employees generally attach to the following conditions?

Mark with X	Much	Some	Small	None	Not relevant	Don't know
a. More knowledge about the management's strategy and visions	34,1	43,0	12,1	5,4	1,6	3,9
b. More challenging work	32,4	46,8	10,8	4,1	2,5	3,4
c. Better wage conditions	30,6	49,8	12,6	2,2	1,6	3,2
d. More flexible working time	14,4	36,1	27,9	13,6	4,1	3,9
e. Greater influence upon planning of work	22,3	46,3	18,7	7,1	2,4	3,2
f. More time for education	10,1	41,5	28,2	12,1	2,9	5,2
g. Possibilities for working at home	2,1	8,6	18,7	26,5	36,9	7,2

NEW PRODUCTS/SERVICES AND NEW TECHNOLOGY

20. Has the firm introduced new products/ services during the period 1993-95 when excepting minor improvements of existing products?

Mark with X	Yes	No
	51,7	47,4

If no - go to question 23

21. Are similar products/services found .....

Mark with X	Yes	No	Don't know
a. ..... on the Danish market?	76,9	20,2	2,9
b. ..... on the world market?	78,1	10,8	11,2

22. Has the firm used the development of new products/services to conquer *new* customer groups?

Mark with X	Yes	No
a. On the Danish market?	73,8	24,0
b. On the world market?	48,7	48,7

23. Has the firm introduced new technology during the period 1993-95?

Mark with X	No	Yes. Kindly mark how many		
		Below 25%	25-50%	Above 50%
a. New technology based upon information and communication technology	33,7	39,4	24,0	36,3
b. Other forms of new technology	44,8	53,4	23,0	22,9

COMPETITION AND CO-OPERATION

24. Has the competition from other firms changed during recent years?

Mark with X	Yes	No	Don't know
	74,3	22,0	3,7

If No or Don't know, go to question 26

25. In which direction has the competition changed?

Mark with X The			
Much sharper	A bit sharper	A bit milder	Much milder
53,5	43,9	2,0	0,2

26. To which extent has the firm developed a closer co-operation with the following actors during the period 1993-95?

Mark with X	High extent	Some extent	Small extent	Not at all	Not rele-vant	Don't know
a. Customers	36,7	44,4	8,1	6,7	2,1	2,0
b. Subcontractors	29,4	41,3	18,2	11,3	5,8	3,0
c. Consultants' firms	4,0	18,4	30,6	30,4	13,2	3,5
d. Knowledge centres such as universities and technological institutes	1,8	14,1	21,9	41,7	16,1	4,3
e. Educational institutions	3,9	22,2	25,5	34,0	10,3	4,1
f. Public authorities	2,4	17,0	24,5	39,6	11,8	4,8

27. The firm's relationships

Mark with X	Yes	No	Don't know
a. Is the firm a part of a concern?	44,4	54,4	1,2
b. Does the firm primarily see itself as a subcontractor?	20,8	75,5	3,7

Table A1. *Percentage distribution of 1900 answers (%) regarding total flexibility index (I) and its components/questions*

I	%	5b	5c	6a	6b	6e	6f	12c	12e	15g	15h	20	22b	23a	23b
0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	00	0.0
1	3.1	3.4	5.1	0.0	0.0	22.0	1.7	20.3	0.0	0.0	0.0	1.7	0.0	10.2	6.8
2	5.3	10.0	11.0	8.0	4.0	50.0	6.0	19.0	12.0	13.0	5.0	5.0	0.0	12.0	3.0
3	6.7	21.3	14.2	6.3	5.5	64.6	17.3	22.8	23.6	18.9	8.7	16.5	0.8	21.3	15.0
4	7.3	21.7	13.8	18.1	13.8	81.9	41.3	30.4	24.8	21.0	11.6	23.2	2.2	29.0	15.9
5	7.7	19.9	19.9	18.5	12.3	87.0	41.8	37.7	39.7	32.9	21.2	32.2	10.3	46.6	25.3
6	8.5	21.0	14.2	29.6	21.2	84.6	51.9	37.7	51.9	34.6	30.9	44.4	14.2	66.1	34.6
7	9.7	20.5	18.4	50.8	28.1	92.4	61.6	46.0	61.1	49.2	44.3	42.7	13.5	57.8	43.8
8	10.3	27.2	23.6	51.3	43.1	92.3	65.6	55.4	67.2	63.6	55.4	54.9	15.9	72.8	46.2
9	10.0	27.9	20.5	64.7	51.6	95.8	67.9	59.5	80.5	70.5	63.7	61.6	27.4	85.8	54.2
10	8.9	35.3	25.3	79.4	57.1	97.7	78.8	65.3	82.9	72.9	74.1	73.5	38.8	90.6	61.8
11	9.2	32.8	32.2	94.8	71.3	98.3	82.2	75.3	89.7	84.5	81.6	87.4	48.3	94.3	66.1
12	5.7	60.2	38.0	93.7	72.2	99.1	88.0	75.9	94.5	88.9	83.3	98.2	71.3	95.4	83.3
13	3.7	52.9	34.3	100	92.9	100	94.3	91.4	100	98.6	98.6	100	87.1	97.1	87.1
14	1.7	100	62.5	100	100	100	100	100	100	100	100	100	100	100	100
	100	27.7	21.4	49.3	37.6	84.3	56.4	49.7	58.7	52.0	46.5	50.8	24.7	62.8	43.3

Note: Question 5c shows 62.5 pct which is inconsistent with the computation of the index. The reason for this error has not yet been found.

Table A2. *The distribution of firms along flexibility, occurrence of major organisational changes 1993-95, and experiences with a sharpening of competition during recent years*

Index	Per cent of 1900 firms	Major organisational changes 1993-95 P.c.	Sharpening of competition	
			Much P.c.	Some P.c.
0	2,3	13,6	20,5	13,6
1	3,1	6,8	23,7	10,2
2	5,3	11,0	20,0	22,0
3	6,7	26,7	25,2	28,4
4	7,3	32,6	32,6	26,1
5	7,7	36,3	34,9	30,1
6	8,5	46,3	36,4	37,7
7	9,7	43,2	41,1	35,1
8	10,3	61,5	45,1	32,3
9	10,0	66,3	45,3	34,2
10	8,9	67,1	37,7	40,6
11	9,2	79,3	45,4	37,4
12	5,7	82,4	50,0	38,0
13	3,7	90,0	62,9	31,4
14	1,7	97,0	68,8	28,1
Total	100,0	51	53,5	43,9

Table A3. *Changes in employees' work content during the period 1993-95 conditioned by flexibility*

In-dex	Work auton-omy		Specialisation		Routine work		Co-operation with collea-gues		Co-operation with manage-ment		Vocational qualifications	
	More	Less	More	Less	More	Less	More	Less	More	Less	More	Less
0	9.1	0.0	2.3	2.3	4.6	0.0	6.8	0.0	6.8	0.0	6.8	0.0
1	15.3	0.0	5.1	1.7	5.1	0.0	8.5	0.0	8.5	1.8	10.2	3.4
2	18.0	1.0	14.0	5.0	7.0	7.0	12.0	5.0	13.0	4.0	21.0	2.0
3	24.4	3.2	26.0	2.4	5.5	6.3	18.1	3.9	21.3	3.2	27.6	3.9
4	36.2	3.6	17.4	8.7	6.5	11.6	23.2	4.4	25.4	6.5	29.7	5.1
5	39.0	6.2	26.0	8.2	9.6	15.1	30.1	4.8	30.1	6.9	34.3	6.9
6	53.7	6.2	24.7	16.1	10.5	21.6	39.5	8.6	40.1	6.2	40.7	8.6
7	49.7	3.2	30.8	11.4	6.0	29.7	36.8	4.9	43.2	6.0	49.2	5.4
8	65.6	3.6	34.9	13.9	5.1	31.3	46.7	7.2	55.4	6.2	54.9	6.2
9	64.7	4.7	37.9	20.5	7.9	33.2	54.7	4.2	56.3	4.2	54.7	6.8
10	75.3	2.9	44.1	15.9	7.7	42.9	58.2	5.3	63.5	2.9	58.2	7.1
11	77.6	1.7	37.9	21.8	5.8	48.3	64.4	6.9	71.3	8.1	62.6	7.5
12	78.7	2.8	34.3	27.8	5.6	47.2	69.4	3.7	72.2	3.7	70.4	10.2
13	88.6	4.3	40.0	22.9	2.9	74.3	80.0	4.3	84.3	1.4	67.1	8.6
14	93.8	0.0	31.3	46.9	6.3	62.5	90.6	6.3	90.6	3.1	65.6	9.4
	54.7	3.4	29.8	14.4	6.7	28.8	43.0	5.2	46.6	5.1	46.1	6.3

Table A4. *The relationship between flexibility and elements which have caused changes of employees' work content to a high degree during the period 1993-95*

Index	Need for greater flexibility among employees	Sharper competition	Introduction of new technology	Need for better contact to customers	Better possibilities for development of employee qualifications	Better possibilities for development of new products	Need for better contact to sub-suppliers	Demand and wishes from employees
0	2.3	4.6	0.0	0.0	0.0	0.0	0.0	0.0
1	3.4	8.5	0.0	1.7	0.0	3.4	0.0	1.7
2	17.0	10.0	3.0	13.0	6.0	4.0	3.0	5.0
3	11.0	13.4	8.7	11.0	1.6	5.5	6.3	3.2
4	10.9	22.5	12.3	10.9	2.2	5.1	4.4	4.4
5	17.1	24.0	15.1	18.5	7.5	8.9	5.5	4.1
6	31.5	30.9	24.7	21.0	8.6	8.0	9.3	7.4
7	28.1	22.7	21.6	21.1	8.1	9.2	4.9	6.5
8	28.2	35.4	33.3	24.6	15.9	15.4	8.2	14.4
9	38.4	36.8	39.0	28.4	19.0	12.6	10.0	13.2
10	42.9	40.0	44.7	34.1	23.5	23.5	11.8	12.4
11	47.7	35.6	46.6	31.6	20.1	15.5	14.4	11.5
12	50.0	41.7	45.4	35.2	23.2	25.0	25.9	15.7
13	71.4	60.0	41.4	45.7	42.9	22.9	24.3	15.7
14	71.9	53.1	59.4	40.6	56.3	50.0	25.0	40.6
Total	31.0	29.7	27.7	23.2	14.0	12.8	9.6	9.5

Table A5. *Percentage distribution of the firms according to flexibility and changes in the firms' recruitment demands 1993-95*

Flexibility index	Changes of recriutment demands 1993-95			
	Vocational qualifications	Ability of co-operation and communication	Ability of readjustment	Responsibility and quality consciousness
	2,3	2,3	2,3	11,4
1	15,3	11,9	10,2	23,7
2	27,0	25,0	24,0	35,0
3	32,3	22,8	21,3	38,6
4	33,3	31,2	30,4	39,9
5	39,7	41,1	43,8	48,0
6	41,4	51,9	46,9	64,2
7	46,0	48,1	51,4	67,0
8	53,9	53,9	52,8	66,7
9	53,2	60,0	66,3	71,6
10	52,9	60,6	65,9	71,8
11	57,5	73,6	70,7	79,3
12	52,8	76,9	78,7	81,5
13	72,9	82,9	87,1	84,3
14	68,8	84,4	90,6	87,5
Total	45,3	50,3	51,3	60.9

Table A6. *The extent of education among top management, middle management and supervisors, and employees.*

Flexibility index	Employees		Middle management and supervisors	Top management
	More than half of the employees	More than five days	More than five days	More than five days
0	0.0	0.0	0.0	0.0
1	5.1	3.4	5.1	8.5
2	12.0	13.0	6.0	6.0
3	18.1	7.1	10.2	12.6
4	20.3	8.0	10.9	13.8
5	25.3	17.8	23.3	21.2
6	32.1	19.1	26.5	27.2
7	35.1	21.1	29.2	22.2
8	42.6	21.5	38.0	33.9
9	49.0	25.8	42.1	40.5
10	51.8	30.0	40.6	32.4
11	61.5	34.5	51.2	46.6
12	71.3	34.3	57.4	46.3
13	60.0	32.9	48.6	48.6
14	87.5	53.1	62.5	46.9
Total	38.8	21.6	31.4	28.4

Table A7. *The distribution of firms according to flexibility and the subjects of employees' courses or training schemes*

Index	Strategy,market and customer conditions	New technology	Communication, sooperation etc	Quality management	Working environment	Environmental demands	Leadership development	Subjects custom tailored to the firm's needs
0	2.3	6.8	2.3	2.3	2.3	0.0	2.3	0.0
1	8.5	13.6	5.1	8.5	15.3	6.8	3.4	18.6
2	17.0	23.0	12.0	14.0	16.0	15.0	7.0	22.0
3	20.5	35.4	13.4	25.2	17.3	12.6	21.3	25.2
4	29.0	39.9	22.5	33.3	24.6	20.3	25.4	31.2
5	32.2	39.0	25.3	31.5	24.0	17.8	26.7	39.7
6	46.9	58.0	35.2	46.9	39.5	27.2	32.7	38.3
7	49.7	60.5	47.0	50.3	37.8	29.7	47.6	40.5
8	51.8	68.2	47.2	58.0	42.1	30.8	47.7	49.7
9	68.4	82.1	62.1	65.8	43.7	39.0	59.0	58.4
10	65.9	80.6	61.8	72.9	51.2	44.7	67.7	64.7
11	77.0	89.7	73.0	75.9	62.6	53.5	75.3	74.1
12	79.6	88.0	82.4	86.1	67.6	52.8	88.9	68.5
13	90.0	91.4	82.9	90.0	71.4	71.4	87.1	84.3
14	84.4	93.8	93.8	93.8	84.4	78.1	93.8	87.5
Total	50.4	61.5	45.5	52.3	40.1	32.8	46.8	48.0

Table A8. *Percentage distribution of the firms according to flexibility and whether they have developed a closer co-operation to a high extent or some extent with other firms and institutions*

Index	Customers	Subcon-tractors	Consul-tants' firms	Knowled-ge centres	Educatio-nal insti-tutions	Public authories
0	29.6	15.9	4.6	0.0	2.3	4.6
1	44.1	30.5	0.0	1.7	6.8	5.1
2	59.0	43.0	6.0	4.0	13.0	12.0
3	62.2	44.1	8.7	5.5	13.4	10.2
4	65.9	50.0	12.3	2.9	8.7	9.4
5	75.3	58.2	11.6	2.1	14.4	10.3
6	77.8	51.2	16.1	11.7	19.1	13.0
7	83.8	61.6	20.5	12.4	21.6	17.3
8	86.2	61.5	24.6	15.4	26.2	21.0
9	90.0	70.5	27.4	18.4	27.9	23.7
10	90.0	63.5	28.8	20.0	28.2	24.1
11	91.5	77.6	35.1	30.5	43.7	25.9
12	97.2	82.4	39.8	38.0	46.3	35.2
13	100.0	91.4	44.3	42.9	65.7	40.0
14	96.9	84.4	50.0	43.8	75.0	37.5
Total	79.8	60.6	21.9	15.7	25,6	19.0

Table A9. *Distributions of firms regarding facilitators (+) and obstacles (-) to organisational change conditioned by flexibility*

In-dex	Middle mgt. attitudes		Middle mgt. qualifications		Employees' attitudes		Employees' qualifications		Knowledge from other firms	
	+	-	+	-	+	-	+	-	+	-
0	2.3	0.0	2.3	0.0	4.5	4.6	4.5	4.6	0.0	0.0
1	15.3	3.4	11.9	5.1	11.9	3.4	16.9	5.1	6.8	0.0
2	23.0	4.0	22.0	6.0	24.0	7.0	25.0	8.0	13.0	1.0
3	29.1	7.9	33.1	9.5	33.9	11.0	30.7	6.3	16.5	0.8
4	37.0	8.0	31.2	10.9	33.3	12.3	31.2	7.2	17.4	1.5
5	46.6	11.6	43.2	13.7	41.1	14.4	39.7	11.6	20.6	2.1
6	48.2	13.0	38.9	14.2	46.9	10.5	42.6	8.0	29.0	1.9
7	54.6	14.1	43.8	15.7	49.7	16.2	42.7	10.3	32.4	3.2
8	53.3	24.1	44.1	22.1	50.8	21.0	42.6	13.8	30.3	0.5
9	58.9	19.0	44.7	28.4	55.8	22.6	44.2	20.0	45.8	1.1
10	58.8	19.4	52.4	21.8	51.8	22.4	48.8	14.7	40.0	2.9
11	58.6	23.6	46.6	27.0	52.9	20.7	41.4	16.7	50.6	1.7
12	61.1	23.2	50.0	27.8	56.5	23.2	51.9	25.9	55.6	0.9
13	55.7	32.9	50.0	38.6	62.9	24.3	54.3	30.0	51.4	1.4
14	46.9	43.8	53.1	40.6	68.8	18.8	62.5	12.5	59.4	3.1
	47.7	16.3	40.5	18.9	45.4	16.6	40.1	13.3	32.4	1.6

In-dex	Co-op. with educat.inst.		Co-op. com-mittees		Shop stewards		Consultants' qualificat.		Public support measures	
	+	-	+	-	+	-	+	-	+	-
0	2.3	0.0	2.3	0.0	2.3	0.0	0.0	0.0	0.0	0.0
1	13.6	1.7	5.1	0.0	1.7	3.4	0.0	0.0	5.1	0.0
2	12.0	2.0	6.0	3.0	8.0	2.0	1.0	1.0	7.0	2.0
3	19.7	0.8	11.8	1.6	12.6	1.6	11.0	0.8	9.5	0.0
4	17.4	1.5	15.9	0.0	13.0	1.4	17.4	1.5	5.8	1.4
5	25.3	2.1	20.5	1.4	18.5	6.2	16.4	2.7	6.2	1.4
6	19.8	0.6	17.3	1.2	15.4	6.8	17.9	0.6	11.7	1.9
7	21.1	2.7	21.6	2.2	22.7	5.9	15.7	4.3	10.3	3.2
8	28.7	2.6	28.7	1.5	22.1	6.1	25.6	2.1	11.8	1.0
9	37.4	1.1	32.1	1.6	28.4	6.8	30.5	2.6	18.4	1.6
10	34.7	1.8	40.0	1.2	36.5	5.9	29.4	2.4	14.1	2.4
11	41.4	1.7	39.7	2.3	37.4	4.6	33.3	2.3	12.7	1.7
12	50.9	0.0	38.0	4.6	31.5	6.5	38.0	2.8	21.3	0.9
13	52.9	1.4	50.0	11.4	48.6	14.3	44.3	1.4	34.3	1.4
14	68.8	3.1	50.0	6.2	56.3	9.4	53.1	3.1	40.6	3.1
	28.9	1.6	25.8	2.1	23.6	5.4	22.4	2.1	12.7	1.6

Danish **R**esearch **U**nit for **I**ndustrial **D**ynamics

The Research Programme

The DRUID-research programme is organised in 3 different research themes :

- The firm as a learning organisation

- Competence building and inter-firm dynamics

- The learning economy and the competitiveness of systems of innovation

In each of the three areas there is one strategic theoretical and one central empirical and policy oriented orientation.

Theme A: The firm as a learning organisation

The theoretical perspective confronts and combines the ressource-based view (Penrose, 1959) with recent approaches where the focus is on learning and the dynamic capabilities of the firm (Dosi, Teece and Winter, 1992). The aim of this theoretical work is to develop an analytical understanding of the firm as a learning organisation.

The empirical and policy issues relate to the nexus technology, productivity, organisational change and human ressources. More insight in the dynamic interplay between these factors at the level of the firm is crucial to understand international differences in performance at the macro level in terms of economic growth and employment.

Theme B: Competence building and inter-firm dynamics

The theoretical perspective relates to the dynamics of the inter-firm division of labour and the formation of network relationships between firms. An attempt will be made to develop evolutionary models with Schumpeterian innovations as the motor driving a Marshallian evolution of the division of labour.

The empirical and policy issues relate the formation of knowledge-intensive regional and sectoral networks of firms to competitiveness and structural change. Data on the structure of production will be combined with indicators of knowledge and learning. IO-matrixes which include flows of knowledge and new technologies will be developed and supplemented by data from case-studies and questionnaires.

Theme C: The learning economy and the competitiveness of systems of innovation.

The third theme aims at a stronger conceptual and theoretical base for new concepts such as 'systems of innovation' and 'the learning economy' and to link these concepts to the ecological dimension. The focus is on the interaction between institutional and technical change in a specified geographical space. An attempt will be made to synthesise theories of economic development emphasising the role of science based-sectors with those emphasising learning-by-producing and the growing knowledge-intensity of all economic activities.

The main empirical and policy issues are related to changes in the local dimensions of innovation and learning. What remains of the relative autonomy of national systems of innovation? Is there a tendency towards convergence or divergence in the specialisation in trade, production, innovation and in the knowledge base itself when we compare regions and nations?

The Ph.D.-programme

There are at present more than 10 Ph.D.-students working in close connection to the DRUID research programme. DRUID organises regularly specific Ph.D-activities such as workshops, seminars and courses, often in a co-operation with other Danish or international institutes. Also important is the role of DRUID as an environment which stimulates the Ph.D.-students to become creative and effective. This involves several elements:

- access to the international network in the form of visiting fellows and visits at the sister institutions
- participation in research projects
- access to supervision of theses
- access to databases

Each year DRUID welcomes a limited number of foreign Ph.D.-students who wants to work on subjects and project close to the core of the DRUID-research programme.

External projects

DRUID-members are involved in projects with external support. One major project which covers several of the elements of the research programme is DISKO; a comparative analysis of the Danish Innovation System; and there are several projects involving international co-operation within EU's 4th Framework Programme. DRUID is open to host other projects as far as they fall within its research profile. Special attention is given to the communication of research results from such projects to a wide set of social actors and policy makers.

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