

Synopsis for the Danish Cluster Studies

By Michael S. Dahl, DRUID/IKE-Group¹

Introduction

This synopsis is an introduction to the three studies, which are the Danish contributions to the comparative studies in the OECD Cluster Focus Group this year. The writer carries out the studies on behalf of the Danish Agency for Trade and Industry. The Danish contributions are studies of three Danish clusters, ICT, Construction and Agro-food.

The studies will be divided into seven chapters. The first chapter will give an introduction to the analysis and to the clusters. The next chapter will give a description of the existing literature and methodology on clusters and cluster analysis. The third will analyse and discuss the definition of the clusters. The fourth will describe the historical development of the cluster and accentuate some key features of its development. The next will give a description of some of key competencies and characteristics of the clusters. The sixth chapter will give some empirical facts of the clusters and their development. It will include some international comparisons. Finally, the last chapter will give the concluding remarks.

Theory and methodology of analysing clusters and the three clusters will be briefly introduced in this synopsis.

Existing cluster theory and methodology

The approach to see industrial specialisation and competitive strength in Danish agriculture as a cluster originally came from by Lundvall *et.al.* in 1983. The work was used in the case studies of the Danish economy, which was made by Møller & Pade (1988) as the Danish contributions to Porters book, "The Competitive Advantage of Nations" (1990). But still there was and is a need for a more precise definition of cluster. A step in that direction is the contributions from Porter in 1998.

According to Porter (1998) a cluster is "*a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalties and complementarities.*" This rather broad definition of a cluster enables a cluster to be broader than a single industry. A broad cluster captures important linkages and spillovers of technology between industries, which are fundamental to competition, productivity and to innovation. The geographic scope of a cluster ranges from a single city or region to a country or even a network of regions in neighbouring countries. Clusters vary in size, depth and level of aggregation across geographic localisation, industries and from

¹ Department of Business Studies, Aalborg University. Fibigerstraede 4, DK-9220 Aalborg. E-mail: md@business.auc.dk. The analysis of ICT is written in collaboration with Bent Dalum, who also supervises the other studies.

cluster to cluster. In one of the clusters, which is the case here, the agro-food cluster in Denmark could include industries, which are not included in agro-food clusters in other countries.

The boundaries of a cluster change over time as new firms, industries and institutions evolve and as established industries and institutions change. Government legislation also contributes to the change of a cluster as new laws and regulatory changes make new demands for the cluster. In this case, legislation on the quality of agro-food related products will directly influence the development of the cluster.

This will end with a discussion of the methodology in a cluster study. Which includes a discussion of how it has been done in Denmark by the policy makers in the Danish Agency for Trade and Industry (the Danish Mega Clusters).

Danish Mega Clusters approach

The Danish Mega Clusters (DMC) approach to studying specific industrial areas of business is intended to strengthen the framework for the development of Danish industry. This approach is based on several studies of specific parts of the Danish economy, which is the foundation for dialogs with the firms and organisations involved in the specific clusters. The purpose of dividing the clusters into different areas is to capture important differences in different clusters. The goal of this is to put forward very specific policy implications on each cluster in order to improve the conditions for the clusters. With this agenda the DMC studies is planned to be a corner stone in development of new conditions for industrial policy in the future.

The DMC project is based on dialog between many different actors, i.e. a reference group, a panel of experts and dialog groups with representatives from firms in the specific clusters. Each cluster is analysed thoroughly by the Agency for Trade and Industry, who then discusses the analysis of each cluster with the industry and the firms in cluster through dialog. The result of this is a formulation of direct policy implications tailored for each cluster of interest.

The ICT cluster

The importance of ICT sectors has increased rapidly during the last decade. Not only the ICT sector itself has experienced high growth, but also a lot of other sectors, which have implemented ICT related products and service, have experienced growth.

The aggregation of ICT is a fairly new aggregation of interconnected business. This means that there is a need for an exact definition of, which industries and sector belong in this area. Furthermore it is necessary to categorise the activities in the ICT in order to get an overview of the activities.

Defining the cluster

Looking at a comparison of the available definitions (see table 1 in appendix comparing ICT definitions) from the Danish Mega Clusters (EFS, 2000b), Nordic Statistical Institutes (1998) and

the Dutch OECD Cluster Focus Group contribution on ICT (Brouwer & den Hertog, 2000), there is a few differences between the definitions.

The Danish Mega Cluster (DMC) and the Dutch definitions are very similar. They both include activities like newspapers, reproduction of all kinds of sound and video and publishing. The only differences between the two are that production of office machinery, wholesale and retail of ICT activities are included in DMC and that photographic and videotape rental are included in the Dutch definition. It is odd that the Dutch definition neglects the production of office machinery, which belongs to core of the manufacturing activities.

The more narrow definition from the Nordic Statistical Institutes (1998) concentrate on activities on four aggregated areas, manufacturing, wholesale, telecommunication and consultancy services/renting of machinery. But this definition neglects the retail and the media related activities.

The Construction cluster

This cluster analysis will be describing the construction cluster in Denmark. The cluster has a long and interesting history that shows the important events, which has formed the cluster as an internationally competitive Danish sector. The cluster analysis will primarily be based on the newly released Danish Mega Cluster analysis of the main part of the cluster from the Danish Agency for Trade and Industry.² This will be combined with existing theoretical cluster literature and empirical comparisons of the cluster made by the author.

The construction Danish Mega Cluster has always been rather sensitive to changes in business cycles. Furthermore, the Danish Mega Cluster is characterised by a relatively high number of employees per Danish Kroner in turnover and a relatively low import ratio per Danish Kroner in turnover. So the sector has been used as and instrument for the Government to stimulate the entire economy, e.g. by implementing public investments in infrastructure.

The history of the Danish construction cluster has been highly influenced by regulative legislation. The Government has influenced the growth of the sector in the last century. In the 1950s there was an extensive demand for housing in Denmark. To solve the problem there was a need for an industrialisation of the construction sector. This led the Government to set up new regulations promoting this industrialisation. By subsidising both private and public funded housing projects, they succeeded in moving the production from the building sites to production plants or factories. This movement of the physical activities was necessary in order to receive the subsidy. By doing this, the Government succeeded in promoting the production of housing and the industrialisation of the sector.

Furthermore the structure of financial side of the sector, the building societies, has contributed to development. When a house is build, the debt of the house stays with the house, when it is bought and sold. This means that a considerable share of people is able to build and own a home.

This explains that Denmark has a relatively large share of people owning their homes, and plays an important role in the history of the sector.

The fact that people own their homes is closely connected with the development of the furniture and appliances industries. In Denmark there has been a large market for specially designed furniture and appliances, because a home is considered a unity and the appearance, tastes and fashion is important. This makes people willing to pay large amounts for the right kind of furniture (Scandinavian Design). This also applies to domestic appliances.

EFS (2000a) emphasises three mayor problems for the cluster, which are interconnected:

- **Demands of the end-users are not meet properly.** In a market utility and price are compared in order to meet the demand. But firstly, in construction the true price of the project is not present until long after the demand of the end-users are formulated. Secondly, the formulation of demand is often made a third person (e.g. a consultant or architect) and the ultimate end-user of the project is not involved in the formulation.
- **Prices are too high.** The splitting of project formulation and construction means that it is impossible for end-users to gain knowledge of the market, because no exact knowledge of the prices is present at the time the project is formulated.
- **New houses and buildings contain too many errors.** It is a problem when a construction project involves 15-25 different professions. This increases the risk of error, when the construction goes from one profession to another. When the price of a project near it's finish are much higher than the price in the beginning costs are lowered, which results in more building errors.

Competencies

Summarised the cluster has key competencies on the following areas:

- Building techniques
- High skilled non-educated labour
- Energy and environmental technology
- Danish architecture and design (High overall level)
- Physical planning and logistics (Increase speed of production)

Defining the cluster

The existing delimitation of construction in the Danish Mega Cluster (DMC) definition from EFS (2000a) is not directly compatible with a definition of a cluster in the light of the existing theory. An important aspect of a construction cluster has been left out of the DMC definition.

² Danish Agency for Trade and Industry [EFS](2000a), "Bygge/Bolig - en erhvervsanalyse", Analysis of the Danish Resource Areas.

Presumably, because the division of the firm side of the economy into DMC does not allow firms or industries to be included in more than one DMC. Therefore furniture and household appliances has been left out of the DMC definition.

Furthermore, it is clear that these industries belong in a construction cluster, when keeping Porters (1998) implications in mind. The development and the competitive position of these industries are important, because their development is a large part of the entire development of the cluster. The strong positions in furniture and household appliances in Denmark are closely connected with the development of the construction industry and should therefore be included. Household appliances are considered a part of a house in Denmark and usually stays in a house, when the owner of a house changes. This might not be the case for other countries. Thus household appliances might not be a part of a construction cluster in other countries although it is a part of a Danish construction cluster.

The Agro-food cluster

The food industry is a very important industry for the Danish economy. One third of the Danish exports come from the food industry and more than 350.000 people are employed in the industry (EFS, 2000b). This makes Denmark the fifth largest exporter of products from this industry.

The agro-food cluster is highly internationally competitive. This is primarily founded in the structural and business synergies between the branches in the sectors of the cluster. Adding to this come the rationalisations of structures of the cluster, which has been successfully initialised, and the high international quality demands, which continually have formed the cluster.

According to the 1993 Danish Mega Cluster analysis from EFS the main weakness of the cluster was the low level of investments (EFS, 1993). But it is interesting to know if this still is the case and if the low level of investments was correlated with the general recession of the Danish economy in beginning of the 1990s.

Historical development and key characteristics

The history of agro-food cluster is highly influenced by the history of the primary sector, especially agriculture. The co-operative movement of the cluster and the vertical integration have been important features. The co-operative movement has dominated the owner and managerial structure with the primary sector as the owners of slaughterhouses and dairies. The purchasing function of firms in the cluster has also been co-ordinated with one single company in charge of purchasing for the entire industry. This has also been the case for consultant businesses, research and education, with noticeable success.

This holds especially for the agricultural part of the primary sector. Fishing has only to a small extent been as integrated as agriculture. Historically the fishing sector has been an important part of the economy, because of the big supply of resources, early industrialisation of the sector and considerable exports.

The Danish agro-food cluster is characterised by being a coherent system with strong vertical and horizontal linkages. Mutual dependency between the different actors in the system has led to important synergy effects.

The high integration of the agro-food cluster and the competition between the firms has created competitive advantages. Favourable co-operation on quality control to meet the high demands from the market has been possible due to the mutual dependency and vertical ownership. High international quality demands has influenced the competitive position of the cluster, and the Danish firms have been able to gain access to important international markets, e.g. Japan (EFS, 1993).

The co-operative structure is also a mayor problem or challenge for the cluster in the near future. The ecology movement, which began in Denmark in the mid-90s, has raised demand for ecological product. Demand for these products are increasing, but the supply is relatively low, because a majority of farmers are too conservative to meet the demand on ecology. This is spread to the entire cluster through the co-operative structure. The refusal to adjust to the new and increasing consumer demand on this point is a growing threat as more people and countries are moving towards ecological food products.

Defining the Agro-food cluster

The Danish Mega Cluster definition from EFS includes the primary businesses (e.g. farming, fishing or gardening), food processing industry, retail and wholesales businesses and the suppliers in the DMC. This definition is not directly compatible with the OECD Cluster Focus Group (FG) definition in Hauknes (1999) (See table 2 comparing the NACE codes in appendix).

Apparently the Danish definition is describing the agricultural linkages, while the Cluster FG definition concentrates more on the linkages in fishing. Furthermore supporting services and production of machinery or packing is not included in the FG definition. This is quite odd since hotels, restaurants and catering are included, but not in the RA definition.

This should be combined in the forthcoming comparative studies of the cluster in the OECD Cluster FG in order to give the best picture of the entire cluster. Further discussion of this will be made in the analysis after a discussion with the agro-food countries.

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Note: Translation of Danish titles in brackets.

Appendix

ICT cluster definitions

The Agro-food cluster contains the following sector in the Danish Mega Cluster, the Nordic Statistical Institutes and Brouwer & den Hertog, respectively.

Table 1: Comparison of the ICT definitions

DMC	Description	Nordic	Dutch
2221	Printing of newspapers	NOT INCLUDED	2221
2222	Other printing	NOT INCLUDED	2222
2223	Bookbinding and finishing	NOT INCLUDED	2223
2224	Composition and plate-making	NOT INCLUDED	2224
2225	Other activities related to printing	NOT INCLUDED	2225
2231 + 2232 + 2233	Reproduction of sound recording, video recording and computer media	NOT INCLUDED	2231 + 2232 + 2233
3001	Manufacture of office machinery	3001	NOT INCLUDED
3002	Manufacture of computers and other information processing equipm.	3002	3002
3220	Manufacture of RTV transmitters & apparatus for line telephony/teleg.	3220	3220
3230	Manufacture of RTV receivers, sound/video recording or reproducing app.	3230	3230
3320	Manufacture of instruments and appliances for control, testing and etc.	3320	3320
3330	Manufacture of industrial process control equipment	3330	3330
3130	Manufacture of insulated wire and cable	3130	3130
3210	Manufacture of electronic valves and tubes and other electr. comp.	3210	3210
3340	Manufacture of optical instruments and photographic equipment	NOT INCLUDED	NOT INCLUDED
2211 - 2215	Publishing	NOT INCLUDED	2211 - 2215
5143 + 5164 + 5165	Wholesale of ICT equipment	5143+5164+5165	NOT INCLUDED
5245 + 5247	Retail of ICT equipment	NOT INCLUDED	NOT INCLUDED
5272	Maintenance and repair of consumer electronics	NOT INCLUDED	NOT INCLUDED
6420	Telecommunications	6420	6420
7133	Rental and leasing of ICT equipment	7133	NOT INCLUDED
7210	Hardware consultancy	7210	7210
7220	Software consultancy and supply	7220	7220
7230	Data processing.	7230	7230
7240	Database activities	7240	7240
7250	Maintenance and repair of office, accounting and computing machinery	7250	7250
7260	Other computer related activities	7260	7260
7440	Advertising	NOT INCLUDED	7440
9211 - 9213	Motion picture activities	NOT INCLUDED	9211 - 9213
9220	Radio and television activities	NOT INCLUDED	9220
9240	Press agencies	NOT INCLUDED	NOT INCLUDED
9251	Libraries	NOT INCLUDED	9251
NOT INCLUDED	Photographic activities	NOT INCLUDED	7481
NOT INCLUDED	Videotape rental	NOT INCLUDED	71401

Sources: EFS (2000b), Nordic Statistical Institutes (1998) and Brouwer & den Hertog (2000).

Agro-food cluster definitions

The Agro-food cluster contains the following sector in the Danish Mega Cluster and OECD Cluster FG definitions, respectively.

Table 2: Comparison of the agro-food definitions

Included in DMC	Description	Included in FG
Primary Businesses		
11	Agriculture	11
12	Live stock	12
13	Plants and live stock (mixed businesses)	13
14	Agriculture and husbandry service activities	14
15	Hunting (plus services connected)	NOT INCLUDED
501	Fishing	501
502	Fish hatcheries and fish farming	502
1430	Extraction of minerals for producing chemical and fertiliser products	NOT INCLUDED
Manufacturing of food and food products		
151	Meat and meat products	151
152	Fish products	152
153	Fruit and vegetables	153
154	Vegetable and animal oil and fats	154
155	Dairy products	155
156	Grain mill products, starches	156
157	Prepared animal food	157
158	Other food products	158
159	Beverages	159
160	Tobacco	NOT INCLUDED
Supporting sectors		
1571	Production of final feed products	NOT INCLUDED
1752	Ropewalks and producers of trawls, dragnets etc.	NOT INCLUDED
2121	Production of paper packing and corrugated cardboard	NOT INCLUDED
2415	Production of fertilisers	2415
2420	Production of nitrogen compounds and pesticides	242
2522	Production of plastic packing	NOT INCLUDED
2613	Production of glass and jars	NOT INCLUDED
2872	Production of cans	NOT INCLUDED
2924	Production of machinery for other general purposes	NOT INCLUDED
2931	Production of tractors	NOT INCLUDED
2932	Production of other machines for agriculture	NOT INCLUDED
2953	Production of machines for producing food and food products	NOT INCLUDED
NOT INCLUDED	Building and repair of ships	35111 - 35113
NOT INCLUDED	-	35116 - 35117 + 3512
NOT INCLUDED	Hotels and accommodation	551 + 552
NOT INCLUDED	Restaurants and catering	553 - 555
141	Farming Services	NOT INCLUDED
142	Services connected with live stock (not vets)	NOT INCLUDED
503	Fishing Services	NOT INCLUDED
5110	Wholesale of food and food products	NOT INCLUDED
5211	Retail businesses of food and food products	NOT INCLUDED
7131	Leasing of equipment	NOT INCLUDED
8520	Veterinarians	NOT INCLUDED

Source: EFS (2000b) and Hauknes (1999)