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Lokal innovation og produktion af teknologi til fiskeindustri

-Betingelser for lokalisering af innovation og produktion af maskiner og udstyr til fiskeindustri i Alaska og Island

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Résumé of the Ph.D. thesis:

Local Innovation and Production of Technology for Fish Processing

- Conditions for localisation of innovation and production of machinery and equipment for the fish processing industry in Alaska and Iceland

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The background to the thesis lies in the attempts made in the Arctic and Sub-Arctic regions and countries in the second half of the 20th century to move towards political, cultural and economic independence of their southern parent countries. Setting up a more independent economy is, if not a precondition, then certainly an important factor in securing the material basis for independence in the regions. The northern (Arctic and Sub-Arctic) regions have already begun to make advances in the industrial processing of their own natural resources. The next step towards a higher degree of independence of the economies requires that a larger part of the value chain be located within the regions themselves. This forms, then, the central issue addressed by the thesis: What conditions are required for the development of the manufacture of productive assets in the peripheral northern regions?

Many northern regions are highly dependent on their fisheries, with fish processing in several places figuring as the dominant manufacturing industry. There are a number of instances where the requirements of the local fish processing industry have triggered the development and production in situ of machines for both local demand and export.

Among the northern regions, Alaska and Iceland catch and process the greatest volumes of fish. The fish processing plants in the two regions have the *potential* to constitute an important market for local manufacturers of fish processing equipment. A number of initiatives directed at innovation of machinery for fish processing have been recorded in both regions. But while a number of companies manufacturing machines for fish processing have developed in Iceland, these have not been matched by counterparts in Alaska.

Thus the empirical problem the thesis addresses may be formulated as follows:

Why does the innovation of machines and equipment for fish processing in Iceland result in their subsequent manufacture there, while innovation of machines for fish processing in Alaska are not similarly translated into production?

What are the regional developmental dynamics and barriers that determine whether or not innovation results in production?

The theoretical objective of the thesis is to add to the understanding of the concept 'localised learning', not least as regards the geographical discussion of local learning as a way of building regionally specific competitive advantages¹.

Theoretical framework

The theoretical framework is covered in two chapters, which address the issue of which factors importantly influence the competitive power of innovative production, and how such factors localise.

In the first chapter dealing with the theoretical framework (chapter 2) the parameters influencing the competitive power of innovative production is discussed. The discussion is predicated on the assumption that knowledge and learning are central elements in the innovation process. The chain model of innovation² lays weight on the fact that the team involved in the innovation process is in continuous interaction with others, both in-house and with external actors, in order to acquire the knowledge needed to carry the process further. In this process knowledge and learning are the central elements. It is stressed that learning is contingent both on the existing structures of knowledge and on the social and psychological climate surrounding the learning process. Knowledge is defined on two dimensions: as tacit or codified knowledge and as embodied or disembodied knowledge. Further, three types of learning process, which the companies can set up in relation to actors external to the organisation, are defined.

In the context of this conception of innovation and learning processes four factors which importantly influence the competitive power of innovative production are specified in general terms.

- Low unit costs, as competition on price may still be a factor in 0 production.
- The general institutional background framework including legal institutions, institutions offering vocational training to secure a qualified work force, research institutions and institutions charged with the diffusion of scientific and technological knowledge etc.³.
- Dynamic structural tensions between companies in complementing sectors, and the innovative company's opportunities to forge relations to complementing companies⁴, and
- The presence of informal institutions, including companies in the complementing sectors⁵.

¹ Which among others Asheim 1996, Malmberg, 1997, Maskell et al. 1998. discuss

² Kline & Rosenberg 1986

³ North 1990, Rosenberg & Birdzell 1986

⁴ Dahmén 1988, Lundvall 1992

⁵ Håkansson 1989

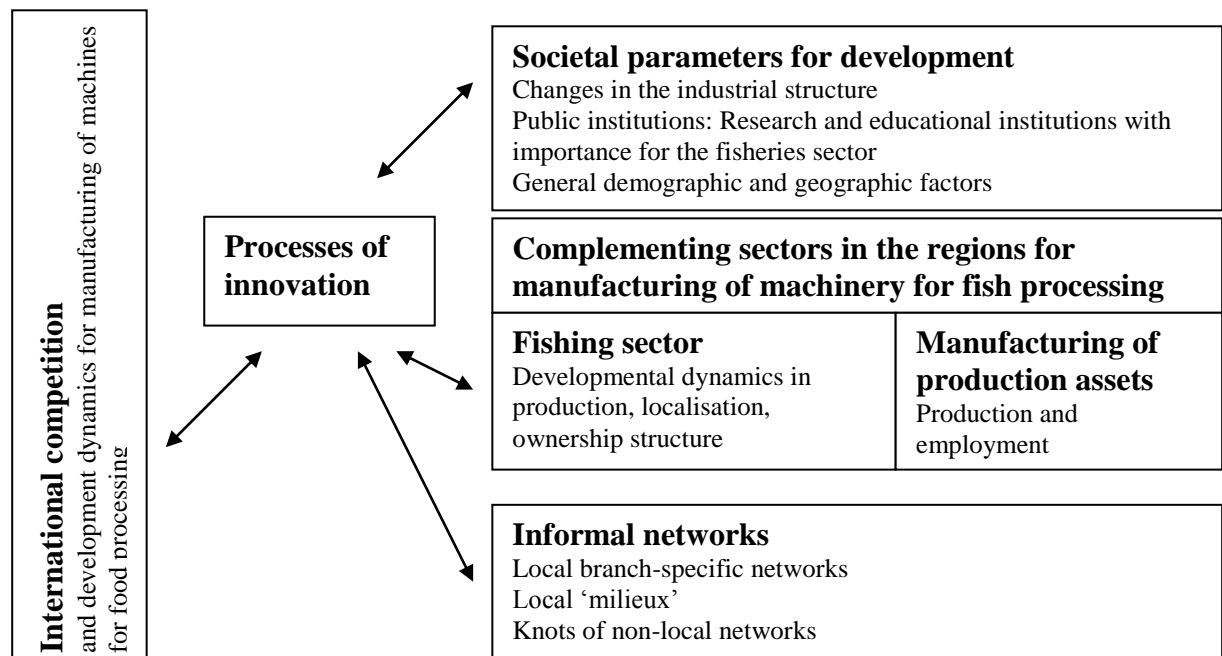
The second of the chapters dealing with the theoretical framework (chapter 3) discusses the localisation of the factors, which importantly influence the competitiveness of innovative production. The discussion is based on three sets of theories. First: The discussion of the minimising of costs as a factor relevant to localisation is based on classical localisation theory and a discussion of the significance of agglomeration⁶. Second: The discussion of the regional institutional framework and what factors condition the emergence of complementing sectors are based on development theory. The special structure of these northern societies as regions of low industrialisation more or less integrated in high income industrial countries may significantly influence the regional framework in relation to the localisation of the factors impacting on the competitive power of innovative production⁷. Third: The form in which informal institutions can localise and their importance to innovation is discussed. Pivotal here are analyses of regional economics, which indicate the significant role of diverse forms of informal institutional networks in facilitating exchanges between the innovative companies and those who function as purveyors of knowledge. Such institutions may be embodied in a local branch-specific network, in the local ‘milieu’ as such or as part of a ‘global’ network with a local knot⁸.

Chapter 4 performs a bridging function, linking the theoretical framework with the empirical analysis. In this chapter the empirical methods employed are discussed, and the model for empirical analysis operationalises the theoretical discussion of the localisation of the factors which significantly influence the competitiveness of innovative production.

Figure 1: Levels of analysis in the empirical analysis. Own model.

Conditions of competition

Institutional framework in Alaska and Iceland



⁶ Weber 1923, Marshall 1936

⁷ Rostow 1962, Martinussen 1990 og Myrdal 1957

⁸ Piore & Sable 1984 Saxenian 1990, Camagni 1991 et al.

The model brings together the various elements of the empirical analysis. The processes of innovation, which are the object of the study, figure at the centre. These processes are influenced by international competition in the field of the manufacture of machines for food processing and thus also fish processing. Furthermore, the regional institutional framework influences the innovative processes.

Empirical analysis

The empirical analysis consists of a general discussion of international competition in what concerns the manufacture of food processing machinery in chapter 5. The regional institutional frameworks in Alaska and Iceland are analysed in chapters 6 to 8 (Alaska) and 9 to 11 (Iceland). These two divisions trace the three levels of regional institutional frameworks given in the above model.

The first level of analysis deals with the general regional framework with the evolution of the industrial structure and the existence of formal institutions for research and the dissemination of knowledge as the central elements. The frameworks in Alaska and Iceland are analysed in chapters 6 and 9 respectively.

The second level of analysis focuses on the sectors which have the potential to interact in complementary roles: the fish processing industry and existing manufacture of productive assets. The size and characteristics of the sectors and their potential for developing interaction which can serve as a catalyst to innovation is discussed in chapters 7 and 10, with reference to Alaska and Iceland respectively.

The third level of analysis focuses on 10 processes all told of technological innovation for use in fish processing in Alaska and Iceland and on the informal institutions which have facilitated interaction and learning by liaising between the innovative companies and those delivering knowledge. At this level each process is analysed in respect of the organisation of the innovative unit, the actors external to the company involved in the learning processes and the character of the relations between the unit and these actors, this last allowing the identification of which, if any, informal institutions have facilitated the learning process. To provide a broader context for the analysis the particular technologies are presented in relation to the total fish processing line, as well as being set in relation to the competing design of alternative technology. This level is discussed in chapters 8 and 11, with reference to Alaska and Iceland respectively.

The final chapter (12) concerned with empirical analysis consists of a comparative discussion of the dynamics underpinning the processes of innovation and the institutional framework in the two regions. In what concerns many of the central parameters analysed the frameworks in Alaska and Iceland are similar, but when it comes to the industrial structure the differences are crucial. In respect of employment and economic importance the manufacturing industry counts for very little in Alaska, also compared to Iceland. In combination with another geographic structure of the fish processing industry it marks the crucial difference between the two regions and contributes very significantly to the explanation of the phenomenon the thesis addresses.

Conclusion: Why does innovation of machines for use in fish processing result in its local manufacture in Iceland but not in Alaska?

The elements pivotal to explaining the divergence as regards the translation of innovation into production are to be sought at the level of the industrial structure. In Iceland the fish processing industry and the manufacturers of machinery constitute complementary sectors with a dynamic interplay obtaining between them. No such fruitful interaction is to be found in Alaska.

The dynamic behind Iceland's innovative success has been the activation of the potential inherent in the structural reciprocity between the needs in the fish-processing industry and those companies and entrepreneurs who have competencies enabling them to convert needs into technology. On the one hand, there is the fish processing industry, which for most of the period under scrutiny was organised in one of two national export monopolies. Their weight allowed them both to formulate, in general terms, the technological desiderata and to fund research and development. Further, they could liaise between those working on innovative technology and the particular fish processing plants so that knowledge of concrete problems in production was made available. On the other hand, the manufacturers of machinery for production had the experience required to innovate and put it into production (to which the already existent small-scale manufacture of machines for the fish processing industry testified). The sector had been alert to developments in the fisheries sector and was aware of its specific needs and problems. Finally, in Iceland there already existed a number of networks of informal institutions which facilitated interaction between the fish processing industry as users and the machine manufacturers as producers, thereby creating a setting for learning of the needs and potential markets for new types of machines.

In Alaska innovation has been initiated by public or state-subsidised institutions. The objective has been to create jobs and income in Alaska by developing the fish processing industry. The demand for new technology was assessed through an analysis of the processing sector by public institutions. This was followed by the provision of funding for innovation of the machinery, leaving any subsequent production to market forces. For the innovators in Alaska this means that they have not had input from the 'coalface' to guide their work. Public institutions can indeed promote the technological innovation process but cannot offer any guarantee or likely estimate of the saleability of products. Thus the otherwise plausible link between innovation and manufacturing is severed.

Unlike in Iceland the fish processing industry in Alaska had not interacted with other relevant segments of industry because opportunities for gaining experience in terms of running a plant and identifying technological needs and problems had been drained away from Alaska. This was primarily because companies with headquarters in Seattle, outside Alaska, own the main part of the fish processing industry. The competence to make decisions regarding investments and much of the experience derived from running the plants in Alaska was concentrated in those headquarters. At the same time the sector of industry concerned with the manufacture of machinery for production had been vanishingly small in Alaska, absorbing a mere 0.2 % of the total measure of employment and was oriented towards the oil industry. It could therefore

not function as a complementing sector in setting up the manufacture of machines for fish processing. This emerges from the innovation processes analysed. First, the companies engaged in manufacturing machinery for production were only peripherally involved in the innovative processes. Second, the innovators themselves had no experience of manufacturing and they sought that experience outside Alaska, and third, no networks of informal institutions have been identified involving those working on innovative technology and the fish processing industry. This last is not crucial at the early stages, as the innovations themselves are not driven by dynamics between these two sectors. When *this* dynamic does become relevant, the lack of networks of informal institutions could be crucial, though it is possible that alternative networks might be activated or established at that point.

As the final theme addressed in the thesis the concept of ‘localised learning’ is discussed. It is concluded that

- Localised learning is learning based on exploitation of the tacit elements of knowledge (which is difficult to replicate) and formal and informal institutions (which facilitate interaction and learning within and between sectors), which is specific to the geographic location.
- In analyses of regional growth the central topic is therefore localisation of the framework for learning processes and the acquisition of tacit knowledge.

It is not possible to determine a ‘minimal critical mass’ of the structures a region must include as the necessary framework for innovative production of machines for the fish processing industry. Though it is obvious that:

- Tacit knowledge regarding user needs and key technologies are so central, that this knowledge should be present and *accessible* to the entrepreneur or the innovating company.
- The universities appear to have an important role as disseminators of technical knowledge in relation to several innovative initiatives in the two regions.
- To ensure a continued regional learning process, knowledge and experience drawn from the innovation processes should be gathered in the region. This could be carried out by the entrepreneur and his company, or other local companies or organisations.

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