DANISH **R**ESEARCH **U**NIT FOR **I**NDUSTRIAL **D**YNAMICS

DRUID WORKING PAPER NO. 96-11

Localised low-tech learning in the furniture industry

by

Peter Maskell
September 1996

Localised low-tech learning in the furniture industry

by

Peter Maskell

Danish Research Unit on Industrial Dynamics (DRUID),
Copenhagen Business School, Nansensgade 19, DK-1366 Copenhagen K, Denmark.
☎ +45 3815 2881, Fax: +45 3929 2226, E-Mail: MASKELL@CBS.DK

Paper to be presented at the seminar on
Regional specialisation and local environment - learning and competitiveness
Sophienborg Manor
Copenhagen
31 May - 2 June, 1996.

Acknowledgement: The paper is based on research by the author as part of the project "Regional Production Systems in the Nordic Countries" supported by the Nordic Institute for Regional Research (NordREFO).
An earlier version was presented at the
European Urban and Regional Studies Conference, Exeter, 11-14 April 1996

Abstract
It is by now an established fact, that the so-called high technology industries have experienced growth rates way above average through most years. High technology industries share of the world manufacturers export has risen from 12 per cent in 1970 to 25 per cent in 1995. More than one-third of Japan's manufacturing export and more than 40 per cent of America's manufacturing export are products from high technology industries, and this development has increasingly led to an international obsession with high technology industries. In a number of countries R&D indicators have by now become the object of intense discussions. Great efforts are devoted to improve a bad relative standing.

The aim of this paper is to questioned whether a national specialisation towards high technology industries is the only way by which the mature, developed countries can hope to sustain and augment their economic position. I claim that in contrast to much of the assumptions in contemporary politics and in the majority of the contemporary academic literature on the subject the countries without a specialisation in high technology industries are not left in the backwaters of economic development. Quite the contrary seems to be the case as many advanced, high-cost countries experience an above average economic performance even when specialising in the bottom end of the low-tech industries.

The argument is illustrated with empirical material from the wooden furniture industry in general - and the rather successful Danish wooden furniture industry in particular. The possible reasons behind this apparent paradox are discussed.

Keywords
International competitiveness, industrial clusters, wooden furniture industry, level of technology

JEL Classification
L1, L68, O18, O31, R12

ISBN 87-7873-011-2

Contents

1. Introduction

The discrepancies in competitiveness between countries can no longer be seen as the main outcome of initial differences in resource endowment. The country-based competitive advantages are created, not inherited (Tyson, 1992). They are build on factors such as divergent national patterns of demand, and distinct - but basically random - first-mover cost advantages. Also unlike national industrial specialisation patterns and the development of dissimilar technological capabilities surely play a role (Porter, 1990).

Of these different sources of national competitiveness only the latter - the technological capabilities - lend itself rather easily towards improvements through targeted political initiatives. In a period of intensified international competition it is not surprising that precisely this factor has been receiving a lot of political attention. The theoretical justification for enhancing a country's technological capabilities through governmental intervention is found in the recent developments in endogenous growth theories (Romer, 1990, Grossman & Helpman, 1991 & 1993) and their treatment of commercially oriented innovation efforts that respond to economic incentives as a major engine of technological progress and productivity growth (Coe & Helpman, 1993).

What constitutes the group of technology-intensive or high-tech industries must necessarily be somewhat arbitrary, but usually they are identified on the basis of the R&D effort (OECD, 1985), where R&D expenditure per unit of production is interpreted as a measure of the industries level of technological sophistication.

The OECD has regularly calculated the R&D intensity ratio for 22 manufacturing sectors and thirteen countries[1] which taken together account for more than 95 per cent of the industrial R&D performed in the OECD area. For each industry the ratio has been weighted by each country's share in the total output of the thirteen countries using purchasing power parities to convert to a common currency. Since 1972 the high-tech industries thus defined have included aerospace, computers, electronics and pharmaceuticals, each with an R&D expenditure/production above 6 per cent (OECD 1992, 1995[2]).

Such research-intensive industries are characterised by sharp learning curves and a significant degree of internationalisation of production, enabling them to utilise substantial economics of scale. It is also an established fact, that these industries have experienced growth rates way above

---

[1] The countries are Australia, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Sweden, the United Kingdom and the United States (OECD, 1992).

[2] Up till 1987 Instruments and Electrical Machinery where also included in the group of high technology industries (OECD, 1992).

average through a number of years. High technology industries share of the world manufacturers export has risen from 12 per cent in 1970 to 25 per cent in 1995. More than one-third of Japan's manufacturing export and more than 40 per cent of America's manufacturing export are products from high technology industries.

This change in trade specialisation in the US and Japan has led to an international obsession with high technology industries. In an increasing number of countries R&D indicators have by now become the object of intense discussions and great efforts are devoted to improve a bad relative standing.

Nevertheless it might be questioned whether a national specialisation towards high technology industries is the only way by which the mature, developed countries can hope to sustain and augment their economic position.

Take for instance United Kingdom and Italy, both with app. 58 million inhabitants. Through the last twenty years UK has experienced a distinctly negative trade performance and a decrease in market shares on the world market from 8.1 per cent in 1970 to 5.8 per cent in 1987. The trade performance of Italy has on the other hand been decidedly positive in the same period, with a strengthening in competitiveness and a slight increase in the countries share of the world market from 5.5 per cent in 1970 to 5.8 per cent in 1987 (Guerrieri, 1991). The GDP per capita in Italy is now higher than in the UK (20,200 US$ and 17,300 US$ respectively). Nevertheless does the UK display a degree of export specialisation in high technology industries far higher than Italy and, indeed, higher than in any other European country except Ireland[3].

A closer look on the data farther shows, that only the largest of the developed economies: USA, Japan and the UK (and Ireland) have in fact an export specialisation in high-tech industries (Dalum, 1996). The smaller highly developed countries of Europe[4] follow a very different trajectory, specialising on medium and even low-tech industries.

But in contrast to much of the assumptions in contemporary politics or in the majority of the academic literature on the subject the countries without a specialisation in high technology industries are not left in the backwaters of economic development. On the contrary do many

---

[3] For calculating the export specialisation index se Soete (1987) or Dosi, Pavitt & Soete (1990). The high and growing Irish specialisation in high technology industries is mainly due to foreign investments from multinationals in chemicals and electronics (Dalum, 1996). Ireland is the only small European country with an export specialisation in high technology industries from 1980 to 1990.

[4] The small high income OECD countries usually include Austria, Belgium/Luxembourg, Denmark, Finland, the Nederlands, Norway, Sweden and Switzerland. Norway are, however, often treated separately in such comparisons as her very large share of oil exports distort the general specialisation pattern (Dalum, 1996:13).

experience an above average economic performance even when specialising in the bottom end of the low-tech industries.

Later in this paper a case is presented to illustrate empirically and theoretically how even a high cost country can benefit from specialisation in low technology industries.

First, however, will a few comments be presented on why we apparently find very systematic differences in technological specialisation patterns between larger and smaller countries regardless of their economic standing.

2. Gains and risks associated with specialising in high technology industries

All small countries are faced with the same dilemma of openness: They need access to foreign resources and can only pay their way by exporting commodities or services at an internationally competitive price. This in turn forces the domestic producers to match or outstrip foreign firms in competitiveness and the only feasible way to ensure that the domestic firms keep pace with the best is by eliminating all barriers to trade. Protectionism is simply not a viable option for small countries. Small countries need to become *regions* in a broader economic entity with as little loss of political independence as possibly.

It is not surprising then, that the small developed countries of Europe - Denmark, Sweden, Norway, the Nederlands, Belgium, Austria and Switzerland - a long time ago opened their economies and actively advocated adopting a non-tariff, non-barrier world trade system (Balassa, 1969). The liberalisation has been an ongoing process beginning with commodities and later encompassing services, capital, knowledge and - to a degree - also labour[5].

Once the domestic market for commodities had become sufficient open, a process of industrial restructuring was set in motion whereby the small countries experienced a further specialisation in certain groups of products in which they already had some market power. Even without any major initial advantage the growth in competence and the utilisation of economies of scale enabled each country to establish an internationally competitive manufacturing industry (Krugman, 1991). Over time, generations of rounds of investments - based on perceived international developments in demand and competition - together with embedded knowledge and other sunk costs have

---

[5] It must be mentioned, that the European movements of labour across borders are very insignificant and has until now only involved a little cross-border commuting, a few workers engaged in temporary jobs in the construction industry or some workers in the transport sector, and finally a group of bureaucrats. It is nothing near the expectations when this issue where originally discussed before the signing of the treaty of Rome. The low mobility is significantly different from the situation in the US. Even on a cross-regional scale can labour hardly be considered a mobile factor of production in most European countries.

solidified the once chosen distribution of investments and thus limited the range of possible avenues, that might be taken in the time to come (Dosi, 1990).

The restrictions of size have thus gradually channelled the process of specialisation towards industries with rather stable demands and low price-elasticity[6]. These industries are often medium or low-tech, but can, nevertheless, yield high profits. Front-edge high-tech industries are to a high extent left to the bigger countries, either by choice or by necessity[7]. Theoretical developments in the "new trade theory" (Krugman, 1994) support this by stating that countries are likely to specialise in sectors and commodities, where the domestic market is of particular importance. The home market for high-tech commodities does seldom play such roles in small countries.

Furthermore do the modest sizes of the national economy in small economically advanced countries place tight restrictions on the ability to function as a buffer for supernormal fluctuations in international demands. For instance has the market price for the most common memory chip dropped from US$13 in November 1995 to US$9 in January 1996 and is expected to drop to US$5 at the end of 1996 while the industry is expecting massive losses and cuts in capacity (The Economist, 23rd of March 1996). No small countries can in the long run cope with committing a larger part of its resources to industries with such ups and downs.

Sustaining a high technology industry is not only associated with high risks, but also with high costs, creating distortions in the national capital base. Even a country like Sweden has probably exhausted its economic ability to participate in the race for developing the next generation of advanced military air crafts. All leading edge technologies are furthermore highly subsidised by the necessity of considerable government procurement, noticeable government subventions (sometimes through massive government-funded research programs) or strong regulatory "infant-industry" protection (Grupp, 1995).

Also the limited size of the national knowledge base influence the range of industries in which small countries might successfully specialise[8].

---

6 The empirical evidence of a low price-elasticity is, however, not very solid and might still be questioned.

7 One of the shortcomings of focusing exclusively on R&D expenditure in a particular sector are, of course, that some industries might do little R&D themselves while simultaneously purchasing as input highly R&D-intensive intermediate and capital inputs from other sectors domestically or aboard (Klette, 1994). Se also Zander & Kogut (1995) on this.

8 Drèze (1960 (1989)) where the first to forward this "standard goods hypothesis", and Melchior (1995) presents new empirical evidence on this, while Fagerberg (1995) use a different approach to address the same question. One should note, that the specific specialisation of small countries like Austria and Switzerland are very different from the specialisation in the Benelux-countries, which again is different from the Nordic countries. All have by and large a specialisation in natural resource-based products. The specific products that dominate the Nordic Countries include metal and ore, paper and pulp, fish and wood etc. For a further discussion on specialisation patterns and divergence/convergence see Dalum (1996).

Together, these different restrictions all participate in drawing small countries away from any path leading towards specialisation in high technology industries. The following section will intend to show, that other trajectories might also be attractive and economically feasible even in sustaining some of the highest wage-levels in Europe.

3. Development of a low technology industry in high cost environments - the case of the wooden furniture industry

The production of wooden furniture (NACE 4670) is a very important industry in the EU(12), where the approximately sixty five-thousand firms have an annual production of 39 billion ECUs, an annual growth rate of 4.5 %, and more than 480.000 employed in 1991 (COM-DGIII, 1993).

Out of a total of 85 subsectors the wooden furniture industry thus ranks as number seven in the EU(12), only surpassed by the industries: car manufacturing (with 1.070.000 employed), telecommunications equipment (890.000), tools (810.000), plastic and clothing (both with 790.000 employed) and basic industrial chemicals (490.000).

The international economic development has furthermore increased the demand for furniture. The furniture industry (which also includes other less important subsectors than wooden furniture) has thus experienced an *average annual growth rate* of 19 per cent in international demand from the OECD countries for the whole period from 1961 to 1990 (Villumsen & Dalum, 1994), only surpassed by computers and peripherals (20.4 %). The market for furniture has become international. With an annual extra-EU export ratio of 9.2 % (1991) and a EU import penetration of only 6.4 % the wooden furniture industry is, furthermore, not an unimportant contributor to the EU trade balance. Competition from the United States and Japan is negligible.

Not only is the wooden furniture industry large and economically important, but it also undoubtedly belongs to the low technology industries (see table 1) according to OECD's recently proposed classification of high-technology products and industries (OECD, 1995). But regardless of the low-tech status of the industry do a lot of incremental product innovation take place, just like in other low-tech sectors such as the clothing industry.
Recent surveys conclude, that firms supplying the important German market reckons, that as much as a quarter of their turnover comes from designs which are less than one year old (Mckinsey, 1994, ch.3.4).

Though a few larger furniture producers attract much media attention (Natuzzi (Santeramo, Italy) Panda Furniture, (Belgium), Poliform (Brianza, Italy), DMF (Illinois, US), Davis (High Point, N.Carolina) Shadow Interiors (Indiana, US)), the wooden furniture industry is dominated by small

and medium sized firms[9]. This size structure is not a peculiar European phenomenon, but is also found in the US, where the $19 billion furniture industry (1995) has about 30% of its plants in North Carolina. Despite numerous attempts to consolidate the US furniture industry, the size structure remains the same:

> Since 1965, some 42 outsiders have invested in furniture making, each with dreams of teaching the industry's quaint family founders how to make lots of money through consolidation... But the outsiders apparently learned a lesson themselves. All 42 have pulled out of the industry. The most recent two, Masco Corp. and Armstrong World Industries Inc., bailed out last month after investing hundreds of millions of dollars in some of the industry's biggest-name companies... For Masco, it was about $600 million poorer: the difference between the $1.7 billion it invested in 14 home-furnishings companies and the $1.1 billion sales price...
>
> These weren't small players or Johnny-come-latelys. Together, Masco and Armstrong World controlled nearly 11% of the industry's manufacturing base. Their return: profit margins that were half or even a quarter of their other investments... The home-furnishings business is so highly fragmented, cyclical, labor-intensive and, well, stuck in its ways that profitability just hasn't measured up to many other industries...
>
> Thus, while wave after wave of consolidation pumps new profits into industries ranging from banking to entertainment, furniture seems impervious to the changes...
>
> So, why is the furniture industry so resistant to consolidation? Analysts and others offer these thoughts: Furniture is an industry of niches... Some 600 companies specialize in products ranging from $20,000 mahogany dining-room suites to $6 plastic patio chairs... There's minimal patent protection, and, except for a handful of top names, there's little brand awareness or loyalty... It's also an easy business to enter. It's tough to gain efficiencies through mass production (from Gepfert, 1995).

The increased competition between producers has lead to escalated efforts to automate production processes, and some progress has been made especially in the production and assembly of rectilinear furniture from coated panel boards (COM-DGIII, 1993). The production of furniture is, nevertheless, still rather labour intensive and labour productivity and labour unit costs are therefore of particular interest to this industry.

With this in mind it is perhaps somewhat surprising, that the highest export ratio per capita in all Europe is found in the parts with some of the highest labour costs: in parts of Germany, Belgium,

---

[9] The average German furniture manufacture has 125 employees and only nine German firms has over a thousand employees.

Northern Italy and in Denmark. The latter have the largest export ratio per capita, even thought the development in the relative unit labour cost in common currency against the other EU member-countries has not been favourable at all (COM 1991)[10]. As much as 20 per cent of the export of wooden furniture from EU is produced in Denmark, which has only 1.5 % of EU's population.

The export specialisation pattern also revealed a competitiveness of the Danish furniture industry with a long track record. In the last twenty five years the market share of all Danish produced commodities from all sectors of industry to all OECD countries has never exceeded 1.3 % (in 1969). But the market share for wooden furniture has always been at least four times higher (Dalum, 1995).

This is not in accordance with former theories of national specialisation and international division of labour, and it might be worthwhile to look into the reasons behind this somewhat extraordinary position.

4. Danish furniture industry and the factors of competitiveness

The sustainability in industrial competitiveness for the furniture industry of Denmark is not reached through the use of any outstanding production technic or through the application of superior technologies. The production processes used in the wooden furniture industry do not in general distinguish Danish producers from their main foreign competitors, nor are the stocks of machinery different from what is accessible throughout Europe even though a certain amount of customisation will always take place when installing larger or more complex machines at a plant.

Danish producers of wooden furniture do not in general possess any specific property right (patents, registered designs or trade marks etc.) by which they are protected from competition, even if as much as 10 per cent of the firms do in fact produce up-market, "designed" furniture[11]. And the competitiveness can be hardly ascribed to the utilisation of any economics of scale or the

---

[10] Only the last two years of the period studied (1991 and 1992) showed a slight reduction. With the period 1961-1973 as basis (100), the index for the relative unit labour cost in common currency against the other EU member countries were: 1974-83: 110.6, 1984: 100.8, 1985: 101.7, 1986: 103.7, 1987: 110.5, 1988: 109.9, 1989: 106.4, 1990: 105.2, 1991: 99.2, 1992: 95.9.

[11] Other producers of more standard type of furniture may, however, sometimes benefit by some sort of good-will spillover from the design segment. The use of the concept of Scandinavian design in marketing of low- and medium- price commodities might be seen as a sign of such spillovers.

building of large vertical integrated corporations. Few firms have been recorded[12] to cross the borders between the supplying industries and the furniture industry proper - as shown in figure 1 - and no manager in the furniture industry is recorded for expressing any desire to increase the degree of vertical integration[13].

The wooden furniture industry proper consists, however, of two distinctive and technologically very different processes - the process of manufacturing the furniture (wood cutting, drilling, shaping, grinding and assembling) and the process of painting it[14] - which is nevertheless more often than not integrated in the same firm[15]. The main reason for this seems to be that the paints or lacquers are often - at least to some degree - customised to the individual plant, its product range and its paint spraying equipment, thereby making the painting or lacquering process an important and integrated part of the firms core competence[16]. Also, time and transport costs surely play a role: furniture can seldom be packed and transported in any standardised manner.

Yet even though the firms in the wooden furniture industry usually contain both production processes, they are mostly very small: The average firm has had approximately 35 full time employees through a quarter of a century, from 1972 and to the present day (see table 2)[17], in spite of the acquisitions that has recently taken place. The furniture industry is perhaps exemplifying the points made both by Stiegler (1951) and by Langlois (1989)[18]. But whether it is the long term growth of the market for wooden furniture or the lack of any rapid technological progress that has determined the structure, it is a fact, that the Danish wooden furniture industry is precisely as dominated by small firms as in many other parts of the world.

---

12 A few producers of wooden furniture own (a part of) a local saw-mill, while a few others belong to the same enterprise as a producer of boards and semi-finished wooden products. Such integrations are, however, not creating any obvious advantages for the firms involved, and can perhaps mainly be seen as acoincident of history.

13 Hence Eccless' "....somewhat ironic fact that many managers consider internal transactions to be more difficult for exchange than external ones, even though vertical integration is pursued for presumed advantages" (Eccless, 1982 p.28) has no basis whatsoever in the wooden furniture industry.

14 Even though paint and lacquer only account for approximately 5 - 6 % of the total production cost of wooden furniture, the cost of the entire coating process (smoothing, priming, painting or lacquering, drying/defueming, polishing etc.) can exceed 50 % of the total production costs, depending on type and style of furniture (Dam-Johnsen et al., 1995).

15 A few independent firms do painting and /or lacquering on a contract basis, but market share are very limited. There are also many producers of semifinished furniture parts and of specialised producers of wooden frames (later to be used in the production of upholstered furniture) who do not usually sell coated products.

16 As Collis (1991) puts it: "....core competence must still be defined relative to competitors".

17 This permanence in the size structure indicates a lack of any major economies of scale.

18 Stigler suggested, that the 'extent of the market' determines the degree of vertical integration. Langlois on the other hand maintained, that the extent of vertical integration is primarily determined by the rate of technological progress.

However, that don't prevent some types of furniture from being produced in an increasingly automated way - for instance the production and assembly of rectilinear furniture from coated panel boards. Firms producing commodities less suited for automatization often specialise in a limited range of furniture products for use in bedrooms, lounges, offices, shops, kitchens or gardens etc. to more or less targeted groups of customers. Many firms function as subcontractors, and use a small or large proportion of their capacity to produce specialised, finished or semifinished inputs to other furniture producers - products like cupboard doors, or front pieces and sides of drawers.

Many of these subcontractor relationships are very deep-rooted and long lasting. In a recent survey[19] some 29 per cent of the firms in the Danish wooden furniture industry answered questions regarding the average age of their relations to their main customer and to their main supplier. Both (!) relations turned out to be amazingly stable: they had known their business partner for as long as 13 years on average[20]. The survey further shoved, that the main customer bought 39 per cent of the total output, and that the three main customers (which they had done business with for 11 years on average) bought more than half of the firms total output. An almost similar concentration was found on the supply side: the firms' main supplier delivered 23 per cent of its total purchase, while the three most important suppliers together cowered 38 per cent of the input. As many as 82 per cent of the firms further interacted that they often interacted with their customers in developing new products, sometimes leading to temporary exchange of personnel, loans of machinery or expertise or coordinated investments in production equipment.

Nevertheless, barely half had any sort of written contract or other formal legal framework for this interaction. This matter of affairs is in full accordance Macaulay's study of the extent to which litigation was used to settle disputes between firms in the US. He notes that disputes are:

---

[19] The survey was conducted by the Statistics Denmark (Danmarks Statistik) on the behalf of the EU-Commission and EUROSTAT. The results will be published in 1996.

[20] In his classical study of interaction in the US industry Macaulay (1963, p.61) once noticed that "...Salesmen often know purchasing agents well. The same two individuals may have dealt with each other from five to 25 years. Each has something to give the other. Salesmen have gossip about competitors, shortages and price increases to give purchasing agents who treat them well". The same goes for the up- and downstream relations of Danish producers of wooden furniture.

> "…frequently settled without reference to the contract or potential or actual legal sanctions. There is a hesitancy to speak of legal rights or to threaten to sue in these negotiations...Or as one businessman put it, 'You can settle any dispute if you keep the lawyers and accountants out of it. They just do not understand the give-and-take needed in business'... Law suites for breach of contract appear to be rare... Even where the parties have a detailed and carefully planned agreement which indicates what is to happen if, say, the seller fails to deliver on time, often they will never refer to the agreement but will negotiate a solution when the problem arises as if there never had been any original contract...'If something come up, you get the other man on the telephone and deal with the problem. You don't read legalistic contract clauses at each other if you ever want to do business again. One doesn't run to lawyers if he wants to stay in business because one must behave decently" (Macaulay, 1963 p.61).

The transmission of business attitudes from one generation of managers and owners of firms to the next is secured by new firms being established mainly by the skilled workers of the industry. These industry-born entrepreneurs seldom have the ability or personal interest to expand the firm into a larger and more professionally a managed unit. The specific recruitment pattern is, therefore, further consolidating the industry's size structure[21]. On the other hand it is precisely the upbringing in the industry and the careful acquired (often tacit) knowledge of these homespun managers that has enabled the industry to overcome the problems of poor quality, rejections and higher manufacturing costs to a higher degree and more consistently than their foreign competitors[22]. Nonetheless does the financial vulnerability of small firms and the low level of commercial managerial competence show in the high degree of closures and in the low survival rate of new firms when the firm is unexpectedly hit by some bad payer, some change in taste or some other unforeseen market fluctuation.

The survival rate increases with age and size. But even the group of firms, which have proved their merits by existing in at least four years with more than five full time employees, have experienced a closure rate of 47 per cent (Table 3)[23]. Yet, the low entry barriers and the (until now) constant supply of entrepreneurs willing to start producing wooden furniture, has some way or other maintained almost the same number of firms - and certainly the same size structure - from one year to the next through several decades.

---

[21] Recent developments in the Danish wooden furniture industry has once again shown, that any radical expansion in size necessitates hiring of directors with a general management background.

[22] The unit labour costs in Denmark has always been higher than the EU or OECD average.

[23] Of the 369 firms in the Danish wooden furniture industry in 1972, 297 also existed in 1976. Of these 297 firms 139 were closed before 1992 (= 47 %).

Like most small and medium size enterprises the Danish producers of wooden furniture have difficulties in reaching culturally distant markets. The volume of their annual production makes it impossible, or at least very difficult, to build and maintain an international oriented sales organisation. Their limited managerial and financial capacity makes it too burdensome to maintain contacts on formerly important markets during periods of low demand. The resulting export strategies of "hit-and-run" on different markets, as determined by the exchange rates and the development in demand, also imply the risk of being unable to un-commit resources sufficiently fast when the situation changes. Many firms in the Danish wooden furniture industry instead choose to deliver to large international oriented furniture retailers like IKEA. Others join with local producers of supplementary commodities and form some sort of temporary or more permanent combined sales organisation. Hence, a group of firms can at the same time be competitors on the labour or input market, rivals on some product markets and companions on others.

The apparent paradox between the structural vulnerability of the wooden furniture industry on the one hand, and its sustained competitiveness on the other, might be explained by an existence of an especially favourable domestic resource endowment. Such an environment could include many highly specialised suppliers of input and investment goods thus permitting the wooden furniture producers to engage in a close and mutual beneficial exchange of ideas and experiences (Lundwall, 1985). The utilisation of such domestic knowledge creation might then explain their competitive advantage vis-à-vis producers with a less favourable industrial environment. Unfortunately, a closer look at the Danish industrial environment does not lend much support to such an explanation.

The most important input to the wooden furniture industry is softwood, of which more than 85% is imported (Schultz et al., 1995), primarily from the other Scandinavian countries, but increasingly also from the former communist countries in Eastern Europe[24]. The effects of the fragmented domestic forest's sector are great difficulties for Danish producers of softwood in utilising the economies of scale available to their foreign competitors.

The domestic suppliers of wood processing machinery (cutting, shaping, grinding etc.) were important once, but not anymore. Before the war approximately half the machinery in the furniture industry was produced in Denmark, but today more than 90% are imported, mainly from Italy and Germany. The remaining Danish producers of wood processing machinery are all small and traditional metalworking enterprises who have not yet been able to bridge the technology gab to the world of electronics, while their global operating competitors for some time have produced

---

[24] The imports of softwood in 1994 (in mil. cubic metres) was from Sweden 1.3, Finland 0.7, Poland 0.1, Norway 0.05, Russia 0.04, and other countries 0.07 (Schultz et al., 1995).

computers aided wood processing machinery - some with image processing abilities. The market share of Danish furniture related machine producers are thus likely to continue to fall.

The same large import penetration applies for the paint spraying machinery, where Italian producers dominate, even though the largest Scandinavian producers are located in Denmark.

The paint and lacquer used for wooden furniture are, however, partly produced in Denmark, though mostly by branch plants of the large multinational producer Akzo Nobel, while other foreign producers are represented with own distributing and service enterprises (Becker, Klinten, Hesse Ling, Vortle). The increased environmental pressure in recent years on the wooden furniture industry to reduce its emission of volatile organic compounds (VOCs), has resulted in rapidly growing demands for new types of paints and lacquers with high content of solids and/or based on water. The interaction has been intense between the wooden furniture industry and the producers of paint and lacquer or their local representatives, in order to ensure the same surface quality (durability, colour, coverage, shine, thickness etc.) as before. Within this specific area, a process of knowledge creation has often been embarked upon which sometimes is seen to have made a difference by enhancing the competitiveness of the involved firms[25]. Through a:

> .."continuing association both parties can benefit from the somewhat idiosyncratic investment of learning to work together" (Eccles, 1981 p.340)

5. Why is the competitiveness not eroded by imitation?

The absence of any strong specialised domestic industrial environment to support and supply the wooden furniture - with the paint and lacquer industry as a possible exception - might indicate, that the revealed international competitiveness of the many small producers originates from their superior ability to create and accumulate knowledge *internally* because of acumen in the day-to--day operations in product development, purchasing, production organisation, handling of labour relations, marketing etc. If the perceived results of the internal processes were continuously adjusted in interaction with customers, suppliers and other actors in their business environment, a sustainable competitiveness might be the result.

---

[25] The change from traditional used paint to paint or lacquer, where the solids are contained in water, has a number of other effects. Typically the production process will have to be changed, as the paint or lacquer takes longer time to dry before the pieces can be further handled. This might necessitate enlargement of the drying facilities, which on the other hand no longer need special filters or chimneys to reduce the impact on the surrounding environment. In order to get the same smooth surface as before the waterbased paints or lacquer will often have to be applied several times with a grinding process in between.

This raises, though, a new set of questions. Schumpeter ((1911)1934) argued that successful firms would be followed by an expanding group of competitors which would imitate them and ultimately "catch up". But the persistent competitiveness of firms in the Danish wooden furniture industry indicate the existence of strong "isolating mechanisms" (Rumelt, 1984), where even continuous and painstaking imitative efforts might be made in vain. Following Dierickx & Cool (1989) three important factors which hamper imitation can be identified[26].

Asset mass efficiency is the first, and presumably most significant factors. Firms that have already a large stock of R&D- or experience-based know-how, a specialised labour-force, and operational line of machines etc., are often in a better position to make further breakthroughs and add to their existing stock of knowledge than firms who have a small initial supply of such factors. Instinctively, the Danish wooden furniture industry seems an unlikely candidate for any general claim on some firm-specific asset mass efficiency, which provides a continuous advantage.

There might, however, be some important extra-firm, but intra-industry, elements of asset mass efficiency. In recent years, many have thus forwarded the idea, that spatial agglomeration of related economic activities does promote firms' competitiveness, by condensing the effects of a common culture, a specific language, and a set of informal, but essential economic institutions.

Such agglomerations might be defined as

> ... a set of companies located in a relatively small area; ...the ..... companies work, either directly or indirectly, for the same end market; ... they share a series of values and knowledge so important that they define a cultural environment; ... they are linked to one another by very specific relations in a complex mix of competition and co-operation (Brusco, 1990).

First, theory predicts and empirical investigations support[27] the notion that entrepreneurs within a given business sector will concentrate in areas, where this sector is already strongly represented. Here, the potential entrepreneur has learnt the necessary, trade specific qualifications and gained the needed experiences. In addition, during this period of learning he or she has established the imperative personal contacts and has become familiar with the local institutions, both of which are prerequisites in order to secure the process of opening a new business.

---

[26] The following leans heavely on Maskell and Malmberg (1995).

[27] The phenomenon can be illustrated with data on new firm formation in Denmark. Consider a matrix, where all the 208 sectors (ISIC69) in manufacturing industry are placed on one axis and the 12 Danish counties (including the greater Copenhagen area) on the other. Though the majority of the cells of the matrix were empty, 87 per cent of the new firms established between 1972-92 were found in "occupied cells" e.g. in the same sector and region as at least one incumbent firm (see Maskell, 1992).

Second, a geographical agglomeration of firms within a given business sector in a region will make the region especially suited to meet the specific location requirements of the firms within the sector. Even assuming that a new firm or an incumbent is completely free in its choice of location, the optimal location would usually be exactly the region with a proven record of servicing firms in just that sector: only such a region has had the opportunity to develop the desired capabilities. These capabilities include the building of specialised educational institutions[28] or units targeted at public financed dissemination of technological information etc. The differences in capabilities between regions will (by definition) be divulged in discrepancies in the competitiveness of firms located there, with long term consequences for their competitiveness.

An empirical indication of the strength of these two forces can be obtained by analysing the development in the wooden furniture industry's locational pattern. As can be learnt from the maps 1 and 2, the wooden furniture industry has experienced a pronounced relocation and agglomeration in the period from 1972 to 1992 - the years of increasing international exposure.

The most visible agglomerative force are the *cost reduction* that might be experienced by the easier access to specialised supply of complementary (Richardson, 1972) products or services: auditing, finance, transport, repairs, logistics, market research, marketing, data processing or design. Just as important might be the easy access to supply of raw materials and intermediary products or machinery and other production equipment.

The more subtle agglomerative force is associated with *learning*. Everything else being equal, interactive collaboration will be less costly and more smooth, the shorter the distance between the participants[29]. The proximity seems to create an economic system where malfeasance is punished[30] and trust-relations can be build and utilised in knowledge-creation (Maskell, 1995), just as the "flow of information can only take place if there exist channels of information through which the message can pass. Further, a code of information is necessary in order to make the transmission of messages effective" (Lundwall, 1988 p.354).

To communicate tacit knowledge will normally require a high degree of mutual trust and understanding, which in turn is related not only to language but also to shared values and 'culture'.

---

[28] Like the wood/furniture engineering school in the provincial town of Herning, centrally situated in the cluster of wooden furniture manufacturers.

[29] It is partly to overcome such obstacles to exchange of information that new network relations between firms seem to be developing at a faster rate than ever before (Axelsson & Easton, 1992).

[30] As Ben-Porath described it: "..continuity of relationships can generate behaviour on the part of shrewd, self-seeking, or even unscrupulous individuals that could otherwise be interpreted as foolish or purely altruistic. Valuable diamonds change hands on the diamond exchange, and the deals are sealed by a handshake." (Ben-Porath, 1980 p.6)

Such trust relations are, however, not just something that comes into existence once a firm is located in proximity with others. Trust has to be build and that takes time. *Time compression diseconomies* is thus the second important factor hindering competitors readily imitation of established successful behaviour.

A firm can't just plug into the information channels of a local business system like the wooden furniture industry. Some knowledge can't simply be bought. On the contrary: often is knowledge exchanged in a very old fashioned, pre-capitalistic way: by barter. Knowledge is exchanged directly - without the use of money. You simply need to produce knowledge in order to get knowledge.

The third safeguard against imitation is the *interconnectedness of asset stocks*, i.e. the complex web of linkages between the firms internal resources and the actual or potential resources it has access to in its surroundings. Collins (1991) underlines, that the specificity of this interconnectedness of asset stocks also influences the choice of strategy:

> While the external opportunity set is the same for every firm, the additional resources each must acquire on the factor market to effectively serve a particular product market will differ, because the vector of resources each possess (represented by its core competence) is different. Firms acquire primarily resources from their domestic factor markets. A firm's country of origin will directly affect its choice of strategy (Collis, 1991)

The differences in choice of strategy to a foreign potential imitator might in itself serve to discourage any closer investigation into the causes behind the revealed competitiveness. Even when this is not the case, a foreign competitor might acquire some of the vital components or ingredients in this entangled web, but will often in practice finds it difficult to duplicate the relevant elements in toto (Prahalad & Hamel, 1990). Formal and informal inter-firm resources might even interact with the formal institutions in the region in the origination of derivatives with profound influence on the economic development of the region by being "in the air", thus making it almost impossible to understand, codify, capture and imitate the capabilities causing the firms revealed comparative advantage. That such Marshallian phenomenons are indeed still very much in existence can be illustrated in the great disagreements between local, well-informed businesspeople in for instance the Italian industrial districts, when they try to identify the reason behind the districts' contemporary success (Harrison, 1992). The same observation has been recorded from interviews of managers in the Danish wooden furniture industry (Ranis & Bjørn, 1995). Which elements that are important and which that are not is simply not always obvious for a potential imitator (Lippman & Rumelt, 1982).

And when imitation of a certain set of resources is difficult, firms having access to that set can benefit over considerable periods of time. Many resources do not wear easily, and will to some extent be transferable over time: their use leads to their reproduction and their transmission from one generation to the next. This transferability over time, but not over space, can sometimes make national differences in competitiveness very long lasting.

6. Conclusion

The main implication of the brief analysis of the Danish wooden furniture industry is that *proximity matter*. This is related to the time geography of individuals. Everything else being equal, interactive collaboration will be less costly and more smooth, the shorter the distance between the participants. A second dimension is related to proximity in a social and cultural sense. To communicate some types of knowledge will require a high degree of mutual trust and understanding, which in turn is related not only to language, but also to shared values and 'culture'.

The benefits of proximity can be translated into a force of spatial agglomeration in relation to firms engaged in interactive processes, some of which might involve learning. In such places, knowledge tends to become embedded, not only in individual skills and in the routines and procedures of organisations, but indeed in the milieu as such, or rather in the relations that connect different firms to each other and to the wider institutional context.

The case illustrates, that it might be highly complicated and in reality perhaps even impossible to transplant all economic characteristics - intrafirm as well as interfirm - successfully from one environment to another, thereby laying the foundation for the observed durability in otherwise incomprehensible competitiveness between the countries of Europe.

* * *

Appendix

Table 1

List of high R&D intensity industries
(Classification ISIC Revision 2)

High Technology

1. Aerospace
2. Computers (incl. office machinery)
3. Electronics (incl. communications)
4. Pharmaceuticals

Medium-high technology

5. Scientific instruments
6. Electronical machinery
7. Motor vehicles
8. Chemicals
9. Non electrical machinery

Medium-low technology

10. Shipbuilding
11. Rubber and plastic equipment
12. Other transport equipment
13. Stone, clay and glass
14. Non-ferrous metals
15. Fabricated metal products

Low technology

17. Petroleum refining
18. Ferrous metals
19. Paper printing
20. Textiles and clothing
21. Wood and furniture
22. Food, Beverages

Source: OECD. 1995. Classification of high-technology products and industries. Working Party no. 9, of the Industry Committee on Industrial Statistics Group of National Experts on Science and Technology Indicators. Paris 12-13 October (Ref.: 023718/ 13799).

TABLE 2
PRODUCTION OF WOODEN FURNITURE IN DENMARK

	1972	1976	1980	1984	1988	1992
ESTABLISHMENTS	369	369	339	370	387	357
EMPLOYED	12528	11790	10745	13122	13214	14041
TURNOVER (mil.92kr)	5257	5338	4852	7041	8008	9945
SALES (mil.92kr)	4752	5108	4465	6333	7396	9488
AVERAGE SIZE	34	32	32	35	34	39
SALES/TURNOVER (%)	90	96	92	90	92	95

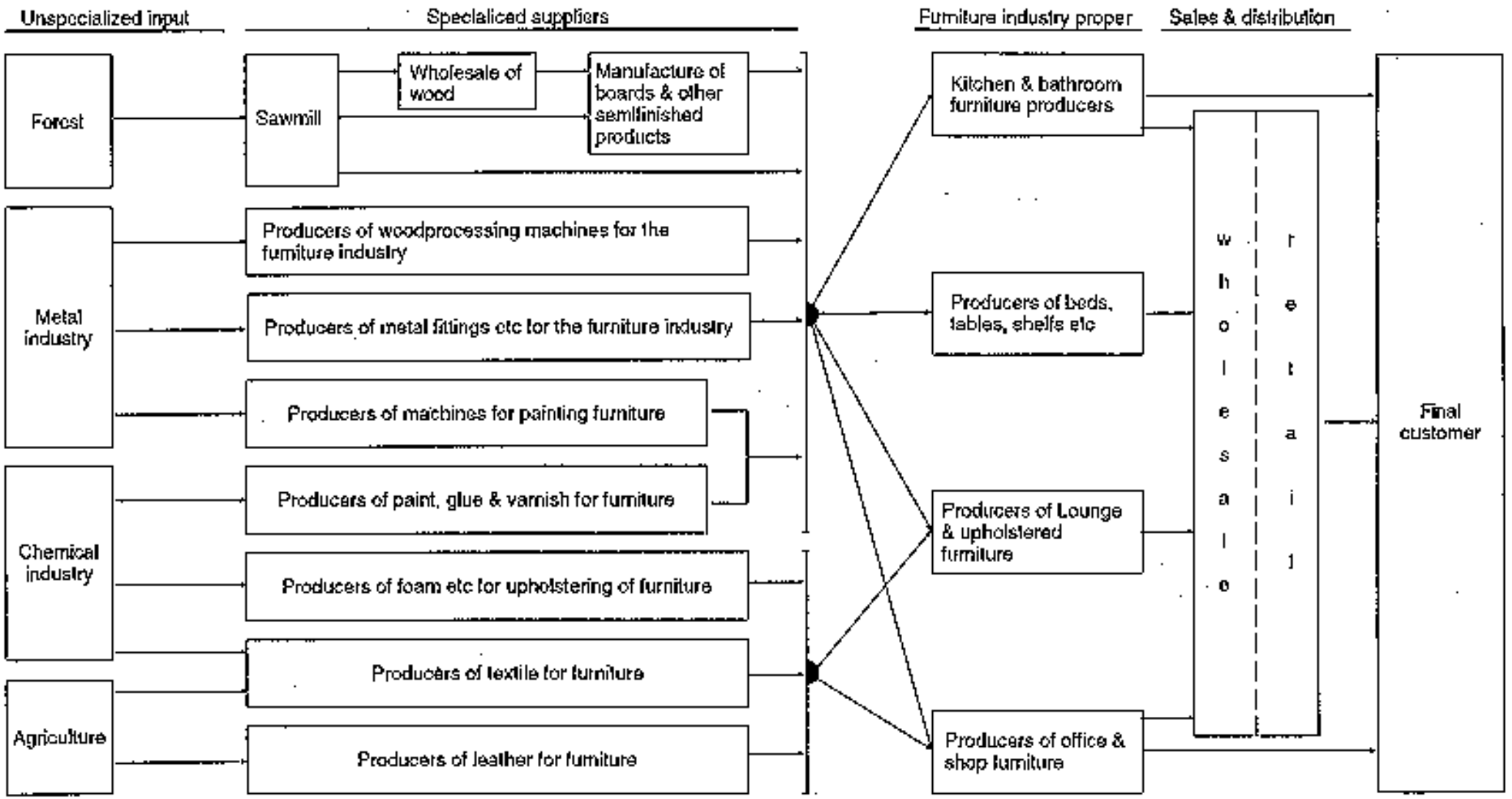
NOTE: 'SALES'=SALES OF PRODUCTS PRODUCES IN THE FIRM. 'TURNOVER'=SALES OF PRODUCTS PRODUCES IN THE FIRM AS WELL AS SALES OF TRADED (UNMODIFIED) COMMODITIES, SERVICE AND REPAIRS, MOUNTING ETC. TURNOVER AND SALES GIVEN IN MILLION DANISH KRONER.
SOURCE: STATISTICS DENMARK (DANMARKS STATISTIK) UNPUBLISHED MATERIAL

TABLE 3
NEW FIRMS, CLOSURES & INCUMBENTS IN DENMARK 1972-92
INDUSTRY: WOODEN FURNITURE (ISIS(68) 33201)
(TURNOVER IN MILLIONS DANISH KRONER)

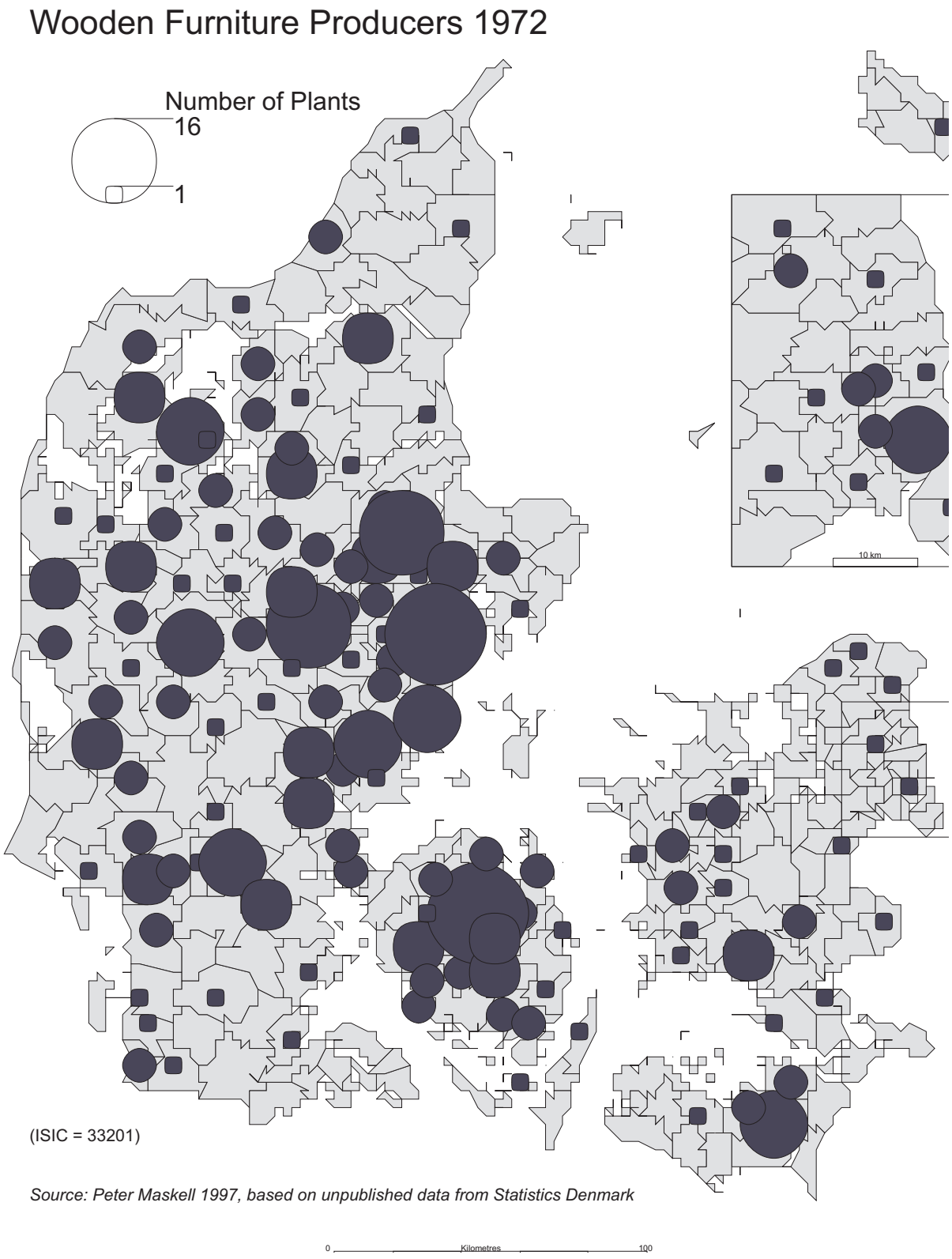
	FIRMS		EMPLOYEES		TURNOVER	
	1972	1992	1972	1992	1972	1992
NEW	0	212	0	8035	0	5691
CLOSED	224	0	6313	0	2427	0
INCUMBENT	145	145	6215	6006	2826	4259
TOTAL	369	357	12528	14041	5253	9950

SOURCE: OWN ANALYSIS BASED ON UNPUBLISHED STATISTICAL MATERIAL
FROM STATISTICS DENMARK (DANMARKS STATISTIK).

The furniture industry

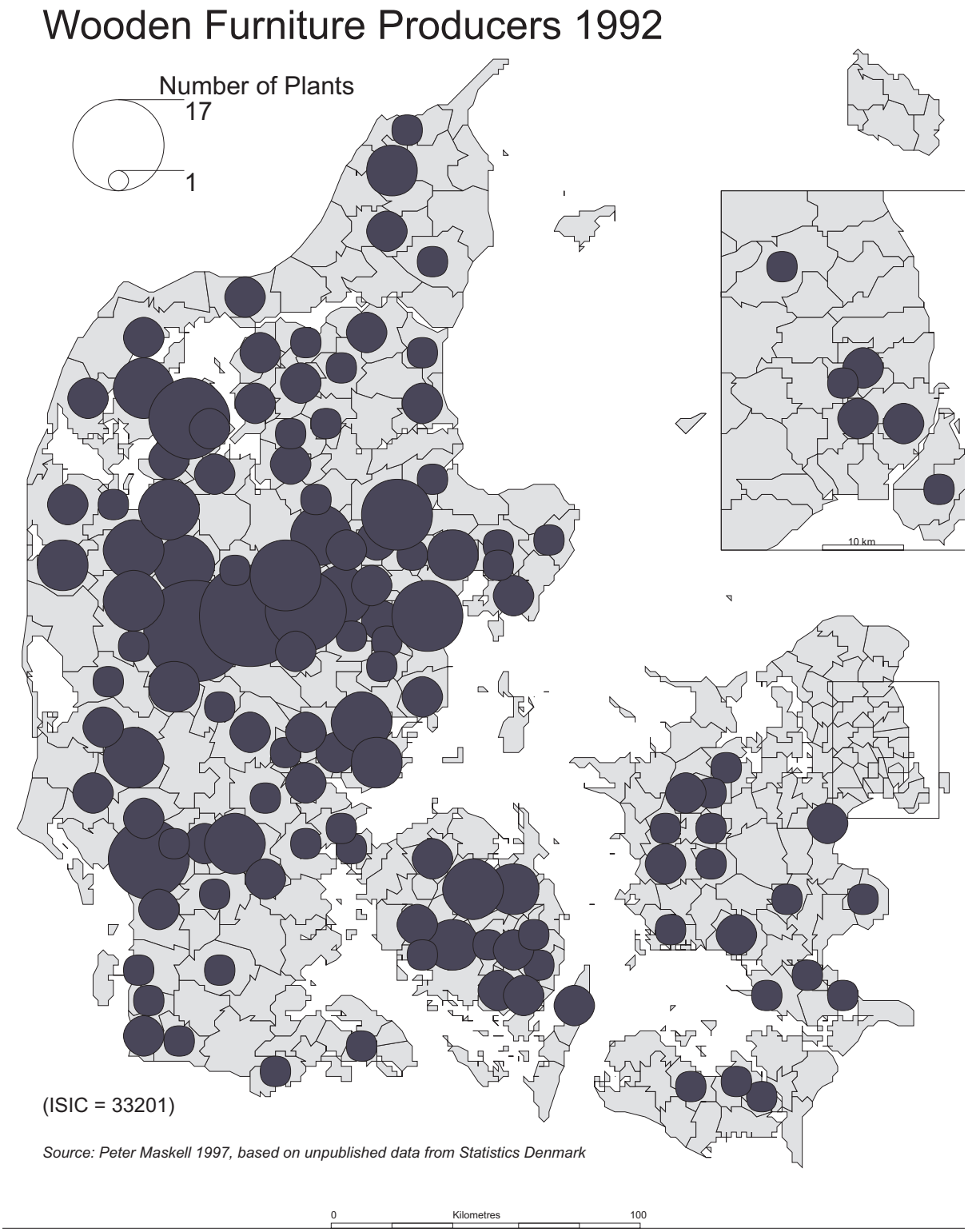


MAP 1



Source: Peter Maskell 1997, based on unpublished data from Statistics Denmark

MAP 2


Wooden Furniture Producers 1992
Number of Plants
17
1
10 km
(ISIC = 33201)
Source: Peter Maskell 1997, based on unpublished data from Statistics Denmark
0
Kilometres
100

References

Axelsson, Björn & Geofferey Easton (eds). 1992. Industrial Networks - A New View of Reality. London.

Balassa, Bela. 1969. Industrial development in an open economy: the case of Norway. Oxford Economic Papers, new series 21:344-359.

Ben-Porath, Yoram. 1980. The F-connection: Families, Friends and Firms in the organization of exchange. In Population and Development Review, vol. 6, no. 1, pp. 1-30.

Brusco, Sebastiano. 1990. The Idea of the Industrial District. It's Genesis. In F.Pyke et al. (eds) Industrial Districts and Inter-Firm Co-Operation in Italy. Geneva. Pp. 10-19.

Christensen, Peer Hull. 1996. Variations in the nature of the firm in Europe. In Richard Whitley & Peer Hull Christensen: The changing European firm - Limits to convergence. London, pp. 1 - 38.

Coe, David T. & Elhanan Helpman. 1993. International R&D Spillovers. International Monetary Fund Working paper no.84.

Collis, David J. 1991. A resource-based analysis of global competition: The case of the bearings industry. In Strategic Management Journal, vol. 12, p.49-68.

COM 1991. European Economy. Commission of the European Communities, Directorate General for Economic and Financial Affairs. Annual Economic Report 1991-92, no. 50, December. Brussels.

COM-DGIII 1993. Panorama of EC-Industry. Commission of the European Communities, Directorate General for Industrial Affairs, Brussels.

Dalum, Bent. 1995. Denmarks' market shares, OECD markets. Mimeo. IKE-group, Aalborg.

Dalum, Bent. 1996. Growth and international Specialisation: Are National Patterns Still Important? Chapter 3 in Jane Marceau (ed.): The Competitive Advantage of Small Welfare Nations? (forthcoming) Canberra.

Dam-Johnsen, Peter, Anna Goto, Ignacio E. Herruzo-Marcos, Kamran Mir, Risa Amerie Ota, Bo Ketil Riemer. 1995. Paint and lacquer for the Danish Wooden furniture industry. IMM-project. Copenhagen Business School.

Dierickx, Ingemar & Karel Cool. 1989. Asset Stock Accumulation and Sustainablity of Competitive Advantage. In Management Science, vol. 35, no. 12, December, pp. 1504 - 1513.

Dosi, Giovani. 1990. Finance, Innovation and Industrial Change. Journal of Economic Behaviour and Organization. Vol. 13, pp. 299 - 319.

Dosi, Giovani, Keith Pavitt & Luc Soete. 1990. The Economics of Technical Change and International Trade. London.

Drèze, Jacques H. 1960. Quelques réflexions sereines sur l'adaption de l'industrie belge au Marché Commun. Comptes Rendus des travaux de la Société d'Economie Politique de Belgique du 20 décembre 1960 (17.45-19.15) 275:4-37. (A translated and revised version with the title The standard goods hypothesis is included. Alexis Jaquemin & André Sapir, eds. 'The European internal market: Trade and competition', Oxford 1989:13-32.

Ecceles, Robert. 1981. The quasifirm in the construction industry. In Journal of Economic Behaviour and Organization, vol. 2, no. 4, December, pp. 335-357.

Ecceles, Robert. 1983. Transfer pricing, Fairness and control. Harvard Business School. Working paper no. 83-167.

Enright, Michael J. 1994. Regional clusters and firm strategy. Paper prepared to the Prince Bertil Symposium, Stockholm, June 16-18.

Fagerberg, Jan. 1995. Competitiveness, Scale and R&D. Paper presented at the NUIP/FIEF conference on Technology and International Trade at Leangkollen, Oslo 6-9 October.

Gepfert, Ken. 1995. Southeast Journal - Economic Focus: Why Furniture Business is rough on outsiders. The Wall Street Journal, 20th. March, p. 1.

Grossman, Gene M. & Elhanan Helpman. 1991. Innovation and growth in the Global Economy. MIT Press. Cambridge Mass.

Grossman, Gene M. & Elhanan Helpman. 1993. Endogenous Innovation in the Theory of Growth. National Bureau of Economic Research Working Paper No. 4527. Cambridge MA.

Grossman, Gene M. & Elhanan Helpman. 1995. Technology and trade. CEPR discussion paper no. 1134, February. London.

Harrison, B. 1992. Industrial Districts: Old wine in New Bottles? In Regional Studies, vol. 26, pp. 469 - 483.

Grupp, Hariolf. 1995. Science, high technology and the competitiveness of EU countries. Cambridge Journal of Economics, vol. 19. pp. 209-223.

Guerrieri, Paolo. 1991. Technology and International Trade Performance in the Most Advanced Countries. The Berkeley Roundtable on the International Economy (BRIE), Working Paper no. 49, University of California Berkeley.

Klette, Tor Jacob. R&D, Spillovers and Performance among Heterogeneous Firms. Statistics Norway, Research Department. Discussion Paper no. 133, Oslo.

Krugman, Paul. 1991. Increasing returns and economic geography. Journal of Political Economy 99:483-499.

Krugman, Paul. 1994. Empirical evidence on the new trade theories: The current state of play. Pp. 11-31 in New trade theories - a look at the empirical evidence. Centre for Economic Policy Research (CEPR), London.

Langlois, Richard. 1989. Economic change and the boundaries of the firm. In Bo Carlsson (ed.): 'Industrial dynamics - Technological, organizational and structural changes in industries and firms'. Boston/Kluwer.

Levy, David. 1984. Testing Stigler's interpretation of 'the division of labor is limited by the extent of the market'. In Journal of Industrial Economics vol. 32, no. 3, Pp. 377 - 389.

Lippman, S.A. & R.P.Rumelt. 1982. Uncertain Imitability: An analysis of Interfirm differences in Efficiency under Competition. In Bell Journal of Economics, vol. 23, pp. 418 - 438.

Lundvall, Bengt-Åke. 1985. Product innovation and user-producer interaction. Industrial development research series no. 31, Aalborg University Centre.

Lundvall, Bengt-Åke. 1988. Innovation as an interactive process: From user-producer interaction to the national system of innovation. In Giovanni Dosi & Christopher Freeman & Richard Nelson & Gerald Silverberg & Luc Soete (eds): 'Technical change and economic theory' London, pp. 349 - 369.

Macaulay, Stewart. Non-Contractual relations in business: A preliminary Study. In American Sociological Review, vol. 28, no. 1, pp. 55-67.

Maskell, Peter. 1995. Learning in the village economy of Denmark - The role of institutions and policy in sustaining competitiveness. Paper presented at the DRUID-seminar at Højstrupgård, Denmark 1. - 2. December.

Maskell, Peter & Anders Malmberg. 1995. Localised learning and industrial competitiveness. The Berkeley Roundtable on the International Economy (BRIE), Working Paper no. 80, University of California Berkeley. Available on the Internet: HTTP://SERVER.BERKELEY.EDU/BRIE/WPLIST.HTML#WP80

Mckinsey Global Institute, 1994: "Employment performance". Washington, D.C.

OECD. 1985. Trade in High Technology Products. Directorate for Science, Technology and Industry. DSTI/SPR (84.66). Paris.

OECD. 1994. Globalisation of industrial activities, Vol. I-II, Working paper no. 48, Paris.

OECD. 1992. Industrial Policy in the OECD countries. Annual Review. Paris.

OECD. 1995. Classification of high-technology products and industries. Working Party no. 9, of the Industry Committee on Industrial Statistics Group of National Experts on Science and Technology Indicators. Paris 12-13 October (Ref.: 023718/13799).

Pade, Henrik (ed.). 1991. Møbelindustrien. København.

Porter, Michael E. 1990. The Competitive Advantages of Nations. London

Prahalad, C.K. & Gary Hamel. 1990. The Core Competence of the Corporation. Harvard Business Review, No. 3, May-June, pp. 79 - 91.

Ranis, Troels & Morten Bjørn. 1995. Interviews of Danish wooden furniture producers and their suppliers. Mimeo. Copenhagen.

Richardson, G.B. 1972. The organisation of Industry. In Economic Journal, vol. 82, no. 2, September, pp. 883-896.

Romer, Paul M. 1990. Endogenous Technological Change. Journal of Political Economy. No. 98, Supplement pp. 71 - 102.

Rumelt, R. 1984. Towards a strategic theory of the firm. In R.Lamb (ed.): 'Competitive Strategic Management' pp. 556 - 570.

Schultz, Nicklas & Claudia Tretter & Karin Momme Nielsen & Jesper Salskov Jensen & Kathrine Vilstrup & Thomas S.Hedegaard. 1995. Wholesale distribution of wood and semi-finished wood products for furniture etc. IMM-project. Copenhagen Business School.

Schumpeter, Joseph Alois. (1911)1935. Theorie der wirtschaftlichen entwicklung (1911) 4.edt. München 1935 (The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle), Cambridge, Mass. 1934).

Soete, Luc. 1987. The impact of Technology Innovations of International Trade Patterns: The evidence Reconsidered. Research Policy, vol.16, no.2-4, pp. 101-130.

Spender, J.-C. 1994. The Geographies of Strategic Competence: Borrowing from Social and Educational Psychology to Sketch an Activity and Knowledge-based Theory of the Firm. Paper presented at the Prince Bertil Symposium. The Dynamic Firm, Stockholm, June.

Stigler, George J. 1951. The division of labor is limited by the extent of the market. In Journal of Political Economy, vol. LIX, no. 3, pp. 185 - 193.

Tyson, Laura D'Andrea. 1992. Managing trade conflict in high-technology industries. Pp. 67 - 99 in Martha Caldwell Harris & Gordon E.Moore (eds): "Linking Trade and Technology policies - An International Comparison of the Policies of Industrialized Nations". National Academy of Engineering, Series on Prospering in a Global Economy. National Academy press. Washington, D.C.

Villumsen, Gert & Bent Dalum. 1994. Trade growth and specialisation, Mimeo, IKE-group, Aalborg.

Zander, Udo & Bruce Kogut. 1995. Knowledge and the speed of the transfer and imitation of organisational capabilities: An empirical test. Organizational Science 6 (1):76-92.

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.

DRUID Working Papers

96-1 **Lundvall, Bengt-Åke:** The Social Dimension of the Learning Economy. (ISBN 87-7873-000-7)

96-2 **Foss, Nicolai J.:** Firms, Incomplete Contracts and Organizational Learning. (ISBN 87-7873-001-5)

96-3 **Dalum, Bent and Villumsen, Gert**:Are OECD Export Specialisation Patterns 'Sticky?' Relations to the Convergence-Divergence Debate. (ISBN 87-7873-002-3)

96-4 **Foss, Nicolai J:** Austrian and Post-Marshallian Economics: The Bridging Work of George Richardson. (ISBN 87-7873-003-1)

96-5 **Andersen, Esben S., Jensen, Anne K., Madsen, Lars and Jørgensen, Martin:** The Nelson and Winter Models Revisited: Prototypes for Computer-Based Reconstruction of Schumpeterian Competition. (ISBN 87-7873-005-8)

96-6 **Maskell, Peter:** Learning in the village economy of Denmark. The role of institutions and policy in sustaining competitiveness. (ISBN 87-7873-006-6)

96-7 **Foss, Nicolai J. & Christensen, Jens Frøslev:** A Process Approach to Corporate Coherence. (ISBN 87-7873-007-4)

96-8 **Foss, Nicolai J.:** Capabilities and the Theory of the Firm. (ISBN 87-7873-008-2)

96-9 **Foss, Kirsten:** A transaction cost perspective on the influence of standards on product development: Examples from the fruit and vegetable market. (ISBN 87-7873-009-0)

96-10 **Richardson, George B.:** Competition, Innovation and Increasing Returns. (ISBN 87-7873-010-4)

96-11 **Maskell, Peter:** Localised low-tech learning in the furniture industry. (ISBN 87-7873-011-2)

Information for subscribers.

Subscription price for 1996 is 600 DKR (about 20 papers). The rate for single issues is 40 DKR. It is possible to make a commitment to an exchange of papers from related departments or research teams. All correspondence concerning the DRUID Working Papers should be send to:

Mette Madsen
Fibigerstræde 4,
DK-9220 Aalborg OE
Tel. 45 98 15 42 11-2945
Fax. 45 98 15 60 13
E-mail: mm@business.auc.dk