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**THE DEVELOPMENT POTENTIAL OF HIGH-TECH FIRMS
IN BACKWARD AREAS**

A CASE STUDY FOR THE NORTHERN PART OF THE NETHERLANDS

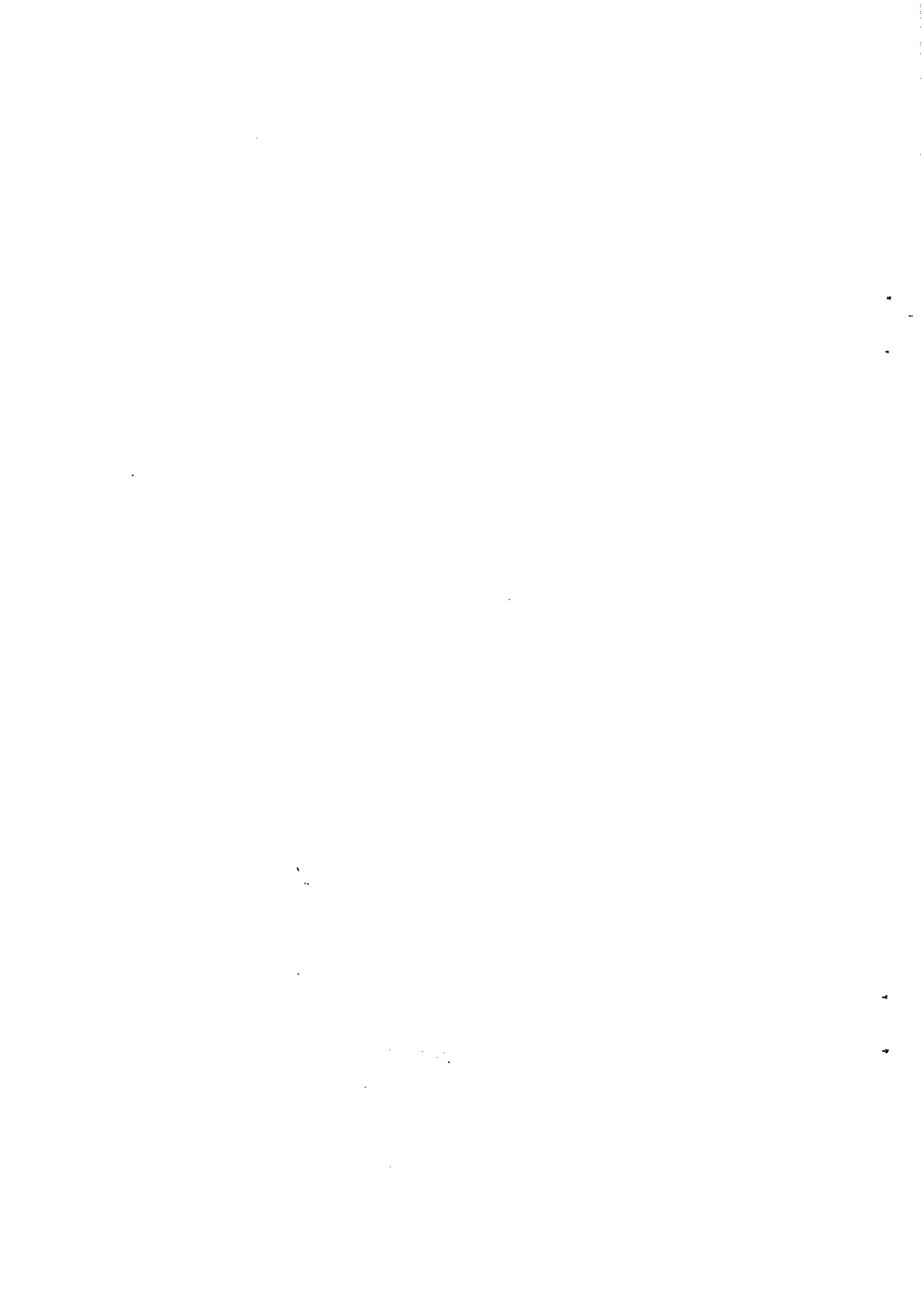
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**VRIJE UNIVERSITEIT
FACULTEIT DER ECONOMISCHE WETENSCHAPPEN
EN ECONOMETRIE
AMSTERDAM**



THE DEVELOPMENT POTENTIAL OF HIGH TECH FIRMS
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OF THE NETHERLANDS

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PN/07/mvk

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1. Introduction

The economic restructuring, the technological changes and the shifts in socio-economic patterns have exerted a drastic impact on the spatial distribution of people, firms and welfare. A great variety of spatial patterns has emerged in the past decades, caused by various antagonistic forces. On the one hand, we observe a spatial and industrial organization in which the requirements of advanced technologies induce a trend toward large scale companies (e.g. in the telecommunication, aircraft, computer, automobile and plastics industry). In this highly oligopolistic-competitive framework, the seedbed conditions for multinational firms are created. On the other hand, we also observe a contrasting tendency, in which the requirements of a modern technologically advanced state induce a wide variety of advanced small and medium sized firms (especially in the business service sector) which through a system of subcontracting, farming out and - sometimes - hollowing shape the seedbed conditions for a flexibility and diversity in a regional- national- international industrial system. These contrasting forces - viz, large-scale internationalisation versus small scale localisation - are thus closely related to the far reaching shifts in the technological and economic conditions of our society (cf. Giayoutzi et al., 1988).

It is noteworthy that parallel to this dichotomy one observes an increasing discrepancy between core and periphery. Internationally, new economic 'heartlands' seem to emerge which exert a real power on the financial and economic markets all over the world (e.g., Milano, Tokyo). However, this trend does not only take place in an international core-periphery context of industrialized versus less industrialized countries. It also applies to the same extent to regions within a national economy. In the light of such universal trends, it is extremely important to design a systematic methodological framework for analyzing and integrating the driving forces at work and their impacts. Such contrasting forces between core and periphery will be dealt with in the present paper with a particular emphasis on the impact of new technologies in peripheral lagging areas. In this framework in the second part of the paper a case study will be described on technology developments and policies in a peripheral region in the Netherlands, viz. the Northern provinces.

2. Technology Policy at Local or Regional Levels

In the analysis of socio-economic, -cultural and -political differences between centre and periphery, the efficiency - equity dilemma has traditionally played an important role (see Nijkamp and Rietveld, 1987).

In a regional-national context, regional/urban policies reflect a permanent conflict between an efficient use of scarce resources (usually in the centre) and the welfare discrepancies with respect to peripheral regions of a national system. The emphasis on either of the two policy objectives has in the past shown a fluctuating pattern, with a trend in the present time to emphasize again the efficiency motive.

Clearly, such policies have a strong sectoral component. For instance, a regional innovation policy favouring the microelectronics industry of the telecommunication sector means that areas with a favourable seedbed potential for these sectors receive a priority treatment. This can be connected with the generally accepted statement that technological innovation is not 'manna from heaven', but can be generated by well focused public policies (in close cooperation with private initiatives). Then the question emerges: which type of policy is needed for which type of technology and in which region? The microelectronics technology, the telecommunications technology, the biotechnology, the agro-technology or the off-shore technology, for instance, have all different seedbed conditions, and hence there is no uniform technology policy which can generate all kinds of new technologies. Technology policy is a tailor-made endeavour to favour the creation of specific innovative activities in specific sectors and at specific locations. This also implies that technology policy cannot be separated from other fields of public policy such as socio-economic policy and physical planning (cf. Whittington, 1985).

Various peripheral regions which usually do not have the infrastructure for attracting new 'technological regimes' (Nelson and Winter, 1982) are facing nowadays a relative decline in their competitive position, given the fact that many new activities are agglomeration-oriented. On the other hand, many of these new technological initiatives are (fairly) footloose oriented, so that - in principle - peripheral regions or border areas (especially those with an accessible gateway function) would have a potential for attracting such new activities. In this context, especially the high-tech sector, the information sector and the computer service sector (the so-called HINCOS-sector) are potentially promising candidates for upgrading the economic position of border areas (see for instance also Giaoutzi and Nijkamp, 1988). So far, however, the HINCOS sector exhibits a rather heterogeneous geographical pattern, with some orientation toward major agglomerations but sometimes also with some orientation toward intermediate areas or specific peripheral areas (the region of Twente in the Netherlands is a glaring example of the latter case).

The main question here is whether peripheral regions are able to benefit from their specific strong points and to suppress the poten-

tial weak aspects of their locational profile regarding the HINCOS sector. There is in general no reason to regard peripheral areas as 'intensive care' areas. Instead, the challenge is to identify for those areas the strategic key factors which provide them with a sufficient growth potential based on an active (bottom-up) self-organizing capability of the area at hand.

Clearly, there is in this context also much scope for specific sectoral- or regional-oriented policies (both public and combined public-private initiatives), as will be discussed later on. First, however, an overview of relevant models of industrial organisation will be presented which are interesting for the analysis of spatial dependence relationships in a core-periphery context.

3. Spatial-Industrial Organisation: A Framework

It is evident that industrial/technological organisation and spatial development are two intertwined phenomena. Here we will present a typology adopted from Swijngedouw (1987). The first dimension considered is the degree of integration, while the second dimension is the degree of horizontal (vis-à-vis vertical) organization. As each of these dimensions implies a certain spatial-industrial dependence relationship, we will discuss them in greater detail, and we will successively deal with the following cross-classification of organizational structures (see Figure 1).

Figure 1 indicates that HINCOS firms can be subdivided into classes corresponding to horizontal and vertical integration (or desintegration) both between and within enterprises. The resulting spatial-organisational structures imply then a certain dependence (or independence), in relation to the sources of industrial growth, viz. endogenous (i.e. from within the area) vis-à-vis exogenous (i.e. from outside the area). All four cases will now briefly be discussed.

Horizontal integration emerges when small and medium sized HINCOS firms, which are more or less operating in the same product activity pattern, have cooperative linkages, e.g. via mutual assistance contracts, technology and information exchange, and a close contact with local R&D centres. This form of integration leads to a geographical clustering of activities, in which a wide variety of various mutually competitive and mutually cooperative enterprises provide an endogenous stimulus to the development potential of the area at hand. The most well-known illustration of this phenomenon is the original spatio-economic structure of Silicon Valley: a fruitful cooperation between local enterprises of a small and medium size,

	Integration of HINCOS firms	Desintegration of HINCOS firms
Horizontal linkage structure	Endogenous independent development potential	Exogenous independent development potential
	-----	-----
	Silicon Valley (1950-1960) Emilia Romagna Veneto	M4 Corridor (GB) Brussels/Zaventem Corridor
Vertical linkage structure	Exogenous dependent development potential	Endogenous (or exogenous) dependent development potential
	-----	-----
	Ireland Portugal Silicon Glenn (Scotland) Northern part Netherlands	Toyota City (Japan) Silicon Island (Japan) Bretagne Sophia Antipolis (France) Bordeaux-Toulouse

Figure 1. Spatial-industrial organisation of individual HINCOS firms with some examples (adopted from Van der Mark et al., 1987).

research centres etc. This is a typical example of a bottom-up development pattern (cf. Stöhr, 1986). In case of a sufficiently large growth in sales and trade, such emerging HINCOS complexes evolve usually in the direction of vertical integration (or desintegration).

It should be added, however, that developments of the type taken place in Silicon Valley are not merely a spontaneous event. It can be shown that the considerable share of federal budgets spent for (semi)-military purposes in this area has meant an enormous push for the regional economy in this area, especially because in this way local entrepreneurs were assured of a guaranteed market, where quality was more important than low prices. Thus public policies may be decisive for such developments.

Horizontal desintegration is characterized by small and medium sized firms which operate in different subsectors or which are (regionally or nationally) relatively autonomous branches ('filières') of multi-national firms. This configuration may lead to a diffuse spatial pattern in which insufficient use is made of the indigenous development potential. The M4 corridor (London-Bristol), and the Brussels-Zaventem corridor are good examples of such non-integrated clusters of technologically intensive activities. The geographical clustering of

these relatively independent HINCOS firms with widely dispersed backward and forward linkages within the enterprise yields hardly a contribution to a stable regional economy, as the orientation of the firm outside of the area concerned precludes the building up of innovative local activities. In such cases public policies can at best try to generate more cohesiveness by means of communication infrastructure.

Vertical integration of multilocal firms occurs if the resulting production activity is characterized by deconcentrated and standardized mass production, benefiting for instance from low wages in the periphery. The R&D core facilities, however, remain usually in the centre. Such a geographical distribution of labour may take place within a country (e.g. Paris vis-à-vis Southern France, or South-East England vis-à-vis Scotland) or between countries (e.g. Europe vis-à-vis NICs). Such a spatial distribution of qualified labour in central areas and of low skilled labour in peripheral areas reinforces the regional development discrepancies and creates hardly an indigenous growth potential. Many examples are to be found in various countries, like Ireland (cf. Kamann, 1986), Portugal, Scotland and the Northern part of the Netherlands.

Finally, vertical desintegration is an extremely important spatial-organisational configuration for peripheral areas. This form is inter alia typical of many Japanese businesses. It is characterized by a structure, in which the whole production process is not entirely controlled by one enterprise. The mother company usually decides on the type of the final product and the key technology to be used. Non-essential activities and delivery of subcomponents however are often delegated to subcontractors. In this case, a spatial clustering of functionally different and more or less autonomous firms may emerge which have tight forward and backward linkages within the region. Such usually smaller firms form often a network that is oriented toward a variety of larger HINCOS firms. This may lead to new organisational structures of interfirm cooperation, in which - due to the high quality requirements of large (often multinational) HINCOS firms - subcontractors are forced to use the best available technology. Clearly, the result may be the formation of relatively autonomous branch plants in combination with local subcontracting, so that as a final result the local or regional economy may be strongly stimulated.

Clearly, there is also a danger involved: the regional economy becomes sensitive to business and product life cycles, especially when this economy is dominated by one type of final product oriented firm (e.g., automobile factory), as in that case a loss of a market share has immediate consequences for the regional economy.

A well-known example of vertical desintegration is Toyota City in Japan. Around Toyota's large car assembly factory, a couple of hundred innovative small and medium-size firms are located. Another example in Japan is Silicon Island. Also in this area we find a geographical agglomeration of (quasi-)integrated intermediate firms around a small number of very large electronic firms (Mitsubishi, e.g.).

Similar examples may also be found in France, although it has to be added that here - both for the development of telecommunication in Bretagne and the defense industry in Southern France - the French government played a crucial role in the geographical distribution of activities.

4. Implications of Spatial Organizational Models of HINCOS Firms

In the present section various implications of the models discussed in the previous section will be outlined.

In case of horizontal integration, a region is able to maintain a high level of innovativeness, as the generation of HINCOS products is favoured thanks to sales to other innovative firms and to adopters. This is especially the case if the area at hand has sufficient HINCOS supporting activities.

A situation of horizontal desintegration presupposes a certain degree of regional innovativeness, but this structure is far less stimulating and is to a large extent dependent on development and decisions elsewhere, especially because this situation mainly concerns regional decision centres of large firms. The relatively high adoption potential for HINCOS activities implies that mainly products produced elsewhere are generated. Such regional decision centres have a high information need, so that there is a large market for HINCOS supporting activities.

In case of vertical integration the branch plant character of large adopters precludes the extension of HINCOS generating activities in the region concerned. In addition, the information need of branch plants is fairly low and hence mainly oriented toward a mother company. Hence, the market for HINCOS supporting activities is limited, so that this sector has less potential in supporting the creation of HINCOS products.

Finally, in a situation of vertical desintegration, the relatively independent position of branch plants and the usually close contacts with sub-contractors assume a relatively rapid diffusion of HINCOS activities among regional firms. Due to the relatively autonomous position and the high rate of generating and adopting HINCOS activities in the region, a potentially favourable market for HINCOS supporting activities may then also be created.

In conclusion, vertical desintegration - in addition to horizontal integration - may provide a region with a relatively high degree of generating and adopting HINCOS products and services. Consequently, a regional policy oriented toward the HINCOS sector in backward areas should focus on either horizontal integration or vertical desintegration, depending on the specific industrial organisational features in the area concerned. Seen from this perspective it would make sense to favour especially the location of relatively independent branch plants of HINCOS firms which focus their attention on a potentially large regional sales market, or to stimulate existing firms to become more regionally autonomous units with a strong interwovenness with respect to the regional economy (cf. Cooke, 1985, and Malecki and Nijkamp, 1988).

After this typological approach, we will discuss in the next section the question whether a peripheral region in the Netherlands i.e., the Northern part, can provide sufficient indigenous potential for such HINCOS developments.

5. HINCOS Firms in a Peripheral Area in the Netherlands: a Case Study on the North

In this section we will first give a short introduction to the economic situation of the area under study: the three Northern provinces in the Netherlands (see Figure 2). Next, the development of employment in the HINCOS sector between 1980 and 1987 will be described. Finally the results of an inquiry among the HINCOS enterprises in the North will be presented, in order to collect more specific information on the (in)dependency of the enterprises, their regional supply patterns, their requirements for the labour force, etc.

5.1 The Economic Situation in the North

The Northern part of the Netherlands can be characterised as a large problem area in a small country and a small problem area in a large economic community (see de Smidt, 1985). In international terms, regional disparities in the Netherlands are not a severe problem, although the Northern provinces are still lagging behind. It is noteworthy that sometimes interregional comparisons conceal intraregional contrasts which are in various respects striking.

The Northern region is part of the periphery of the Amsterdam-Dortmund-Calais triangle. It has a few international contacts, located outside the European heartland and not situated between two or more centres of gravity. In the Netherlands the process of industrialisation and urbanisation meant a concentration of population in the Randstad or its surrounding ring and in some manufacturing regions in



Figure 2. Area under study (shaded).

southern and eastern provinces. The two basic sectors for the North are the manufacturing industry and agriculture. Basic business services including offices are underrepresented. Three types of subregions can be discerned here:

- A) rural-industrial (mainly the southern and south-western parts)
- B) manufacturing (mainly the eastern border, the so-called Peat Colonies)
- C) urban service oriented (around the capital cities in the three respective provinces).

These subregions have certain common problems, but at the same time they also display different patterns of population growth and distribution, economic base and residential development as well as environmental conditions.

Some areas are interconnected by large cooperative agro-businesses with a strong expert orientation. Manufacturing plants in the North are frequently branch plants of large national or international firms with headquarters elsewhere (Philips, Fokker, Honeywell, Alcatel ITT etc.). A good example of a branch plant is the Philips plant in Stadskanaal (in the eastern part of the province of Groningen). In 1985 only 11% of the intermediate deliveries came from the North, and this percentage was for 69% energy supply.

Finally, it can be concluded that in the North the foundation stones of a branch plant economy (vertical integration) are present. However, the situation in each of the provinces is different. This will be discussed in the next two subsections.

5.2 Employment in the HINCOS Sector in the Netherlands

Between 1980 and 1987 the share of the HINCOS sector in total employment in the Netherlands increased from 1.5% to 2.6% (from 63,900 to 125,518 employees). Although the HINCOS sector is not important in terms of employment, its growth has been twice as large as in sectors outside the HINCOS sector. For the next decade, it is generally expected that this growth will continue. A large part of the growth is linked to the computer service sector. The computer service sector itself grew from 492 establishments in 1980 to 1,915 in 1987 and the number of employees in this sector grew from 3,041 to 14,365.

Another considerable part of the growth of the HINCOS sector in the past seven years is linked to the telecommunication sector. On the basis of employment statistics, concentration indices are calculated for each province in the Netherlands for 1980 and 1987 (see table 1).

Table 1. Concentration indices of the HINCOS sector in the provinces of the Netherlands

		1980	1987
Peripheral North	Groningen	28	72
	Friesland	69	41
	Drenthe	151	172
Intermediate Zone	Overijssel	70	84
	Gelderland	78	109
Randstad	Utrecht	170	129
	Noord-Holland	92	110
	Zuid-Holland	130	122
Peripheral South	Zeeland	9	30
	Noord-Brabant	88	74
	Limburg	51	50

As we expected, the position of the HINCOS sector is very strong in the three provinces of the Randstad Holland. However, the strong position of Utrecht decreased, whilst the position of Zuid-Holland did not really change. Only Noord-Holland had an important growth in the HINCOS employment. The position of the HINCOS sector in the intermediate zone (Overijssel and Gelderland) has grown very rapidly. Surprising however, is the very strong position of the peripheral province of Drenthe. In 1987, Drenthe became number one in the Netherlands in terms of relative share of the HINCOS employment in total employment. This is a clear contrast with the peripheral provinces in the South of the Netherlands which might be expected to have a strong position of the HINCOS sector (mainly because in the South during the past few years the unemployment rate has decreased, whilst also the geographical position between the Randstad-Ruhrgebiet (Germany) and Brussels seems very favourable).

If we now take a closer look at our case study, i.e., the three peripheral Northern provinces, we can see that Groningen exhibits a take-over manoeuvre: the employment in the HINCOS sector has increased between 1980 and 1987 with more than 400%. A big part of this employment is concentrated in and around the city of Groningen. The growth of the HINCOS employment between 1980 and 1987 in Drenthe was 128%. Especially in the North of Drenthe, near the conurbation of Groningen, the position of the HINCOS sector is very strong. In the whole of Drenthe, the HINCOS structure varies a lot; the micro-electronic and medical instrument sectors provided, however, a strong contribution to the growth. In the third province in the Northern periphery, Friesland, the situation is less favourable. Between 1980 and 1987 the

concentration index even decreased.

After this general information about employment of the HINCOS sector in the various Dutch provinces and especially in the North, the position of the enterprises of the HINCOS sector in the North will now be studied in more detail.

5.3 Characteristics of HINCOS Activities in the North

In this subsection some results of an inquiry in the HINCOS sector will be discussed. A questionnaire was sent to all HINCOS enterprises in Groningen, Friesland and Drenthe with the aim to obtain more information (response rate 60%). Some interesting results will be presented here in brief.

The majority of the enterprises expects a further growth of employment for the future. Even in the lagging province of Friesland the HINCOS employment will grow. Especially the small and medium-sized enterprises expect a strong employment growth.

The above mentioned HINCOS employment growth can to a large extent be accounted to the medium-sized branch plants. In most situations branch plants are production establishments of multinational (large) firms. For instance, for Drenthe one might expect a strong dependency of enterprises on headquarters outside the province. However, the branch plants here are relatively independent due to the presence of many R&D divisions. In Friesland, however, most of the branch plants do not have R&D divisions. Finally in Groningen the employment growth of the HINCOS sector can mainly be attributed to independent enterprises; so that only here the employment growth has an endogenous origin.

More independence has a positive influence on the local interwovenness with respect to the regional economy. In the North the independence of the introduction of an innovation is higher as the size of the enterprises decreases. External organisations are not important for the introduction of innovations in big enterprises. Mostly these enterprises are branch plants.

The majority of intermediate deliveries for the HINCOS enterprises comes from outside the Northern provinces. The small original enterprises have the strongest orientation toward the region. We can conclude that an increase in the share of intermediate deliveries in the North requires a policy that should not only be directed toward the larger enterprises. Also a stronger interwovenness with respect to the regional economy of the medium sized enterprises can in principle strengthen the Northern economy.

In the inquiry the enterprises mentioned more process than product innovations. The medium sized enterprises are the most innovative (in terms of process and product innovations). Many more process than

product innovations are mentioned by the large enterprises because these enterprises are acting at already developed markets and they aim at lowering the product costs. This is characteristic for a peripheral region.

It is noteworthy that 82% of the respondents expects that the educational level will be upgraded from secondary education to high education. The HINCOS entrepreneurs have to attract these employees elsewhere, as otherwise they can never follow the technological change of the present and the nearby future. From the inquiry it appears that large and small and medium sized enterprises recruit higher educated employees in a different way. For the small and medium size firms the informal job search channels are the most important and successful approach. The more formal way of attracting labour by the larger enterprises leads to various recruitment problems. In this respect, there are not many differences between the three Northern provinces mutually. Only less problems are mentioned in Drenthe. The residential quality is in general regarded as being better here than in Friesland and Groningen. In the last section we will discuss some elements of a successful HINCOS policy for the North.

6. A HINCOS Policy for the North

In general it can be concluded that the North has a spatial industrial organisation of vertical integration. A development strategy for the future must be focussed on reaching a more vertically desintegrated situation. This situation may provide the North with a relatively high degree of generating or adopting HINCOS products and services. For this the branch plants should become more independent. At the moment there are some developments inside the organisational structure of large enterprises which can lead to more independence of the branch plants. Inside some multinationals (Philips, e.g.) an organisational reorientation toward the direction of more independence exists for the production divisions (intrapreneurship). The ultimate result may be that more work will be contracted out in the region itself. Especially if one takes into account the principle of just-in-time (JIT) production. The small and medium size enterprises in the North may then benefit from this situation.

This policy is possible in three types of intermediate delivery strategies: independent supply, subcontracting (production on the basis of specification of the purchaser) and co-makership (cooperation in the field of product development and production). However, the situation in the North is in fact difficult. The biggest problem is the widespread and varied structure of activities there. The large enterprises have high requirements on product quality for their intermediate products and they demand supply in large quantities. But the

small and medium size enterprises in the North cannot satisfy these needs. The quality requirements call for enormous investments and such large quantities can lead to too much dependence on one single firm. On the other hand, the new policy of some large enterprises tends to favour a stronger regional interwovenness with respect to the regional economy (and a more vertically desintegrated situation). But on the other hand, the special economic situation in the North and the requirements of the large enterprises precludes this. A solution may be that the enterprises tend to cooperate more not only in terms of co-makership between large and small and medium sized enterprises in order to assist with the quality of the product, but also between SMEs to solve the dependence problem.

In order to reach this goal, the sectoral policy should also have a regional or local component. The best results will be reached where the Northern economy is less widespread and economically more cohesive. This policy must be oriented toward these designated regions in the North. For example, in the centre of the three provinces one can distinguish a promising development triangle made up of the towns Drachten-Assen-Groningen. In this area, 40% of the HINCOS activities of the North is concentrated. Here one finds also a concentration of the labour force (200,000). Also this triangle has a very nice residential climate, which is an important condition for entrepreneurs in the HINCOS sector. The university in Groningen and several other higher educational amenities in this area can also supply enterprises with a highly educated work force.

Outside this central core, a few other development triangles can be found. For example, in the Southern part near Emmen one finds a concentration of enterprises in the new materials sector and there are also training facilities in this field. Next, the centre of Friesland is specialised in industry based on dairy products.

Based on a geographical concentration and a sectoral focus of regional policy, the best result can be reached for a stronger interwovenness of the larger enterprises in the Northern economy through which the creation of a vertically desintegrated economic structure is possible. Outside of these regions, the widespread and incohesive spatial lay-out of various activities will remain a fundamental problem for further independent development; the remaining areas will mainly remain dependent on spillovers from designated core areas. In conclusion, a new type of HINCOS growth policy is likely to be most promising for lagging areas in industrialized countries.

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