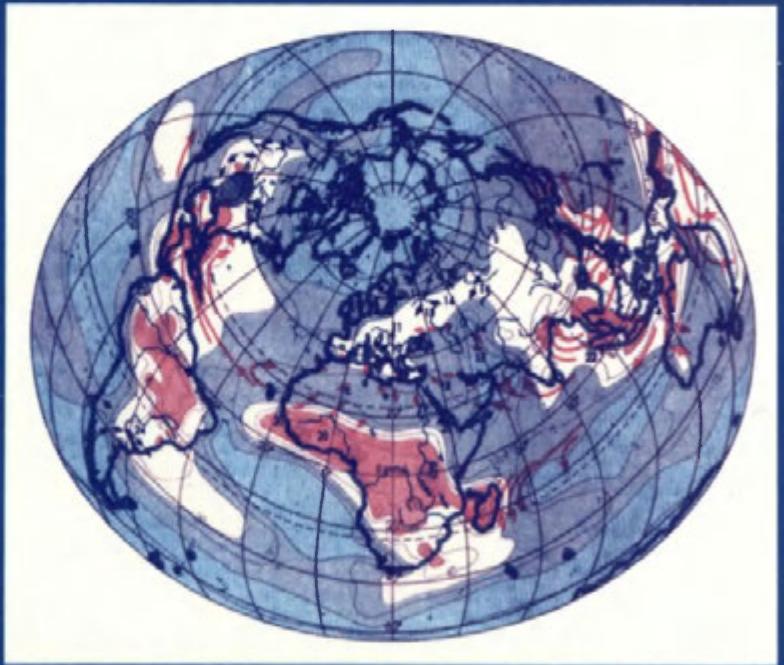


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EDITORIAL

Thirty-five years have passed since the first issue of GEOGRAPHIA POLONICA was published. Since that time a total of 71 volumes have appeared, presenting the contributions of authors from more than 20 countries.

This issue is the first in a new series as, beginning in 1999, GEOGRAPHIA POLONICA is adopting the format of a regular international journal. Two issues per year will be published initially, one in Spring and one in Autumn. The list of contents, which currently consists of articles only, may in the future be extended to include research notes, discussions and book reviews.

We hope that GEOGRAPHIA POLONICA will continue to attract the readership our title has been able to gain in past years. But we will also attempt to reach new readers – a task which we realize is not easy in the increasingly competitive world of scientific journals. We invite empirical as well as theoretical contributions to human and physical geography, and we offer standard review procedures, as well as timely publication of manuscripts accepted.

A TOP-DOWN BOTTOM-UP APPROACH
TO MANUFACTURING CHANGE.
SOME EVIDENCE FROM ŁÓDŹ, POLAND

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ABSTRACT: It is argued that the emergence of new manufacturing is heavily determined by the way local bottom-up influences or 'agents' – urban managers, producer services both specific and non-specific to particular industries, and new-firm founders – adjust to wider top-down economic and political 'structures'. To set this structurationist approach in context, a brief resume of the changing thrusts of research in industrial geography since the 1950s is presented. The approach is exemplified for Poland before and after 1989. The paper then focuses on the work of the four bottom-up influences, offering evidence from Łódź and Poland's central macro-region.

KEY WORDS: theory of industrial geography, top-down bottom-up approach, structurationism, urban managers, producer services, small firms, Polish central macro-region, Łódź.

INTRODUCTION

It is tempting to see the rejection of communism and the switch to the market economy in Poland as simply representing a reduction in the importance of central government as a factor influencing the geography of manufacturing on the one hand, and a growth in the significance of market forces on the other. As a generalisation this is true, but the substantial decentralisation of government powers to the *województwa* and *gminy* has greatly increased the importance of local politicians and officials. Moreover, the scope for individuals, small firms and indeed firms which existed during socialism, to develop in the way they see fit within the constraints of the market, has added to the significance of local decision-making. Not only are local officials active in seeking foreign investment and supervising the process of privatising state assets, but also there has been a remarkable upsurge of new small firms and of producer service firms providing a vital underpinning for new manufacturing ventures unable to afford their own stocks of materials, transport and professional services. Yet while the importance of decisions made at the local scale is indisputable, it is nevertheless clear that the opening-up of the economy to international competition subjects local busi-

nesses to rigorous price and quality constraints. It may therefore be argued that the market, both national and international, has largely replaced the controls exercised by central government prior to 1989, making it inappropriate to assume that local decision-makers are free to act as they wish. In other words there is a fine balance between 'top-down' forces acting at the macro-scale and the meso-, or governmental, scale, and 'bottom-up' forces operating at the local scale. However obvious the importance of the interaction of these three spatial scales may now be, it has to be said that it was not until recently that such interaction was explicitly recognised by industrial geographers. To set this in context this paper traces the main thrusts of industrial geography since the 1950s, then models changes in the top-down and bottom-up forces in Poland, and finally focuses on local decision-making in both public and private sectors using the Łódź region as a case study.

THE CHANGING THRUSTS OF INDUSTRIAL GEOGRAPHY SINCE THE 1950s

In common with those of other human geographical sub-disciplines, the research thrusts in industrial geography have undergone a number of important changes of direction since the 1950s, with some of these originating from academic initiatives and others being prompted more by events external to the subject. Prior to the late 1950s, when computing facilities became available and an interest in models began to emerge, industrial geography was essentially descriptive, emphasising the importance of historical patterns, and of physical factors such as raw materials and energy resources, with little attempt being made to generate theoretical frameworks. However, in the late 1950s and 1960s geographers eager to bring a more rigorous approach to bear saw in the work of Weber (1909), and economists like Lösch (1940), Hoover (1948), Isard (1956) and Greenhut (1956), the opportunity of developing spatial cost analysis (Smith 1971). From this sprang regional science, which, though interdisciplinary, by placing statistical methods at its centre, alienated many researchers who had found that industrial firms seldom behaved as optimising theory predicted. The increasing locational flexibility accorded to manufacturing because of the growing sophistication of its products, coupled with the boom years of the 1960s when new firms and plants were established in new locations, made it apparent that a greater understanding of spatial patterns could be obtained from a study of decision-making by manufacturers. This approach was termed behavioural, the omniscient rational economic man able to identify optimum locations being replaced by a more limited individual, the bounded rational satisficer who made decisions which were good enough for him (Pred 1967; Hurst 1974; Kortus and Adamus 1982). Moreover, it became equally clear that spatial cost analysis, which had been applied to a single factory, was not appropriate for the analysis

of international corporations powerful enough to create their own locational environment. Studies of the way in which large firms operated spatially were known collectively as the geography of enterprise (Hamilton 1974; Hamilton and Linge 1981; Taylor and Thrift 1982; Hayter and Watts 1983).

The economic recession of the late 1970s and early 1980s highlighted the way in which international firms, facing increasingly severe competition, could close factories in old industrial areas such as coalfields and inner cities, and invest in what they saw as more profitable parts of the world. Some industrial geographers following this line of research, saw regions being in the control of international capital, and consequently tended to emphasise the global or macro-scale at the expense of the local. This approach was termed structuralist (Walker and Storper 1981; Harvey 1982; Dębski 1995). While recognising the importance of capital, by examining government policy, that is policy at the meso-scale, other researchers broadened the scope of industrial geography still further moving it away from its focus on locality (Martin and Rowthorn 1986). Perhaps acting as a bridge to what was to follow, another group of industrial geographers demonstrated how regional differentiation was exacerbated by capital investment from outside at different times, according to the way in which local resources and population structure could be linked with technological change to secure the best returns on that investment. Thus the characteristics of particular places were responsible for what were termed 'layers' of investment (Massey 1978, 1984). Local decision-makers, however, were unimportant.

However, a moment's reflection indicates that, despite the undoubted importance of capital and national politics, the fact remains that even localities with similar resource bases possess distinct industrial characteristics, making it likely that some of the differences stem from decision-makers at one location interpreting political and economic influences differently from decision-makers elsewhere. In other words, a rigorous attempt to explain the rich spatial variety of manufacturing must combine influences obtaining at all spatial scales. This approach was formalised as structurationism, and was imported from sociology in the early 1980s (Giddens 1984). More specifically, human 'agents' at the local scale, collectively bottom-up forces, were seen to be working within and adjusting to the constraints imposed by top-down economic, political and social 'structures' obtaining at the national and international scales (Cloke et al. 1991). These agents operate in both the public and private sectors. In the former, local planners for instance have long been influential in determining intrametropolitan manufacturing location, causing them to be described as 'urban managers' (Williams 1982). In the private sector, producer services supporting economic activities in general, such as banks, insurance firms and consultancies have an obvious role to play, along with producer services backing specific industries, such as specialised stockists. Manufacturers themselves are also agents, none more so than those running small firms. The examination of the role of producer services in assisting the growth of new manufacturing firms is now an important thrust in industrial geography (Wood 1991).

In some ways similar to the structurationist approach is realism, which calls for the identification, of, firstly, causal mechanisms (that is, how does something happen?) through 'intensive' research, and secondly, empirical regularities (that is, how widespread is something?) through 'extensive' research (Sayer 1985). Like those following the structurationist top-down bottom-up approach, realist studies have demonstrated how much structuralist work assumed too much for international capital and too little for the power of particular places (Sayer and Morgan 1987).

MODELLING THE STRUCTURATIONIST APPROACH

Having briefly traced the evolution of the principal research directions in industrial geography, it is a helpful exercise, before discussing the role of the bottom-up influences on manufacturing in detail to demonstrate how manufacturing in Poland may be fitted into the structurationist framework. The fundamental change in the balance between top-down and bottom-up influences that took place in 1989–1990 justifies the generation of two different models.

Under communism, top-down influences on manufacturing were paramount. At the macro-scale membership of the socialist bloc resulted in the policy of heavy industrialisation, in a degree of specialisation among CMEA countries, and in an emphasis on the production of military equipment (Davies 1986, p. 366; Kowalski 1986), outside of which there was a low level of innovation. At the meso-scale these principles were operationalised by the Polish government by placing industries under the control of associations, latterly the *zrzeszenia*, supplies and marketing being effected by state trading organisations. Decisions about location, production, investment and manning were taken centrally, rendering the manufacturing enterprises very much decision-takers rather than decision-makers. Exceptions were the small number of small joint ventures and private manufacturing firms which were allowed to establish themselves during the 1980s (Miształ 1991). Obviously such firms nevertheless had to conform to government legislation, but since their location was decided by their founders, whose place of residence was almost certainly the determining criterion (Watts 1987, p. 149), it may be seen that micro-scale private influences did exist under socialism. Also at the micro-scale the *województwa* and *gminy* were heavily influenced by government policy, although they did draw up local plans for the distribution of manufacturing plants in industrial zones. Some of these zones were very large, for instance in Łódź the Żabieniec-Teofilów zone is of 525 ha and that at Dąbrowa 393 ha, and they collectively formed a fringe belt giving a distinctive land-use pattern to the city. Planners were therefore responsible for the actual siting of factories, even if their decisions were sometimes overridden by ministries in charge of manufacturing production (Rykiel 1988; Bury 1995). The situation described is presented in diagrammatic form in Figure 1; the thickness of the arrows indicates the power of the control exercised between elements of the system, the weakness of bottom-up influences being clear. It is also evident that

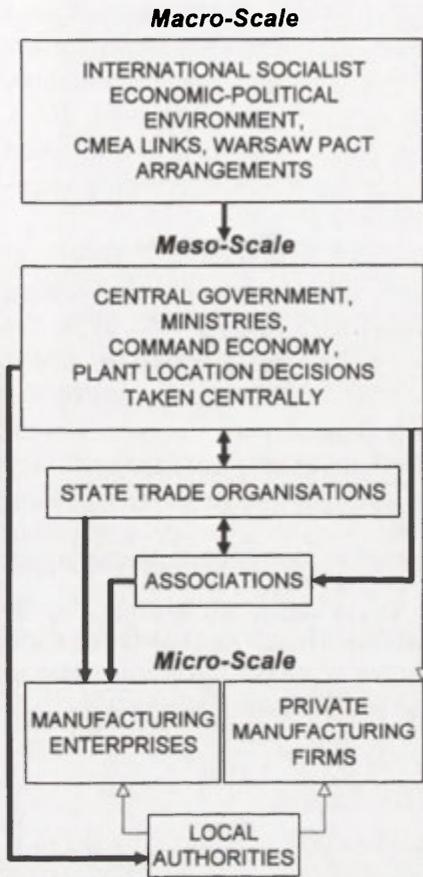


Fig. 1. Top-Down and Bottom-up Influences on Manufacturing in Poland prior to 1990

most decisions about location were aspatial in origin, that is, they were the result of the execution of political and economic principles. In order to understand locational patterns during socialism, it is first necessary to understand the processes giving rise to those patterns.

After 1989 macro-scale influences continued to be of prime importance, but now that the market took the place of socialism many fundamental changes occurred. Poland was cut off from its captive markets for manufactured goods with the dissolution of CMEA, while markets in the West were not available because of tariff protection and disparities in product quality. At the same time the 'peace dividend' reduced the requirement for military equipment. At the meso-scale, government legislation dismantled the old manufacturing hierarchy, rules for the privatisation of state assets were introduced, but to ensure that manufacturing capacity did not disappear almost entirely, arrangements were made for enterprises to be taken under the wing of the Treasury until they could be privatised. Poland had been an incipient 'mixed' economy in the 1980s, but now substantial numbers of private and public factories coexisted. Import tariffs

were set at a liberal level, encouraging import penetration, especially of consumer goods such as cars and electrical products, and of foods, thereby further impinging on Polish manufacturing capacity. In an attempt to counter inflation, rates of interest were fixed at a high level (in early 1996 the rate is still 26%), making it difficult for manufacturing firms to raise money for much-needed modernisation. And in line with the reduction in the power of central government, substantial administrative decentralisation was introduced.

Against the enormous weight of these top-down forces, most of which appeared to be unhelpful initially, it is not surprising that Polish manufacturing employment contracted by 9% between 1990 and 1993 (GUS 1991, 1995). Yet on the one hand administrative decentralisation has greatly increased the power of local government, and on the other the freedom of action presented by the market economy has allowed entrepreneurially-minded individuals to benefit, and in so doing benefit others. In consequence bottom-up forces are now very much more important than formerly, as urban managers, producer services and new firms combine to shape the way in which particular localities develop within and adjust to top-down forces. It is therefore argued that it is bottom-up influences which are replacing central planning as the principal explanation for the spatial differentiation of manufacturing production. The characteristics of these influences as they exist in Łódź and its region are explored in the remainder of this paper. The reformed structurationist model is presented in Figure 2.

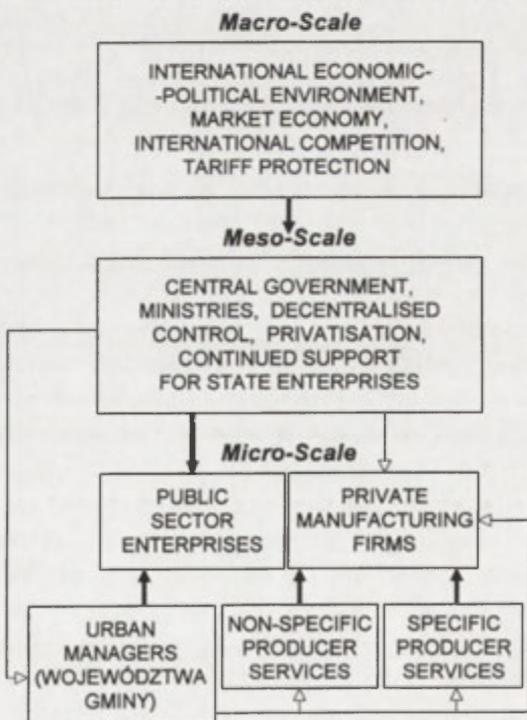


Fig. 2. Present-Day Top-Down and Bottom-up Influences on Manufacturing in Poland

BOTTOM-UP INFLUENCES ON MANUFACTURING

URBAN MANAGERS

The delegation of much economic power to local authorities, which are now in the charge of locally-elected politicians, usually local people with local interests (Markowski and Kot 1993), has greatly increased the opportunities for spatial diversity. In Łódź the *Łódzka Agencja Rozwoju Regionalnego* (Regional Development Agency), established in 1992, pursues an aggressive policy to attract foreign manufacturing investment, offering attractive 'packages' including low taxes and allowances on capital investment to firms, in the hope that they will establish themselves in the city. Offers are negotiated with individual firms and are based on the likely economic advantages to the city. Local autonomy enables decisions to be reached quickly, for example the Barry chocolate plant was in operation only 10 months after negotiations began (Iskrzyński 1996). The Agency injects capital in the form of shares into promising firms, and for selected others it pays their bills against loans from Łódź banks, some of which are in fact shareholders in the Agency itself (Griffin 1996). A trade promotion office has been opened at Kaliningrad in Russia and others are planned on the Czech and German borders. The Agency's receipt of financial support from the European Union Phare Struder Plan, renders it inappropriate to see this as purely a bottom-up influence, but its particularly pro-active stance certainly makes it distinctive.

Also involved in the promotion of new economic activities is the Łódź Chamber of Commerce (*Łódzka Izba Przemysłowo-Handlowa*), established in 1991, while in 1994 the city created a Strategy Department (*Wydział Strategii Miasta*) with sections specialising in promotion, investment advice, the development of entrepreneurial skills, and privatisation. Links have been established with cities throughout Western Europe through the medium of Polish Commercial Attaches. An indication of the effort being directed at promoting the city is the allocation of 879,000 zł (about £231,500) for this purpose in 1995 (Urząd Miasta Łodzi, 1995). It is not possible to assign the responsibility for new investment to one single local agency, rather success may be seen as a collective effort. By the end of 1995 some 22 foreign manufacturing firms had each made investments of more than \$1 million, generating a total of \$127 million; 7 of these had invested more than \$10 million each. Two – the German East-West Spinning and the British firm Coats – are textile companies, and a third, the American VF Corporation, is a clothing manufacturer, suggesting that international meso-scale firms still value the traditional micro-scale attributes of the city. That these 22 firms plan to invest a further \$107 million (Oddział Promocji Miasta i Współpracy z Zagranicą, 1996) would seem to confirm this view, but the part played by the urban managers is also obviously important, since it is known that other cities were simultaneously competing for the initial investment. In fact, potential investors routinely circulate all major cities with their proposals. More generally, rents

for publically-owned industrial premises are fixed by local officials at levels they regard as reflecting market values. In the case of Łódź the division is into rent zones, the boundaries of which are subjective, and in any case subject to change as the local authority reviews its policy. Land taxes exhibit similar principles and vary according to the perception of local officials. Within such a framework it is inevitable that variations will exist between local authority districts.

An area of considerable short-term importance is the privatisation of public sector manufacturing plants, a process which is supervised by local officials of the Ministry of Deprivatisation. Negotiations between prospective purchasers, the enterprise management and the workforce are undertaken, and a central issue in discussions is the value of the property and equipment, which is estimated by officials. Since the latter are not private businessmen discussing their own money, they can be persuaded to take a charitable view and reduce their estimate of the value, helping to increase the number of private firms in existence. Local officials have the power to add provisos to the sale, for instance, requiring that the new firm invest a certain sum within a fixed time period, or pay a financial penalty equal to dismissed workers' wages should employment be reduced (Michalak 1994). These provisos may prove too onerous and cause negotiations to fail, or the firm subsequently to close. The progress of the privatisation of state assets in the Łódź *województwo* is set out in Table 1. Even though local officials are eager to complete as many sales as possible, it is obvious that the process is a slow one, despite the government regulation which allows joint ventures to borrow money at half the current bank rate, and it is therefore likely that the influence of this group of urban managers will persist for some time. It is noticeable that more producer services than manufacturing enterprises have been privatised, representing local entrepreneurs' views of the need for and therefore of the profitability of such activities in the present-day market economy. The difference between specific and non-specific producer services is taken up below.

In addition to supervising the sale of assets, local officials monitor the performance of firms in their care. If a firm is judged to be managed inefficiently, the director may be dismissed and another appointed. Moreover, it is within the authority of officials to close a firm which is manufacturing a product for which there is a declining demand. This is a contributory factor behind the decline in

Table 1. Privatisation Effected by Łódź *Województwo* Officials 1990–1994

Year	Manufacturing	Construction	Specific Producer Services	Non-Specific Producer Services	Total Firms
1990	–	–	–	1	1
1991	–	2	–	–	2
1992	3	1	1	2	7
1993	3	–	1	2	6
1994 (part)	1	–	1	–	2

S o u r c e: Wydział Przekształceń Gospodarczych Urzędu Wojewódzkiego w Łodzi.

the number of state enterprises supervised by the *województwo* from 239 to 180 between 1992 and 1996 (Michalak 1996). However, officials take the view that since the assets of many firms are worth very little, closure would merely result in unemployment, the cost of which may be greater than the cost of retaining production (Michalak 1994). This is indeed a subjective judgement, but one which certainly contributes to the retention of public enterprises.

NON-SPECIFIC PRODUCER SERVICES

Under socialism, services which supported all manufacturing, that is were not specific to one industry, such as accounting, legal advice, advertising, finance, insurance and real estate, were either internalised within enterprises or virtually non-existent. In a market economy, however, such producer services are usually external to all but the very largest firms, and are vital to new firms which are small, lacking in capital and heavily reliant on external support. Furthermore, the growing complexity of business transactions, the increasing need for sophisticated advertising and the ever changing international legal and regulatory environment, typified by the European Union, have placed many aspects of modern business outside the experience of most manufacturing firms. It follows that the growth of manufacturing is in part dependent on the speed with which producer services develop, and as Wood (1991) argues, modern agglomerations of economic activity such as Silicon Valley in California, or the concentrations of small firms in the 'Third Italy', are essentially agglomerations of service expertise. It is known that producer services develop exponentially with the size of a town (Daniels 1978; Watts 1987), such that large cities have more than their 'fair' share, and it is also appreciated that the expertise of producer service firms is available not only to manufacturing, but to all economic activities, and indeed to the public at large (Allen 1988). Nevertheless, even though it is difficult to be precise about the proportion of producer service firms' time actually spent assisting manufacturing, it is a reasonable assumption that the greater the availability of such services, the greater the advantages for manufacturing. It hardly requires emphasising that the level of producer services in particular localities is almost entirely the result of local individuals identifying a demand for their expertise, thereby contributing to bottom-up forces.

Daniels (1986) proposes that insurance, banking, finance, transport and communications may be used as surrogates for producer services in general. In the analysis which follows the last two sectors are excluded on grounds of data availability, but the wide cross-section of activities employed provides a useful indication of potential manufacturing growth. The categories used are: insurance firms, insurance brokers, underwriters, commercial banks, industrial consultants, commercial solicitors, accountants, property managers, market research and advertising agents.

From a position in 1989 of only weakly developed producer services, there has been a remarkable upsurge in the number of firms in this sector in Poland's

Table 2. Size of Non-Specific Producer Service Firms by Employment Class in the Central Polish Macro-Region, 1995

	1-10	11-20	21-50	51-100	101-250	> 250	Total
Łódź	166	59	58	56	32	16	387
Piotrków Tryb.	9	10	11	6	1	—	37
Płock	20	13	18	7	7	3	68
Sieradz	7	5	5	4	3	2	26
Skierniewice	41	5	13	15	8	1	83
	243	92	105	88	51	22	601

SOURCE: Kompas (1995).

central macro-region. Table 2 indicates that in 1995 there were no fewer than 601 producer service firms not specific to manufacturing in the region, the Łódź *województwo* accounting for 64% of the total, a situation very evident in Figure 3. Given the size of the city of Łódź in relation to that of the other settlements in the region, it is reasonable to expect Łódź to have an even greater share, but local decision-makers have seen greater than expected opportunities in the much smaller towns of the Skierniewice and Płock *województwa*, which claimed respectively 13.8% and 11.3% of the total number of firms. It is possible that the relative proximity of these two *województwa* to Warszawa and its strong producer service sector, has caused them to be regarded as possessing especially good business potential. Certainly two *województwa* more distant from the capital appear to have been less successful in attracting producer services, Piotrków Trybunalski claiming only 6.1% and Sieradz a mere 4.3% of such firms. The implication is that areas lacking large towns and distant from the capital city are not likely to be favoured by new manufacturing firms, as opposed to branch plants set up by existing firms. This trend, a result of bottom-up pressures, has been noted in many West European countries (Cole and Cole 1993). The polarisation of activity typical of market economies may also be witnessed at the intra-*województwo* scale. Because the Łódź *województwo* is effectively the city of Łódź, it is not surprising that 93.8% of producer service firms are in the city. However, clustering is exhibited in the other administrative districts which possess smaller towns and a larger surface area: the town of Płock has a truly remarkable 83.8% share of producer services in the *województwo*, while the figures for the towns of Skierniewice (45.8%), Piotrków Trybunalski (40.5%) and Sieradz (30.7%), though lower, nevertheless follow the trend. Chief towns are clearly seen to be favourable locations at the *województwo* scale just as in the case of Warszawa at the national level.

Since the opportunity for the development of producer services has so far been relatively brief, it is to be expected that a good number of firms will be small; indeed 40.4% of all firms employ fewer than 11 staff, 55.7% employ fewer than 21, and 73.2% fewer than 51. Even in Łódź, where a number of trading organisations such as Textilimpex and Surtex, dating from the socialist period, remain in operation, firms with less than 11 employees represent 42.9% of the

total in the *województwo*, while the figure for firms employing fewer than 51 people is 73.1%. Skierniewice in particular seems to have attracted small firms, with almost half (49.3%) the firms in the *województwo* employing fewer than 11 people. It should be pointed out that these small producer service firms in the Polish central macro-region in fact reflect the situation in the USA and Western Europe. Small firms offer the best structure for the provision of specialist expertise with its emphasis on ingenuity and on the increasing need to meet the specific needs of particular customers; additionally small firms have low overheads and can charge very competitive fees (Wood 1991). In line with the findings discussed above, neither Piotrków Trybunalski nor Sieradz have been regarded as being particularly profitable by local businessmen. In the former *województwo* the smallest category of firm accounts for only 24.3% of the total, and in the latter 26.9%. A surprising feature revealed in Table 2 is the existence of some firms of greater size than is normally associated with producer services. The explanation is that such firms are mostly manufacturing enterprises pre-dating the market era which have established consultancy divisions, and the entire workforce is erroneously quoted as being involved in consultancy work. This is no different in principle from the problem of trying to establish how many bank staff are actually concerned with providing services to manufacturing. Notwithstanding these problems, the data do allow for the formulation of general statements about the distribution of producer services resulting from locally-made decisions.

PRODUCER SERVICES SPECIFIC TO PARTICULAR INDUSTRIES

So far attention has been focused on producer services associated especially with the second half of the twentieth century, but the fact remains that manufacturing has always needed service sector support, frequently of a kind specific to particular industries. Such support includes equipment suppliers, maintenance and repair contractors, wholesalers, distributors, agents and representatives. Their role was appreciated long ago by Weber (1909), who saw them as components of agglomeration economies, which with transport and labour, were one of his three general location factors. More recently they were incorporated by Florence (1948) within what he termed diagonal integration, as opposed to vertical and horizontal integration, in his attempt to explain the clustering of manufacturing firms in the British West Midlands agglomeration. In any event, the existence of these services is a function of local people identifying a local need and profiting by it.

The role of producer services specific to particular industries may be demonstrated by reference to textile manufacture in the central macro-region. In 1995 there were 119 firms providing such services, but of these no less than 106, that is 87%, were in the city of Łódź, while a further 6 were in the Łódź *województwo*, bringing the share to 94%. Furthermore, as is clear from Figure 4, the remaining firms were proximate to the Łódź *województwo*. The Piotrków Trybunalski and Płock *województwa* did not have a single textile producer service firm, while

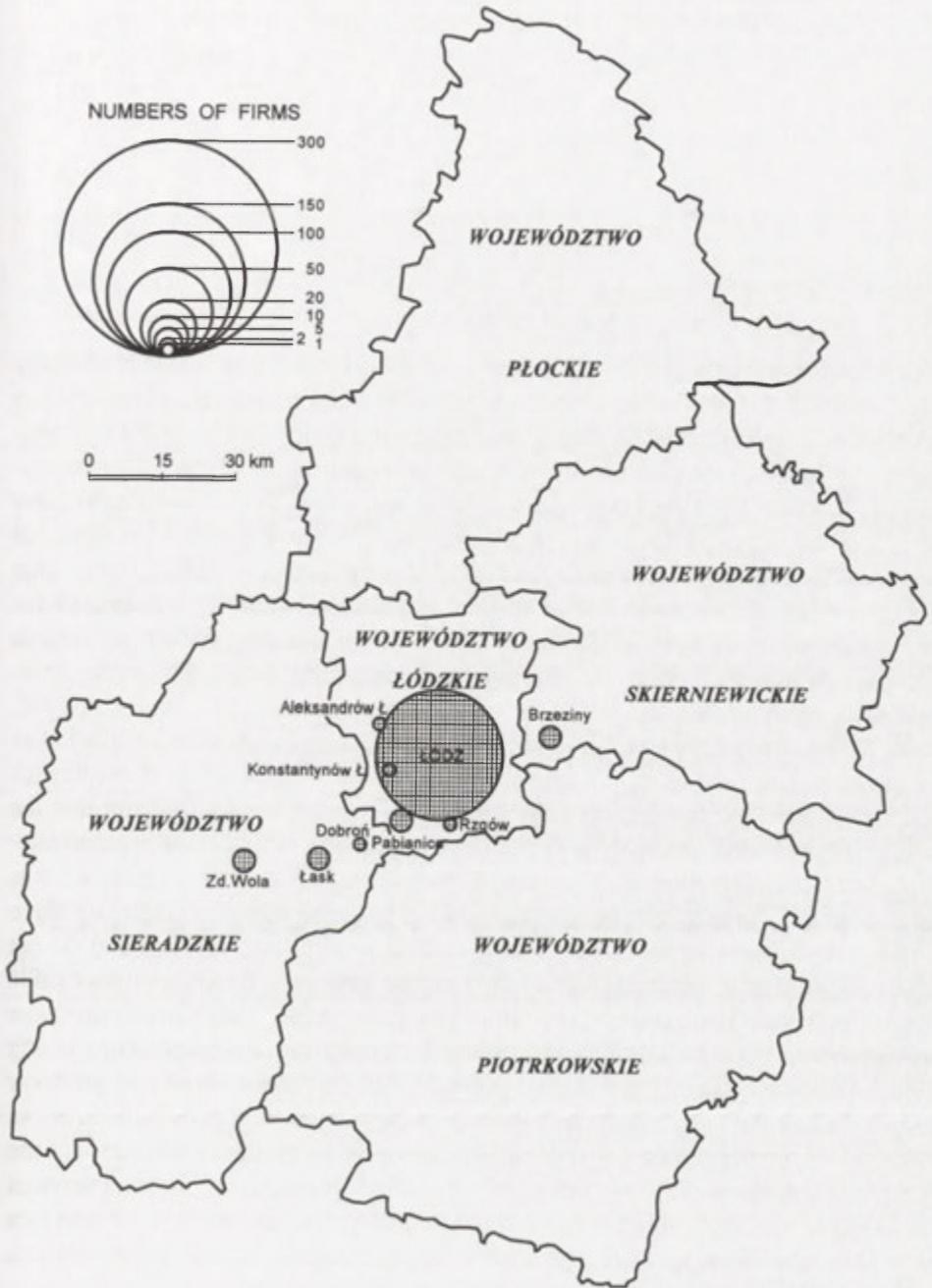


Fig. 4. Producer Services Specific to the Textile Industry in the Polish Central Macro-Region, 1995

Table 3. Size of Producer Service Firms Specific to the Textile Industry in the Central Macro-Region by Employment Class, 1995

	1-10	11-20	21-50	51-100	101-250	Total
Łódź	74	20	11	4	3	112
Piotrków Tryb.	–	–	–	–	–	–
Płock	–	–	–	–	–	–
Sieradz	–	–	2	1	1	5
Skierniewice	1	1	1	–	–	2
	75	21	14	5	4	119

S o u r c e: Kompas (1995).

Skierniewice had only 2. The great majority of these firms are new, and predictably they are small. Some 75 (63%) employed between 1 and 10 people, while a further 35 employed between 11 and 50, together representing 92% of the total. The domination by Łódź of the smallest firms is almost complete, 74 of the 75 firms employing less than 11 being based in the *województwo* (Tab. 3). It is abundantly clear that local entrepreneurs have very quickly recognised a market for their services, but it is equally clear that only in the city of Łódź is this market seen to exist. Thus within only five years of the introduction of the market economy bottom-up influences have become an important factor in the location of new manufacturing growth, for outside the Łódź *województwo* there are obvious disadvantages for small new textile firms. Not surprisingly, of the 105 textile firms employing less than 51 workers in 1995, some 64 were in the city of Łódź, and 29 were in Pabianice and other satellite towns of the city. The Sieradz *województwo* attracted only 7 small firms, Skierniewice 3, Płock 2 and Piotrków Trybunalski none at all. It is customary to claim that the availability of textile mill space is the cause of the success of Łódź, but in a contracting manufacturing environment suitable factory space is everywhere available. It is also sometimes argued that areas characterised by large factories (there are three textile mills employing more than 1,000 workers in Piotrków Trybunalski) do not generate new firm – founders (Watts 1987), but the large size of mills typical of Łódź has not prevented the growth of new firms. By contrast the availability of producer services specific to the industry in Łódź and its environs is a much more telling argument in the explanation of recent growth trends. Of course, some new producer service firms have been established because of the strength of the textile industry in Łódź, so the textile industry is not entirely driven by its producer services, but the fact remains that those districts perceived to have little potential for producer services are unlikely to attract substantial new textile capacity. This polarisation of activities as a risk-reducing strategy is a main spatial characteristic of market economies, underlining the power of bottom-up forces.

Producer services associated with the clothing industry in the central macro-region exhibit similar tendencies (Tab. 4). Of the 100 firms identified, 80 were located in the city of Łódź and a further 4 were based in the Łódź *województwo*. It may be seen from Figure 5 that the concentration upon Łódź is slightly less

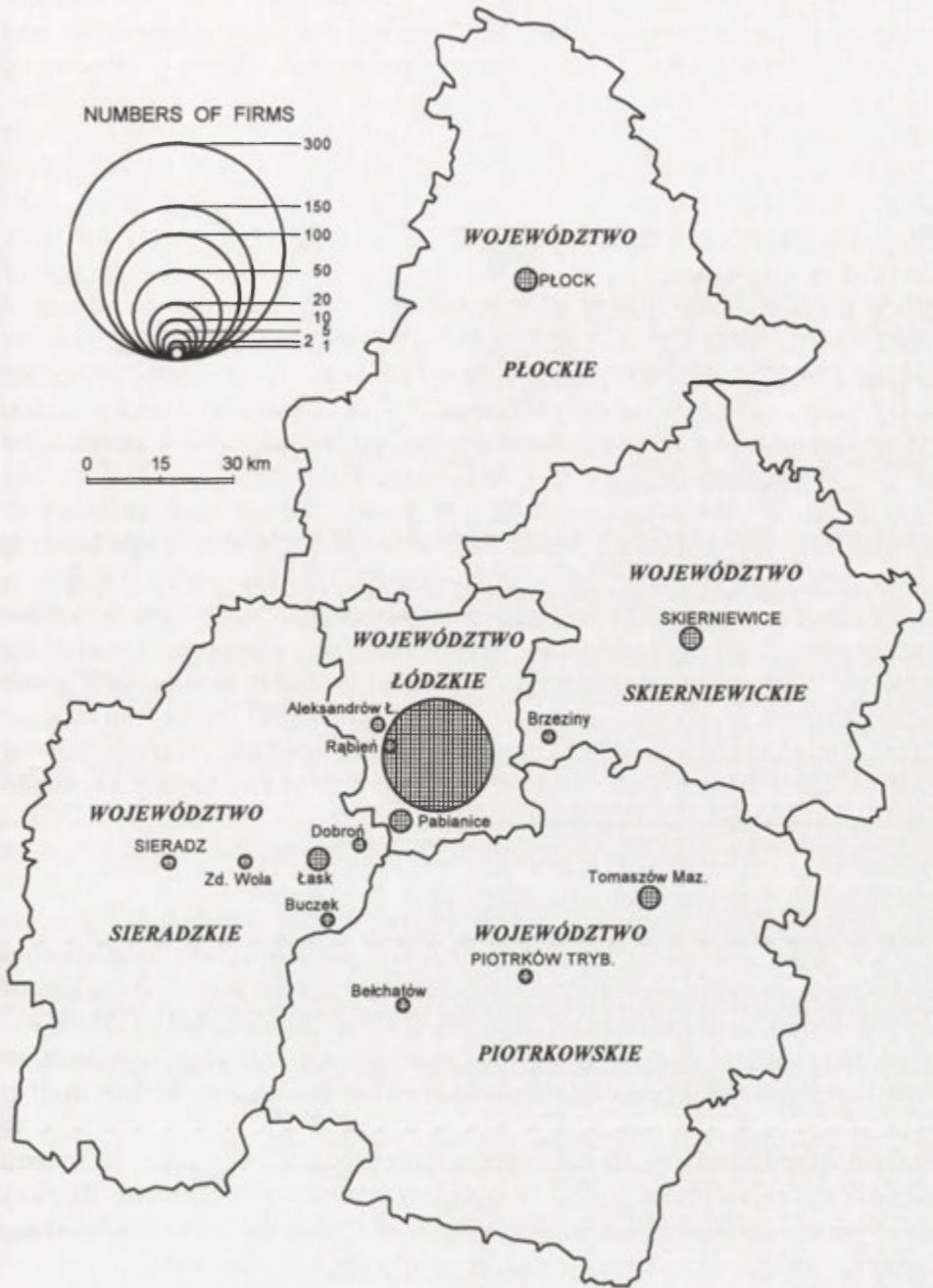


Fig. 5. Producer Services Specific to the Clothing Industry in the Polish Central Macro-Region, 1995

than in the case of textile producer service firms because of the more spatially widespread nature of the clothing industry itself (the Łódź *województwo* had 85.1% of all textile firms in the region in 1995, but only 70.5% of all clothing firms). However, in relative terms clothing producer services are disproportionately clustered in Łódź. Thus the *województwo* had 85.1% of textile firms and 94% of textile producer service firms, but although it had only 70.5% of clothing firms it had 84% of clothing producer service firms. The clothing industry itself may be rather more widespread than textiles, but local entrepreneurs obviously feel that their best strategy is to base themselves in Łódź. Evidence in support of this is provided by the Skierniewice *województwo* which had the second largest number of clothing firms – some 49 – but yet had only 3 clothing producer service firms. As with textiles, the clothing producer service largely comprises small firms, some 55 employing less than 11 people, while 89 have fewer than 51 employees. Similarly, Łódź dominates the smallest, and almost certainly the newest, firms, accounting for 89% of those with less than 11 employees, and providing once more indication of the way in which the economic environment is interpreted by local decision-makers. In this regard, mention should be made of the 20 ha covered market with approximately 2,000 stalls opened at Rzgów to the south of the city of Łódź by local entrepreneurs the Ptak brothers, which has quickly assumed both national and international significance for the clothing industry. Here on all seven days a week small firms can display their goods without the aid of an agent and expect to effect sales to wholesalers and retailers from within Poland and other Central and Eastern European countries (Musiał and Pączka 1995). It is a valuable producer service, and its existence is due to the initiative of local entrepreneurs.

PRIVATE SECTOR MANUFACTURING FIRMS

Although public sector manufacturing firms now have almost complete control over their operations, with the result that their actions regarding the size of the workforce, product diversification, and the use of specialised producer services have an important local impact, their existence is heavily dependent on decisions made centrally under socialism. Therefore this section confines itself to small firms with fewer than 51 employees, most of which it is justifiable to suppose post-date 1989. Since it is not the purpose of this paper to present a complete study of local manufacturing, but rather to demonstrate the way locally-made decisions contribute to bottom-up forces, the textile and clothing industries in the central macro-region are used to provide material.

In the first place, despite the very substantial macro-scale changes, there has been a remarkable increase in the number of small firms in both industries. This suggests that individuals have not been daunted by the experiences of the large public sector firms since 1989, and have had the confidence to establish businesses. No fewer than 105 of a total of 201 textile firms (52%) employed fewer

Table 4. Size of Producer Service Firms Specific to the Clothing Industry in the Central Macro-Region by Employment Class, 1995

	1-10	11-20	21-50	51-100	101-250	251-500	Total
Łódź	49	14	13	2	3	3	84
Piotrków Tryb.	2	2	1	-	-	-	5
Płock	1	-	1	-	-	-	2
Sieradz	-	-	3	1	2	-	6
Skiernewice	3	-	-	-	-	-	3
	55	16	18	3	5	3	100

S o u r c e: Kompas (1995).

than 51 workers in 1995, and this in an industry for many years characterised by large factories. (A survey of 47 Łódź mills showed that the average size in 1988 was 1,850 workers (Riley and Pączka 1992)). In the case of clothing, 215 (64%) of the 339 firms may be classified as small. The importance of small clothing firms is in part a local reaction to meso-scale changes in the form of government relaxation of controls on private business in the 1980s. The clothing industry was a very suitable activity for those with skill and entrepreneurial flair but little capital, because start-up costs are very low, especially since second-hand equipment was available. Private firms introduced piece rates and wage bonuses, while management was involved in day-to-day production on a Western basis. The result was that clothing manufacturers were well prepared to operate in market conditions after 1989, since many had already been trading in this environment. Their success has led to the growth of a process by which large numbers of low paid seamstresses work at home or in small, often unofficial, workshops, of which there are thought to be 54,000 in Poland, with the greatest concentration in Łódź (Griffin 1996). It is likely that some, and perhaps even a majority of, small firms in both clothing and textile manufacture are supported financially by family members or close acquaintances with access to cash (Granovetter 1985; Fuglsang and Pedersen 1995), as has occurred in the Third Italy (Storper 1993). Arguably therefore, this transformation in the structure of both industries has not only been local in origin, but has also involved social networks.

Secondly, recognising the limited potential of standard products, new investors in the textile industry have chosen to specialise in particular market niches, and to compete successfully with larger firms by employing flexible working practices which bigger producers are not able to enjoy. An indication of the specialisation effected by the 105 small textile firms may be obtained from Table 5; it is evident that for the most part output is in those sectors in which economies of large-scale production are unimportant. Knitwear is clearly seen to be a profitable sector, with more than one-third of small firms working in it. This is a branch well-suited to batch production, and its acceptance by small firms represents a reversal of socialist policy, for during the 1960s and 1970s there was considerable investment in medium-sized knitting factories (Niżnik 1980). In

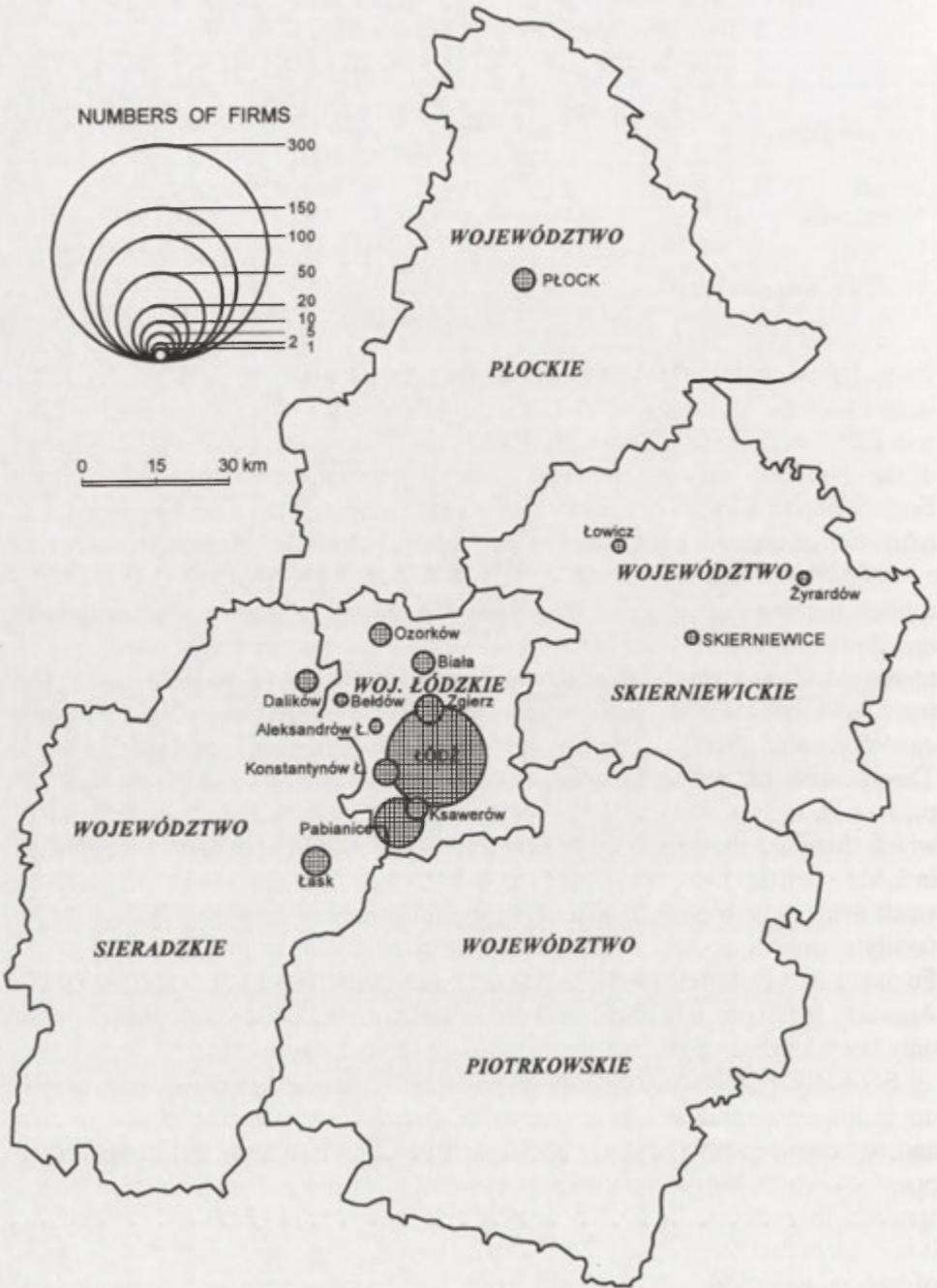


Fig. 6. Textile Firms with < 51 Employees in the Polish Central Macro-Region, 1995

Table 5. Product Specialisation in Textile Firms in the Central Macro-Region with less than 51 Workers, 1995

Specialisation	n	Specialisation	n
Knitwear	37	Elastic wadding	3
Embroidery	13	Twine	3
Spinning	10	Ribbon	3
Weaving	7	Finishing	3
Printing	7	Industrial fabrics	3
Carpets	4	Other	12
Total			105

S o u r c e: Kompass (1995).

purely commercial terms, it would appear that bottom-up forces have a better feel for market potential than top-down forces.

Thirdly, the strength of the Łódź administrative district is once more demonstrated in respect of location. Of the 105 textile establishments, some 93 are in the Łódź *województwo*, while 64 are actually in the city itself. In contrast, only 7 firms have been opened in Sieradz, 3 in Skierniewice, 2 in Płock and none at all in Piotrków Tybunalski (Fig. 6). In favouring Łódź, new firm-founders are reflecting the decision made by both specific and non-specific producer service firms. Further evidence in support of this argument is provided by Piotrków Trybunalski. Not only does the district possess 3 textile factories employing more than 1,000 workers, it also has 3 factories with between 501 and 1,000 operatives. It is therefore not unreasonable to expect that some new firm-founders would have emerged from such a workforce. If they have emerged, then they have not established their businesses in the *województwo*. The noticeable spatial polarisation of small textile firms is less characteristic of small clothing firms, as Figure 7 indicates, but even so the Łódź *województwo* accounts for 77% of the total, with the city of Łódź having 59%. One of the reasons for this is the way local entrepreneurs view the potential of the Skierniewice district, which has 14% of small clothing establishments. Its 49 firms are almost entirely clustered in five towns – Brzeziny, Łowicz, Rawa Mazowiecka, Sochaczew and Żyrardów – and it is tempting to see this location pattern as a link between Łódź as the traditional centre, and Warszawa as an important market. In any event, and out of line with findings elsewhere in this paper, local entrepreneurs have not been strongly attracted by the producer services which are focused on the chief town of Skierniewice itself.

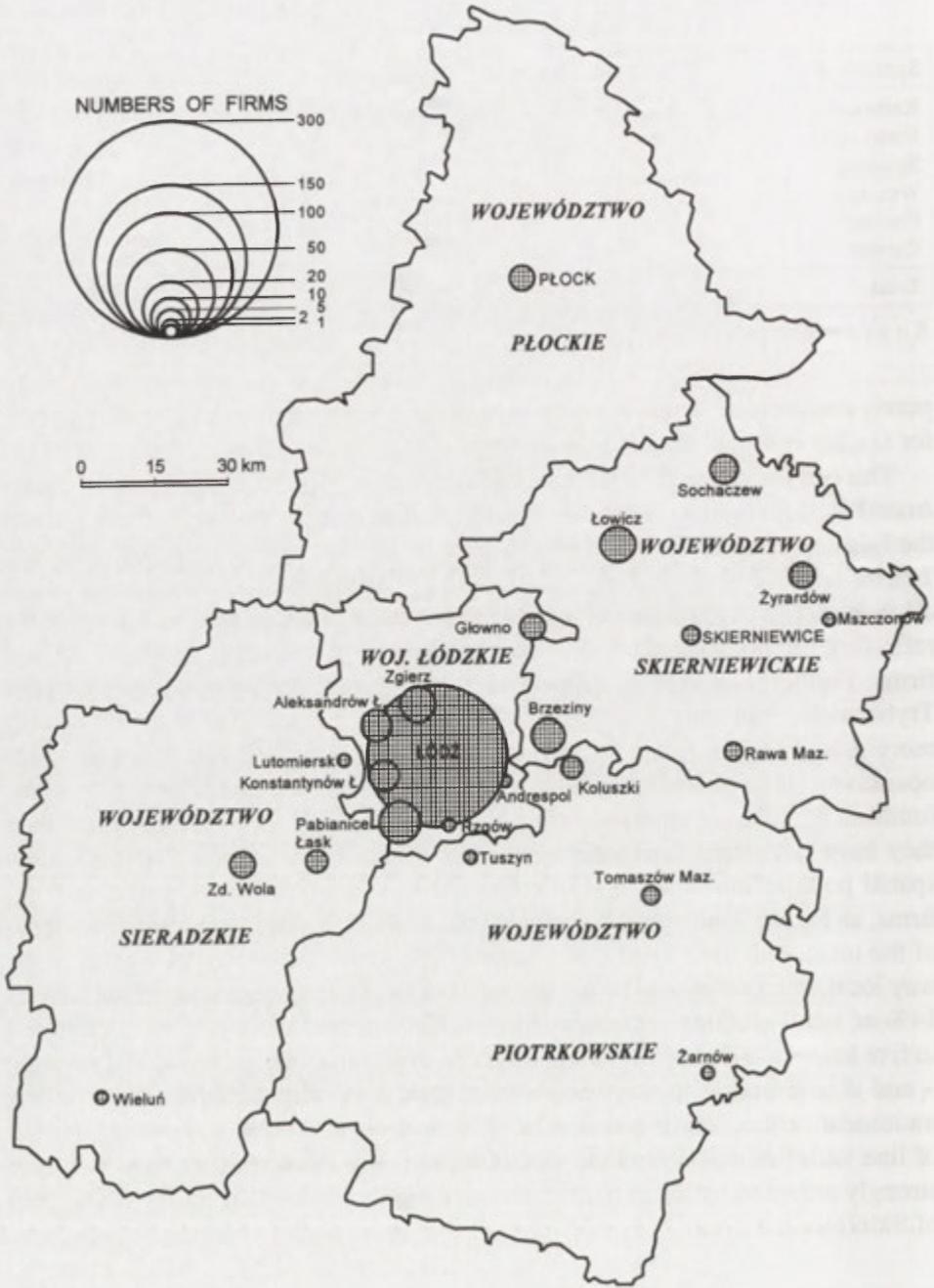


Fig. 7. Clothing Firms with < 51 Employees in the Polish Central Macro-Region, 1995

CONCLUSION

The power of the new bottom-up forces, whether urban managers acting pro-actively in encouraging new investment, or entrepreneurs offering producer services or opening new manufacturing firms, has been demonstrated for Łódź and its region. The principal spatial result of their activities has been to improve the agglomeration economies of the city of Łódź at the expense of smaller settlements, since in this way risk is seen to be minimised and profit maximised. Local 'agents' working within wider 'structures' have thus promoted spatial inequality. In fact bottom-up influences are now so powerful that it is all too easy to overlook the overarching meso- and macro-scale framework within which local decision-makers must work. Indeed, without the fundamental political and economic changes following the rejection of communism, most of the activities of local origin would not be in place. This is the value of the structurationist approach, for it requires the examination of the influences operating at all three spatial scales in order to explain spatial patterns on the ground.

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RESTRUCTURING IN INDUSTRY AND INDUSTRIAL AREAS IN BUDAPEST

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ABSTRACT: Budapest is not only one of the most relevant and dynamically-developing cities of Eastern Europe, it is also the most significant industrial centre in Hungary. This paper demonstrates the most important changes in the industry and industrial areas of Budapest after 1989. The new tendencies in industry (organizational, structural changes, privatization, deindustrialization etc.) have directly or indirectly affected the location of industry, and the size and utilization of industrial areas. Thus, industrial restructuring has contributed to local urban restructuring too, as has been the case in other European cities.

KEY WORDS: restructuring, industry, deindustrialization, urban development, Budapest, Hungary.

INTRODUCTION

During the past few decades, and especially since the late 1970s, the industry and industrial areas of Western cities have undergone considerable change. Basically, these can be traced back to the changes in the world economy in the 1970s; although Rodwin has mentioned three other reasons which have accelerated them (the intensity of international competition, the cumulative impact of research and innovation and the enhanced importance of amenity) (Rodwin 1991, p. 4). Due to these changes, a significant transformation has begun in industry, and in a wider sense in the whole economy. It can best be described by reference to the concepts of: restructuring, deindustrialization and structural changes. Taking these into account, the role of industry has decreased in the economy, while the service sector has developed ever faster. In parallel, the number of employees began to decrease in the second sector and increase in the third. Spatial impacts of the changes could also be observed. On a local (city) level, they meant, among other things, changes in the locations of industry and the service sector, in the size of industrial and business service areas, and in the utilization of traditional industrial areas. Thus, the functional and structural divisions of cities have also been transformed, as described in several publications (Camagni 1991; Doling et al. 1994; Machimura 1992; Parkinson 1991; Rodwin and Sazanami eds. 1991; Takeuchi 1985).

However, these changes began only later in Eastern European cities, and only accelerated after 1989, when radical political change opened the way for economic and social reforms. Since then, numerous studies have been published on Eastern European economic restructuring, on how cities have seen their inherited socialist industry and traditional industrial areas transformed, and on the kind of challenges cities have had to face (Axenov et al. 1997; Gritsai 1997a; Kiss 1993; Korcelli 1995; Korec 1997; Misztal 1997; Turnock 1997). Compared with Western cities, those in the East face a much more difficult situation, because they have to cope simultaneously with the increasing pressure of globalization, and with structural changes in all spheres of life. In addition, the state of the whole economy and society was much worse than in Western countries, a problem whose roots can be traced back to the socialist past. For this reason, the transformation in this part of Europe has much higher economic and social costs, and will take longer, as it is not so smooth, especially in certain parts of the region. There is, however, a general tendency for the changes to be most advanced in the capital cities, which are areas of the countries most innovative and reacting fastest to challenges (Gritsai 1997b).

Among Eastern European capitals, that of Hungary is one of the most dynamically developing. Budapest is not only the political, social, cultural, financial and transport centre of the country, but is also its most important industrial centre. Nevertheless, the last decade has witnessed a decline in the significance of its industry for the economic life of the city and country, and this reflects changes in industry after 1989. In spite of this, the changes taking place in Budapest's industry may determine national trends, and may even be decisive in defining the characteristics of changes in Eastern Europe in general. The demonstration of the most important trends in the restructuring of industry and industrial areas in Budapest is the main aim of this study, which is based on research carried out in the past few years. In the course of evaluating the changes, I have used data from various statistical publications, and detailed information about industrial firms from the Industrial Almanac. Interviews with different local government leaders in some Budapest districts, and observations in the traditional industrial districts of the capital, have also contributed to the obtainment of a real picture of the post-socialist industrial restructuring that is taking place in Budapest at the end of the twentieth century (Tab. 1).

The concept of restructuring is used in many contexts. On the one hand, it can mean a general structural change in economic, social and political organization and form. On the other, it can refer to the development of different sectors of society (Virkkala 1994). Sometimes, it is associated with historical developments, which can be divided into phases, with breaks in between. According to Virkkala (1994, p. 2) "While the phase lasts, there is a stable period, but between phases there is..." a break, when changes happen in the economy and society. In this sense, the Eastern European countries are in the "break" between developments as the old system is undergoing reorganization and restructuring, while the

Table 1. The position of Budapest in the country, 1985–1995

Denomination	Budapest as % of the country			
	1985	1990	1992	1995
by population	19.2	19.5	19.5	18.7
by number of employees	20.9	21.6	28	28.5
by number of employees in service sector	31	31	38	38
by number of industrial employees	22.8	21.7	19.6	16.6
by number of firms	–	43	44	45
by number of industrial firms	34	–	37	38
by number of industrial plants	26.4	30.5	13.7	12.6
by investments in industry	17	19	13.8	22.2
by number of firms with foreign participation	–	–	54	48

– no data.

SOURCE: *Statistical Yearbook of Budapest 1985, 1990, 1992, 1995.*
Statistical Yearbook of Hungary 1985, 1990, 1992, 1995.
Regional Statistical Yearbook 1985, 1990, 1992, 1995.

new system has not formed yet. The process of transition from the centrally-planned economy to the market economy is characterized by crises, and by competition between the “old” and the “new”, as in Soja’s (1987) definition of restructuring. In turn, according to Hamilton (1995), restructuring is a complex process comprising two contrary trends – one destructive, the other constructive. Restructuring is often connected with the word deindustrialization and can be considered a component of it implying a decrease in the significance of industry. Chesire (1991) considers deindustrialization to be one side of transformation which has many hidden aspects, and can be measured by different means. Deindustrialization may also be connected with reindustrialization, including the spread of new means of operation (Virkkala 1994). Restructuring takes place in time and space, and at different levels.

In this article, the primary meaning of restructuring is taken to be the organizational and structural changes in industry in the second sector of the economy, including mining, manufacturing, and electrical, gas and water supply. The demonstration of these changes, and their comparison where possible with those in other Eastern European capitals, is the most important objective of the first section of this study. As similar changes can be experienced in the other Eastern European capitals, the differences are only ones of pace and depth. The first part also deals with restructuring at the level of firms, which is also a relevant element of industrial restructuring. It “... enables firms – originally created to serve the goals of a planned economic system – to operate successfully in a market economy” (Ernst et al. 1996, p. 293). In order to reach this goal, industrial firms must change their basic strategy, products, markets, marketing, finance, production technology, organization, management etc. Finally, there is a need for the

alteration of their a whole organizational and operational form; a time-consuming process whose speed depends on several factors. Where the restructuring of enterprises is concerned, the basic difference between Eastern and Western countries is that the former need to restructure industry as a whole, and each individual firm, simultaneously. In the West only a small proportion of enterprises or of any sector need renewing at any one time (Hillman 1992). This difference can partly explain the difficulties of the Eastern European transformation, and why it is taking such a long time. Industrial restructuring will be analysed at local level, not only in time but also in space, which in this case will mean the traditional industrial areas of Budapest. We will examine how industrial restructuring affects urban space and structure, and whether and to what extent it is similar or different to the processes in other Western and Eastern cities. This is the other essential issue of the study, which will be elaborated in the second section.

MAIN TENDENCIES IN THE INDUSTRY OF BUDAPEST AFTER 1989

Significant transformations of Budapest's industry have followed the change in the system since 1989. They are more or less similar to those taking place in other Eastern European capitals but depend on particular historical background, economic base, size, culture and range of problems (Ernst et al. 1996). Most are still in progress, in keeping with national trends, and variable in terms of intensity and dimension. The traditional industrial areas located in the transitional or mixed function belt of Budapest are the most important sites of these changes, and where the bulk of firms can be found. These processes, which will be described in detail, are not only the natural consequences of the evolution of industrial firms and areas (Chapman and Walker 1988), but also of the industrial reforms carried out after 1989. The success of changes in the industry basically depends on how the whole sector or each individual firm reacts to the challenges and new circumstances which emerged during the 1990s.

Industrial restructuring includes different processes, of which organizational transformation is one of the most spectacular and fastest. Its realization required the introduction of the Act on Economic Associations in 1989. This was the first and most fundamental act opening the way to changes in industry, and in a wider sense, in the whole economic system. Thanks to it, the number of industrial firms has increased and their legal forms have become more diverse, as it has been possible for them to choose from different kinds of organizational form (Csanádi and Fényes 1990). Earlier, during the socialist period, only two organizational forms (the state company or cooperative) had been dominant. (The organizational form must be interpreted as the legal framework of a firm within which it operates.) By the time of writing, the organizational reform has already been finished in Budapest, but it is still in progress in Bratislava, where the main types of organizational form are the same (Korec 1997).

In 1988 the industry of Hungarian capital comprised 369 state companies and 646 cooperatives. Today, the state companies have already disappeared, as a result of either closure or reorganization into a new organizational form. This was also promoted by an act issued in 1992 which obliged companies to begin their transformation. The other old form of the "cooperative" seems likely to exist in the future too, as its pace of transformation is quite slow. Their rate compared to the new ones is rather low because many new industrial firms have been established since 1989 (Tab. 2).

Table 2. Industrial firms in Budapest by organisational form 1991–1995

Denomination	1991		1995	
	no.	%	no.	%
Limited liability company	3530	77.3	7188	88.0
Company limited by shares	107	2.3	364	4.4
State company	278	6.1	–	–
Cooperative	627	13.7	526	6.4
Other	24	0.6	114*	1.2
Total	4566	100.0	8192	100.0

* Most are state companies under transformation.

S o u r c e: *Statistical Yearbook of Budapest 1991, 1995.*

Nowadays, the limited liability (Ltd.) company is the most popular form, accounting for almost 90% of industrial firms. This reflects the facts that responsibility is limited, only about USD 10,000 is needed for establishment and one person can establish. At the beginning the rate of establishment of limited companies was especially high in Budapest, because it was here that more people possessed the necessary start capital and attitudes more innovative and adventurous than those of the people living in other areas (Kiss 1993). Most of the limited companies are completely newly established, with only a small proportion coming from the decomposition of former large state companies into many smaller or larger units which took this organizational form after becoming independent.

The other most frequent new type is the company limited by shares. The number and share of these is dwarfed by those of limited liability companies, because this is the most complicated organizational form and one requiring about USD 100,000 for its establishment. As only a few people had such sums of money at that time, very few completely new companies limited by shares were established. The majority emerged from the transformation of former large state companies.

The decades of socialism witnessed the formation of highly distorted company structure (Inzelt 1988) as a result of centralizational waves (Kopátsy 1983). However, the progress of organizational changes has modified the size structure of firms. A spectacular shift has taken place in favour of small and medium-sized

firms, because the majority newly-founded were such, and because those firms which arose from the decentralization of former giant state companies have become small and medium-sized firms as well. Thus, the size-structure of industrial firms has become more proportionate. The number of firms employing less than 20 employees has increased at the most rapid pace. A similar tendency can be observed in Warsaw (Misztal 1997) and in Bratislava (Korec 1997). In 1995, 81.6% of industrial firms in Budapest employed less than 20 people, while the share of firms with more than 300 employees accounted for only a few percent (Figure 1).

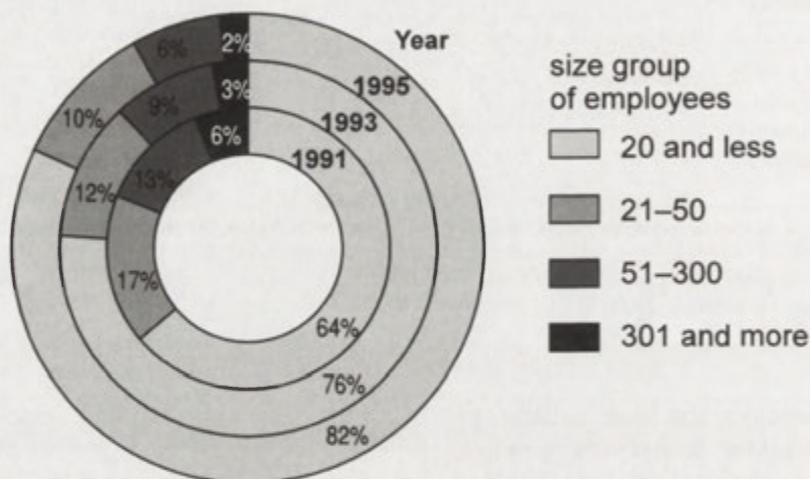


Fig. 1. Industrial firms by the size-group of employees in Budapest, 1991–1995
 Source: *Statistical Yearbook of Budapest 1991, 1993, 1995*

Between 1990 and 1995, the number of industrial firms in Budapest more than doubled, but this did not lead to an increase in the number of industrial employees. On the contrary, their number decreased quite considerably from 277,851 to 126,902. This means that, by 1995, only 16% of all employees in Budapest worked for industry, while more than 43% did so in 1990. During the same time, 1988–1995, the number of industrial employees in Warsaw decreased by over 50,000 (Misztal 1997). In Moscow, the share of manufacturing workers decreased from 23.8% to 21.9% between 1990–1993 (Gritsai 1997a); while in Prague the number of industrial employees dropped by 19%, from 82,502 (22%) in 1994 to 67,577 (19%) in 1996. In turn, in Bratislava, between 1991 and 1995, the numbers dropped from 47,109 (21%) to 37,004 (19%). The comparison of these data with those from Budapest, suggests that deindustrialization is more advanced in the latter. This is confirmed by a rate for employees in services that had almost reached 78% by the mid-1990s, as compared with only 50.2% in

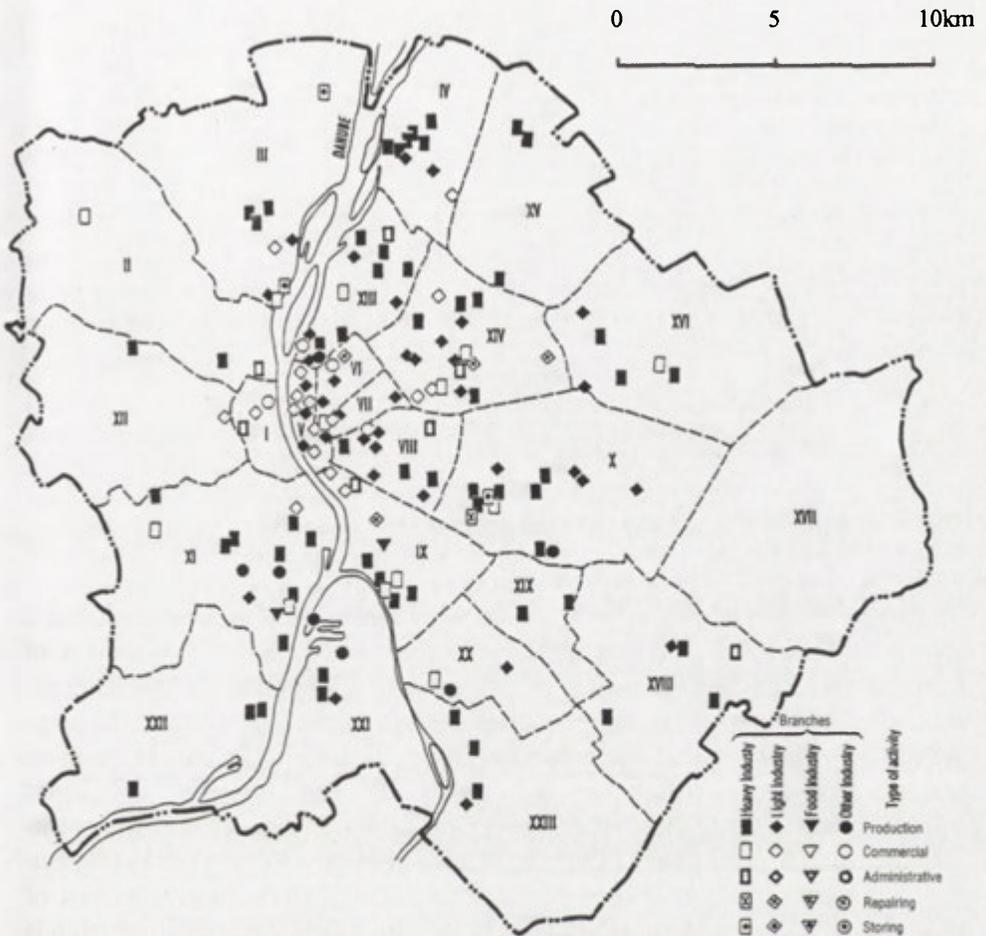


Fig. 2. Industrial plants in Budapest by type of activity and branch, 1996
 S o u r c e: Industrial Almanac, 1996

Moscow in 1993. However, if the present shares of industrial and tertiary workers in Budapest are compared to data for London, New York or even Tokyo, then the lag of Budapest can be seen quite easily, as the Western cities had similar rates (15–20% in industry, 54–74% in service) as long ago as in 1985 (Gritsai 1997a). However, there is no doubt that the rates in Budapest have become much more favourable by now. However, it is not a miracle – the deindustrialization began in these cities much earlier than in Budapest or in other Eastern European capitals. The decrease in the number of industrial employees, considered one of the most common indicators of deindustrialization (Cheshire 1991), has affected each branch differently. The largest losses have been suffered by the mining, machine, textile and food industries. One fraction of those who lost their jobs

Table 3. Number of employees in Budapest by branches of industry, 1985–1995

Denomination	1985	1990	1995
Mining	4 323	2 282	1 164
Electrical industry	10 605	9 933	16 217
Metallurgy	13 327	10 879	12 699
Machine engineering	156 797	127 141	52 746
Building materials industry	7 518	6 522	– *
Chemical industry	34 194	33 291	39 741
Light industry	76 865	57 114	44 207
Of which: Textiles	26 638	18 476	11 179
Food industry	27 258	25 655	16 475
Others	10 965	5 034	9 310
Total	341 852	277 851	192 559

* Classified under construction since 1992.

S o u r c e: *Statistical Yearbook of Budapest, 1985, 1990, 1995.*

began to work in services, another established enterprises or became unemployed (Tab. 3).

Reorganisation of ownership is also a relevant element of restructuring, but it soon comes to an end. This very important process promotes the improvement of technical standards and the quality of products, the adoption of new technology, the modernization of firms, increasing efficiency and productivity, and the preparation of industry to join the European Union. Its favourable effects are more and more obvious. In the course of privatization, the large state companies privatized were mostly those which were easy to sell, in a good state and profitable. It is worth mentioning, however, that the Budapest Region (including Budapest and Pest county) has seen slower privatization than elsewhere, because of the huge supply of property (Csefalvay 1996). But composition by ownership is much more favourable than in other parts of the country, not only because of the large number of private Hungarian owners, but also the considerable number of foreign investors. The basic reason is that the capital and its wider surroundings form the primary target of foreign investors. In 1995, 4302 firms with foreign participation operated in Hungarian industry, of which 1445 (33%) were in Budapest. Most of them are largely or fully in the hands of foreigners. The spatial distribution of industrial firms with foreign participation is closely aligned with the traditional industrial belts of Budapest, since foreign investors have primarily bought those firms which were already there. For various reasons greenfield investments are not characteristic of Budapest (lack of sites, high land prices, environmental pollution etc.).

The restructuring within firms also includes changes in internal structure. Under socialism, it was very frequent for an industrial firm to have one or more plants in the given settlement or another part of the country. This was especially true of firms located in Budapest. However, the 4806 industrial plants in Buda-

pest in 1988, had been reduced by 1631 plants by 1995. After 1989, several less-effective plants were closed down, and many became independent firms. More than half (53–56%) dealt with production activities at both times (1988, 1995). Production plants are mostly in the traditional industrial districts, while the non-production plants have tried to settle down as close as possible to consumers, which is why they are mainly in the inner part of the city (Fig. 3).

Under socialism, Budapest had an extremely important role in the leading and controlling of industry. Many companies had their headquarters in the capital, in particular in the city centre, while the plants dealing with other activities were in the other parts of the capital, in the outer districts or in the countryside. This meant that the leading-administrative functions were geographically separated from the others. This can still be observed today, although some headquarters of former state companies have closed down. In addition, a number of multinational companies have established their headquarters in the capital (Ványai 1996), because – among others things – they wanted to be close to the political, economic and financial institutions which can influence their activities and decision-making.

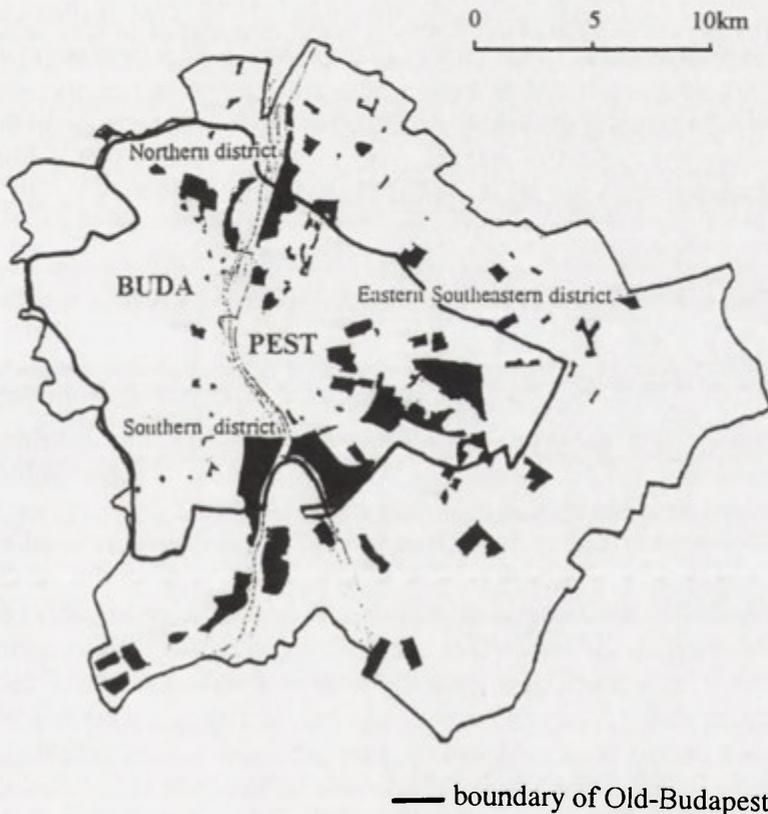


Fig. 3. Industrial areas in Budapest at the beginning of the 1990s
Based on: *Szakági Tanulmányok*, Budapest Fővárosi Önkormányzat, 1992, 70 p.

Four phases can be distinguished in the industrial development of Budapest. As in the case of Bratislava (Korec 1997); the first (pre-1918) and third (1945–1989) are the most important. Owing to the heavy industrialization in these periods, the industry of Budapest became multi-faceted, with almost every branch occurring. However, heavy industry was dominant. In the last decade, the branch-structure of the industry has also changed, although progress has been very slow and will require more time. The processes to date now show that the importance of heavy industry is declining, though this is still the leading branch in terms of number of employees or firms (Kiss 1993). The machine, chemical, publishing, printing and food industries are the fastest-developing branches. At the same time, the role of mining and quarrying, manufacturing of basic metals, and the textile and leather industries, are decreasing continually. In the case of Warsaw, the metallurgy and construction material industries have largely lost their significance, while the role of branches producing consumer goods (the clothing, food and printing industries) have increased (Misztal 1997). In the future, the traditional, so called “smoke-stack” industries will also transform, and the branches developing more quickly will mostly be those which require more information and knowledge, higher qualifications and sophisticated technology. These “non-smoke-stack” branches will become connected very closely with the universities and research-and-development establishments of the city. Although the weight of industry in the economic life of Budapest will decrease in the long run, this does not mean that industry will disappear. The Western European experience shows that industry is needed in cities (Rodwin 1991).

CHANGES IN THE TRADITIONAL INDUSTRIAL AREAS

The formation of industrial areas began more than 130 years ago, when the industrialization of Budapest started. The location of industry was influenced by several factors, such as natural endowments, land-prices, the distribution of residential areas, transport possibilities, the spatial pattern of public utilities and different town-planning measures (Bernát and Viszkei eds. 1972). By the beginning of the twentieth century, significant industrial areas had developed to form a crescent around the city centre. Most of these were /and remain/ on the Pest /left/ side of the Danube rather than in Buda. New industrial areas did not emerge between the World Wars, but existing ones developed further. The reconstruction after World War II provided a great opportunity for the transfer of industrial areas from the inner to the outer part of the city, or else to the countryside, but this was not carried out in the end, as most companies were rebuilt on their former sites. Thus relevant changes in the spatial structure of industry did not take place (Preisich 1969), though the 1950 changes to the administrative boundary of Budapest also changed situation of the “industrial crescent”. While this was previously at the periphery of the city, by the boundary, it ended up in the

middle, stuck between the periphery and the inner city when 23 settlements were attached to Old Budapest to form the present day city. The industry of Budapest developed further during the socialist period, and existing industrial areas grew. In 1960 they accounted for 3600 ha (6.8%) of the city and in 1986 for 4538 ha (8.6%). In contrast, in Warsaw industry occupied 2300 ha (about 5%) in 1985 (Misztal 1997) (Fig. 3).

The industrial areas of Budapest form three main parts: the Northern district, the Eastern, South-eastern district and the Southern district (Bernát and Vizskezé eds. 1972). As more and more firms were established in these areas, they became crowded and polluted, and there was no more space for any further expansion. For these reasons, their situation within the city became a source of tension during the socialist period, which persists even today. Bratislava and Warsaw have had to face similar problems, with the Slovakian capital also having the majority of old industrial sites rebuilt during the socialist era quite close to the centre and to residential areas (Korec 1997). In the case of Warsaw, where industrial areas are concentrated in ten zones, scattered around the city, the spatial pattern and associated large unutilized areas have proved major obstacles to the forming of a rational urban structure (Misztal 1997; Potrykowska 1995).

Thanks to the spectacular changes taking place in the industrial areas, today's Budapest has a good opportunity to change the urban structure and functional division formed earlier. Old, traditional industrial districts are the most important scenes of restructuring, though the pace and size of the changes is different in each district, as industrial areas and firms are in different phases of transformation. The numerous causes to be traced include: the size, location and branch structure of industrial areas, and the size of firms which are in the same industrial district. In part, these are also factors influencing the future fate of each firm and area. There will be areas which remain almost unchanged, and others in which industry renews itself. But there will also be areas from which industry will disappear and be replaced by other functions, as well as new industrial areas that may come into being. These tendencies are not unique, having already been faced by the cities and large towns of developed countries. While at one time, the inner city became a very important regional problem for those countries (Chapman and Walker 1988), vitality has now regained thanks to favourable urban restructuring (Fig. 4).

Derelict or restored industrial buildings and areas can be used in many ways, depending on their size, location, quality of surroundings and other aspects. Most recently, the industrial function of many areas in both Budapest and Warsaw has been replaced by tertiary (commercial, repairing, service and storing) functions (Misztal 1997). However, in the Hungarian capital there are also attempts to replace them with flats, sporting establishments or parks. In the case of flats, a new problem emerging and requiring a solution is the difficulty experienced in selling flats built on former industrial areas. This is not because of the quality of the flats – which are large, very modern, well-equipped and in a certain sense

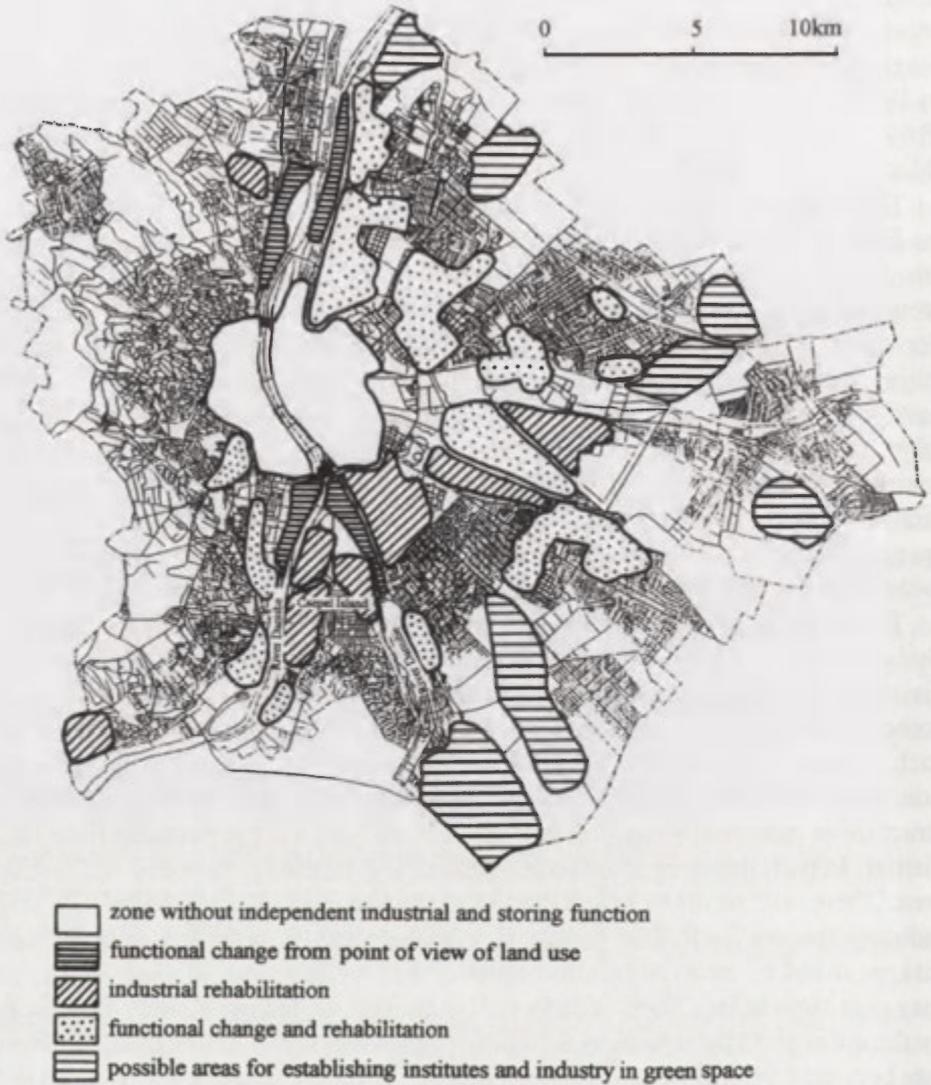


Fig. 4. Future development of industrial areas in Budapest
 Source: Master Plan of Budapest, 1992

luxurious – but rather because of the low quality of the surroundings, and mainly because, these areas still exist as industrial ones in the minds of the residents, and thus have a bad reputation. This also has a very close connection with the qualitative distribution of the population living in Budapest, the roots of which must be looked for in the historical development of the city. In general, the residences of workers on the Pest side have developed around factories. In these quarters, living conditions, infrastructure and the qualifications and educational level of

people were (and remain) worse than in the other parts of Pest or in Buda. It is very difficult to change this “mental picture” in peoples minds, and hence the image of these areas, and it will certainly take a long time to demolish this “mental obstacle”. It is therefore understandable that people who are wealthy and well-educated hesitate to purchase such flats and settle down in these areas.

The restlessness of industrial areas of the urban landscape can easily be realized by anyone in contemporary Budapest. According to local observations, the pace of transformation of industrial areas is fastest in the Northern district, which can thus be considered an example. Deindustrialization is most advanced here, and this is manifested in the highest figure for the number of closed-down firms (100 establishments between 1990 and 1995) (Fig. 5).

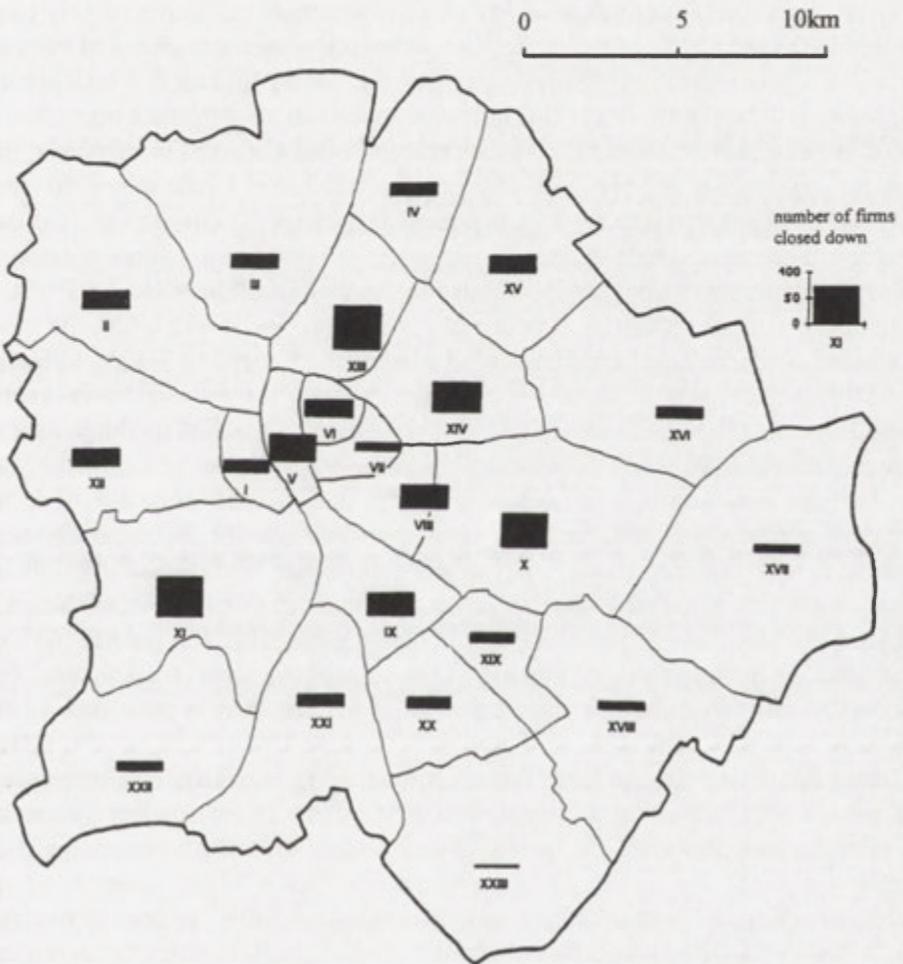


Fig. 5. Number of industrial firms closed down between 1990–1995 by district of Budapest
 Source: Central Statistical Office (unpublished data)

Walking along the main road of the Northern district, where both sides of the street once held different factories and workshops, today's visitor gains a different picture. Only a few old industrial plants are operational mostly on the right side of the road. On the left side, nearer the Danube, the changes are more striking. Old industrial buildings have been renovated and repainted and there are now different kinds and sizes of shops (supermarkets and department stores) and warehouses. Some industrial buildings are utilized by different small firms dealing with industrial-service functions. New office buildings or shopping centres have also been built in the traditional industrial areas. The first Western-style shopping and entertainment centre in Budapest was built here, in the place of a former shipyard, and was opened in 1996. Its standard is such that it could exist comfortably in any Western European city (Fig. 4).

The rapid functional change in this area is also connected with relatively close proximity to the city centre. As the City increasingly become crowded because of a shortage of space, it is beginning to expand, mainly into areas which are not far away and thus within easy reach from the point of view of transport. Due to the number of advertisements, commercials and other coloured inscriptions, different flags, figures and symbols, it is not only the urban landscape of this area that has changed, but its whole atmosphere and image. Owing to this, the city centre of Budapest, which resembles cities in the West more and more because of socio-economic changes and strengthening of city-functions (Klucka 1996), is penetrating former industrial districts and expanding feeler-like along the more important main roads. Similar trends have been experienced in Tokyo, although small firms there, as representatives of local industry (the term used by Takeuchi) were somewhat "obliged" to relocate or close down because of the huge lack of space (Takeuchi 1985).

The change in function and expansion of the City can also be observed in the Southern part of the capital, primarily along the River Danube. But here the transformation is progressing much more slowly than in the North. Basically, this region's main aim is the rehabilitation of industry and old industrial areas, which is why the industry must be reckoned with in the long run. This fact is confirmed, on one hand, by the lower rate of closure of industrial firms between 1990 and 1995, and on the other by industrial investments of greater size than in other parts of the city (Kiss 1993). Statistical data for the first half of the 1990s show that about 60% of the sums invested have been spent on purchasing machines and mechanical equipment in the industry of Budapest, with most imported from developed countries to raise the technical level. At the same time, about 40% of investment went on building, with the vast majority being spent on the renewal of old factory buildings in bad condition, rather than on new industrial buildings within the area of factories and industrial establishments. Utilization of some industrial buildings by an original firm is partial only (because an original function is now excluded from the whole area), so these are partly or completely utilized by many small industrial and/or service enterprises, because the infrastructure is rather good, while the rent is not

as high as in the inner part of the city. It must be emphasized that the rehabilitation or modernization has progressed faster (more spectacularly) in those firms, where the owners (investors) were partly or fully foreign. Due to these changes, the quality of the built environment in the traditional industrial areas has also changed for the better. But for the most part, this cannot be seen by the public. As a consequence, these changes "within factory gates" cannot contribute significantly to the transformation of urban structure (Fig. 4).

In the Eastern part of the city, functional change and industrial rehabilitation are progressing together. However, these are not as spectacular as in the other districts, partly because the industrial areas are not separated so sharply. In the future, only those industrial firms, which are not air and noise polluters will be able to remain at their original location. Those firms which are serious polluters and/or very close to places of residence will be closed down or relocated to the outer part of the city or to the countryside. The outer districts can also be considered possible areas for the development of high-tech-oriented industries requiring high qualifications and knowledge, since at the periphery of the city there is a relatively greater number of free areas and a higher proportion of green space. Thus, much more favourable surroundings will be assured for knowledge-based branches. These peripheral districts will or can develop into new industrial regions of Budapest for the twenty-first century.

CONCLUSIONS

Budapest is today one of the renascent cities of Europe, due to restructuring in all spheres of life and very importantly to industrial transformation. This affects the structural and functional division of the city as large continuous industrial areas split into smaller units, while their size and utilization can also change. In parallel with these processes, the image, atmosphere and composition of local society in the given part of the city can modify as well.

By restructuring, Budapest is not venturing off into new, uncharted territory. Rather, the Hungarian capital shows numerous similarities to other European capitals in this regard. Equally, the changes also differ to a greater or lesser extent, because of Budapest's past, location, size, economy and culture. The changes in industry and urban space are very important, because they make it possible for cities developing in two different parts of Europe to become more and more similar to each other (Węclawowicz 1992).

In summary, industrial restructuring is not only a great challenge, but also a great opportunity for Budapest to catch up with developed cities and integrate into the changing network of Europe's urban areas.

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THE AGRICULTURE OF THE REPUBLIC OF IRELAND WITHIN THE EUROPEAN UNION

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ABSTRACT: The Common Agricultural Policy of the European Union has had major impacts on farming in the Republic of Ireland since accession in 1973. Consideration of the policy context is followed by a discussion of agricultural change with regard to inputs and output and to farm enterprises. Consequences of farm modernisation include uneven development and environmental impacts. While agriculture remains of great importance in Ireland, there has been a broadening of the approach to rural development in the 1990s.

KEY WORDS: agriculture, European Union, Republic of Ireland, rural development.

INTRODUCTION

The Republic of Ireland is generally perceived to be an agricultural country, and farming plays a more important part in its economy and life than in most European states. While the role of agriculture has diminished considerably as in other developed countries, it is greater than certain crude statistics might suggest. Thus, while its share of employment has declined from 25% in 1971 to 10% in 1996, there is substantial additional part-time farming and employment in services and manufacturing associated with agriculture. The share of agriculture and food in total exports declined over the same period from 46% to 15% but the contribution to the national balance of payments is much greater than the latter value would suggest. This is because of agriculture's low import content and predominantly Irish ownership as compared with manufacturing industry, combined with transfer payments from the European Union (EU). Two-thirds of the land in the Republic of Ireland is used for agricultural purposes and 91% of this land is under grass.

The EU has had a profound impact on economic and social development in the Republic of Ireland since accession on 1 January 1973. The pivotal role in the interrelationships between Ireland and the Community has been played by the latter's Common Agricultural Policy (CAP) (Walsh and Gillmor 1993). This follows from the extent to which the CAP has dominated the Community budget, combined with the major importance of agriculture in the Irish economy. It is

largely because of the CAP that Ireland has been a major beneficiary of net financial transfers from the EU. The European Farm Fund (EAGGF) accounted for 71% of total EU payments to Ireland over the period 1973–1996, though this proportion had declined to 61% in the year 1996. The impact of these transfers has extended far beyond the farm sector because of the multiplier effect and the extent to which EU support of agriculture has enabled the Irish exchequer to divert spending towards other purposes such as education, health and social welfare.

With the prospect of Poland joining the EU, there is much interest in Ireland's experience within the Community, and in comparisons between the two countries, as evidenced by publication of the book edited by Clancy et al. (1992). As Ireland's experience relates especially to agriculture, the purpose of this paper is to outline trends in this sector over the period of EU membership. Dates used for statistical comparisons are often 1970–1971 and 1995–1996, representing a quarter of a century of change, because of the availability of agricultural and population data for these years.

PRIOR TO EU ACCESSION

It is necessary to refer briefly to the situation prior to Ireland's accession to the EU. While the impact of the EU on Irish agriculture has been profound, it is common practice to overstate this in attributing most of the changes that have occurred to initiation by the CAP. While the CAP did instigate change, a more widespread effect was the acceleration and accentuation of trends and developments that had begun prior to Ireland's accession to the Community, or that would have occurred anyway. Furthermore, comparisons can be made between Irish rural development efforts prior to EU membership and those within the EU in the 1990s.

Irish agricultural output had increased little from the time of independence from Britain in 1922 until 1960, but substantial modernisation had already occurred by the time of entry into the EU (Gillmor 1977). Major change and development occurred in the contexts of national economic development, expanding markets, greatly increased government subvention and the expansion of agricultural education and research. A substantial part of the increasing state expenditure was on product subsidies, especially on milk. These benefitted the larger producers most, but there were also measures oriented specifically towards small farmers and disadvantaged areas in the west of the country.

Farm development was not unrelated to the EU, however, as the prospect of joining acted as a major stimulus, especially in the years immediately before accession. To the strongly export-oriented Irish agriculture, membership offered unrestricted access to a greatly enlarged market, where prices were much more favourable than in the traditional outlet of Great Britain, which had followed a cheap food policy and was becoming increasingly self-sufficient. The compre-

hensive CAP support system promised an unfamiliar stability. Also the financial resources of the Community afforded the prospect of much greater state support of farming than had been possible from the Irish exchequer. It was the potential benefit to the agricultural sector that was the major element in the enthusiasm with which the Republic of Ireland joined the EU, as reflected in the 83% majority in favour at the preceding referendum.

Major decline in agricultural employment, however, despite farm improvement, reinforced the additional need for non-agricultural forms of rural development. This recognition led to the establishment of County Development Teams in the twelve western counties, with the objectives of promoting and coordinating broadly-based rural development, essentially what came to be known later as integrated rural development. However, the state policy which was pursued most vigorously and which was to have the greatest impact on rural areas was that of spatially-dispersed industrialisation. Rural development efforts were also made by the state with regard to tourism, forestry and fisheries. Regional development, and especially the problems of the west of Ireland, were a focus of major attention in the 1960s.

IRELAND AND THE CAP

No significant policy reorientation for Irish agriculture was needed on entering the framework of the CAP, the objectives of which are to increase productivity in the agricultural sector, to ensure a fair standard of living for the farm community, to stabilise markets and to provide adequate food supplies to the consumer at reasonable prices. Most CAP expenditure has been on its dominating market and price policy, 91% of that in the Republic of Ireland having come under the guarantee section of EAGGF over the period of membership 1973–1996, and still as much as 88% in 1996. Spending under the guarantee section of EAGGF, on socio-structural policy, was less appealing to the government than that under the guidance section because of the requirement of matching funding from the national exchequer. This also complied with the focus by farmers and their organisations on gaining price increases and subsidies rather than on structural matters. The two most important socio-structural measures in the Irish context have been the Farm Modernisation Scheme, designed to improve farm structure, competitiveness and income, and the Less Favoured Areas Scheme, providing compensatory income for farmers in disadvantaged areas.

Adaptation of Irish agriculture to the CAP, including its higher price levels, occurred over a transition period of five years following accession to the Community. Increased market prices were reinforced by favourable manipulation of exchange rates in agricultural trade, referred to as 'Green Pound' increases. It was not long, however, before the limitations to the benefits of EU membership for Irish farmers began to appear. By the late 1970s, the increasing surpluses of production of certain agricultural products and the consequent detrimental impact

on the Community budget, because of the costs of support, storage and disposal, had led to restraint on price increases and later reductions. Quantitative restrictions on production and co-responsibility for the costs of storing and marketing surpluses were heralded by the introduction of milk quotas and a super-levy in 1984. This was of particular importance to Ireland because of the significance and profitability of its dairy sector. One positive development in policy, however, had been the introduction in 1980 of an EU common market for sheep.

There were growing pressures on the EU for radical reform of the CAP. Budgetary strains exerted by the costs of agricultural supports were increasing. The extent of these supports had become a major hindrance to agreement concerning the liberalisation of international trade in the Uruguay Round of GATT, now the World Trade Organisation. There was increasing public concern about the impacts of modern agriculture on the environment. The outcome was eventual agreement on a new set of CAP principles which became operational in 1993 under the Commissioner for Agriculture and Rural Development, Ray McSharry from Ireland. The package of reform measures had three main components: reduced prices for beef and for cereal, oilseed and protein crops, with compensatory payments direct to farmers to offset loss of income; extension of supply control to include not only milk and sugar but also beef, sheep, cereals and oilseeds; a set of three accompanying measures relating to early retirement of farmers, agri-environmental policy and promotion of forestry. These measures gain 75% financial support from the EU and 25% from national exchequers. With the shift in emphasis from market support from to direct payments to farmers, the latter increased as a proportion of farm family income from 30% in 1992 to 60% by 1996.

The restrictions on agricultural output involved in the reform of the CAP have major implications for the future of Irish farming. While there had been substantial achievements in the preceding thirty years, agricultural production in the Republic of Ireland had been a late starter and is of low intensity compared with that in some other EU members. Now, limits based on historical levels of output are curtailing its expansion while it is still far from reaching its full potential, especially its ability to exploit its comparative advantage in grass-based production. From the broader perspectives of the national and rural economy, the benefits of the substantial EU agricultural transfers are being restricted. Nonetheless, the reforms incorporate the beneficial effect of some shift of financial support towards the smaller producers in the context of the compensatory payments, though ultimately this has been more limited than envisaged at an earlier stage in the negotiations.

CHANGE IN FARM INPUTS AND OUTPUTS

In accordance with the agricultural modernisation process elsewhere, and in a continuation of earlier trends, there has been major replacement of labour by

capital inputs in Irish farming since accession to the EU. The number of people employed fully or primarily in agriculture declined by more than one-half between 1971 and 1996, from 266,000 to 130,000. Different sectors have not been affected uniformly, however, with the declines over the period 1971–1991 being 38% for farmers, 60% for relatives assisting on farms and 59% for agricultural labourers. As owners of land, farmers have been more stable than people in other agricultural occupations. These differential changes have further increased the tendency for Irish farms to be one-person businesses, apart from farmers' spouses who are not included in the data.

The decline in the number of farms has been substantially smaller than that in the number of farmers as recorded at the census, though lack of comparability in the data relating to farms makes accurate comparison impossible. The difference mainly reflects growth in the incidence of part-time farming, which occurs on one-third of farms but is most common amongst smallholders. The decline in the number of holdings has been largely of small farms, so that the mean size has increased, being 28 ha in 1995. There has been comparative stability in agrarian structure relative to the extent of change in other aspects of agriculture, reflecting in part a strong attachment of people in rural Ireland to the land.

Greatly increased mechanisation of farm operations which has replaced much of the work of people and horses has been the most obvious feature of the capitalisation of Irish agriculture, accounting for about half of investment. The highest levels of mechanisation have been reached in the east and south, in association with the better land and larger farms of these areas, and with arable farming and dairying systems. There has also been widespread construction and modernisation of farm buildings, much of the work being grant-aided by the state. Usage of purchased fertilisers, chemicals and feedstuffs has increased substantially. The capitalisation of agriculture was marked by greatly increased indebtedness, as farmers resorted much more to borrowed finance as their investment requirements grew. Despite the relative increase in capitalisation, its level in Irish farming remains much lower than in many of the agriculturally more developed countries.

There were major changes in the technology of farm practices, with perhaps the most widespread and pervasive being in the conservation of grass for winter fodder. The traditional and universal method had been the drying of cut grass to make hay, but now 72% of the grassland area used for winter forage is conserved in its green state as silage. Silage has been favoured over hay because it is much better suited to Irish weather conditions, has lower labour requirements and better feeding value, and was promoted by the farm advisory service. The use of silage generally involves self-feed arrangements and has contributed substantially to the construction of new buildings. Much of the farm construction has been to provide for the housing of dairy cows, beef cattle and, to a lesser extent, sheep. The outwintering of cattle in the fields under the mild Irish climatic conditions has been a traditional feature, but increased use of housing protects the land from

damage and ensures more rapid weight gains of livestock. The area of grass conserved as fodder increased by 46% in 1970–1996, reflecting the increased feeding of livestock and higher stocking rates.

Substantial growth in the volume of Irish agricultural production has occurred though interrupted in several years by falls in output. Over the period 1970–1996 there was a 104% increase in the volume of gross agricultural output, which is the amount of production sold off farms or consumed by people on them. The greater intensity of farming is indicated by a total number of livestock unit equivalents 29% higher in 1996 than in 1970. Achievement of greater output, however, involved an increase of 134% in the volume of purchases of farm materials and services. Input costs were equivalent to 49% of the value of gross output in 1996, as compared with 24% in 1970.

Despite increasing costs, farmers made substantial gains in real income terms on joining the EU, with national farm income almost doubling in the 1970s. The principal factors contributing to this greatly-improved situation were the sharing out of the national farm income among a much reduced labour force, the growth in output, the real increases in market prices for agricultural products in the 1970s and the huge growth in state and EU expenditure in relation to agriculture. The trend was dramatically reversed in 1978–1981 when real income fell by 40%, largely due to an acute price-cost squeeze, unfavourable exchange rates and a sharp rise in interest rates. The fall in Irish farm prices was twice that in the EU as a whole. With subsequent slow but interrupted growth, the real national farm income only gradually recovered to the level prevailing on entry into the EU. This income is shared amongst a diminishing labour force which has benefited from increasing direct payments and falling interest rates.

FARM ENTERPRISE TRENDS

Traditional Irish agriculture could be described as mixed livestock farming with some arable cropping. While this remains basically true, significant change in the structure of agricultural output occurred in the period 1970–1996 (Table 1). The most notable feature of the changing structure had been the tendency towards

Table 1. Percentage value of the gross agricultural output

	1970	1980	1990	1996
Milk	24.6	31.9	32.8	34.7
Cattle	33.0	36.9	38.9	32.9
Sheep	4.5	3.4	4.8	6.1
Horses	1.0	1.3	2.0	2.3
Pigs	12.5	7.6	5.5	8.4
Poultry	5.6	4.2	3.9	4.1
Tillage	18.7	14.8	12.1	11.6

greater national specialisation, which resulted mainly from the increased dominance of the two leading farm enterprises of dairying and beef cattle production, and a relative reduction in the shares of the less-important enterprises. The combined contribution of milk and cattle to total output increased from 58% in 1970 to 74% in the mid 1980s, but had declined to 68% by 1996. This level of specialisation on milk and beef is slightly less than that of Luxembourg, but far exceeds the dependence on any two products in all other member states of the EU. Both enterprises are favoured by Irish climatic and edaphic conditions, and in particular by the ability of the land under the moist and mild climate to grow grass, as it is the predominant source of nutrition. This natural comparative advantage was exploited when access to markets and the prices for milk and beef improved substantially.

Dairy farming played a key role in the development of the Irish Republic's agriculture, and milk contributed substantially to its increased output. Even though restricted by milk quotas since 1984, dairying has retained its share of agricultural output because of favourable prices, and it remains the most profitable farm enterprise. The output of beef cattle was depressed in 1996 because of diminished demand and prices (Table 1); in 1995 it had accounted for 37% of total output. Sheep numbers had been declining because of competition for land from dairy and beef cattle and a comparatively low level of state support. This trend altered dramatically with the development of the EU sheep policy, so that the decade 1980–1990 saw growth of 164%, which must constitute one of the most abrupt changes to have occurred in Irish agriculture. Working horses have almost disappeared with farm mechanisation, but demand for thoroughbreds and other horses for recreation has expanded considerably. The shares of pig and poultry production in total output had been declining but this trend has been reversed in the 1990s with increased demand for their meats.

Although the area of arable crops increased in the period 1975–1980, when production benefitted by coming under the Community market regime, the general trend has been for arable crop production to decline. This is largely because the physical conditions of climate and soil combined with relative price trends favour livestock over tillage while the productivity of arable land has increased. The area of arable crops declined by 24% between 1970 and 1996, but output of the main tillage crops increased by 30%. Arable cropping has become dominated by cereals and cereal cropping by barley, such that cereals occupied 72% of the tilled land in 1996 with 62% of this cereal area being under barley.

The national changes in the different agricultural enterprises were reflected at the level of the individual farm. The overall outcome was a strong tendency towards greater concentration and specialisation, which was influenced by but exceeded the trends in the structure of national agricultural output. Thus the traditionally highly mixed character of Irish farming, with individual farmers engaging in a wide range of enterprises, altered significantly as farms became less diversified, but some lessening of this process began to emerge in the 1980s.

The tendency was for individual enterprises to be practised on a smaller proportion of holdings and for the scale of operation to increase on those farms where the enterprise was retained. This greater specialisation of farms, as of national production, has been the outcome of technological, economic and political forces. A prime motive for many farmers has been the need to increase efficiency through attaining internal scale economies and exploiting comparative advantage by concentrating available resources in a lesser number of enterprises. Important contributors to this process of specialisation were the increased capitalisation and diminished labour content in agriculture.

Periodic sample surveys indicate the extent of structural change through greater concentration of some enterprises. It has been most marked in pig and poultry production and to a lesser extent in dairying and arable cropping. In 1973 there were pigs on 35,700 farms with an average herd size of 29, while in 1995, 3,000 farms had an average of 520 animals. Poultry production has also been transformed through the development of large and specialised production units under intensive management systems. While in the past there were poultry in almost all farmyards, by 1995 they were only on 10% of farms, with an average flock of 707 birds and four-fifths of the birds in flocks of over 10,000. Between 1973 and 1995 the number of farms with dairy cows declined from 144,000 to 42,100, and mean herd size increased from 10 to 30. In 1970 there was an average of 3 ha of crops on the 65% of farms with tillage and by 1995 the 10% of farms with cereals had an average 18 ha of these crops.

While there has been considerable stability in the traditional regional pattern of Irish agriculture, investigations for the period 1960–1990 showed substantial spatial variations in the rates of change in individual farm enterprises (Homer et al. 1984; Gillmor 1987; Gillmor and Walsh 1993). These changes incorporated a distinct tendency towards greater areal concentration, with most of the main enterprises becoming more localised in their distributions. Furthermore the distribution of each enterprise became more different from that of other enterprises. The spatial concentration of individual enterprises, combined with the divergence between their distributions, indicated increased regional specialisation of Irish agriculture. This was related to the greater specialisation of individual farms. The strongest tendency towards localisation occurred in poultry, pigs and arable cropping. There were divergent trends in the distribution of sheep in that, with competition from dairying and beef on the lowlands, production prior to 1980 became more concentrated in the uplands, where sheep have a comparative advantage, but subsequent expansion was greatest on the lowlands.

UNEVEN DEVELOPMENT IN AGRICULTURE

The process of agricultural development in the Republic of Ireland has not been uniformly effective (Walsh 1985–1986). Investigation of the changes which

have occurred in farm enterprises by farm holding and by region demonstrates that there have been substantial variations, leading to increasing differentiation. The resultant unevenness of development is considered briefly, first in relation to the differences between farms and second with regard to the consequent spatial dimension.

The reasons why the benefits of development have varied considerably from farm to farm include the influence of the type of farming. The farm family incomes in 1996 on a national sample of holdings, expressed as percentages of the mean for all farming systems, were: pigs/poultry 445, dairying 172, dairying with other enterprises 155, tillage systems 143, mainly sheep 71, cattle with other enterprises 54, cattle rearing 50 (Heavey et al. 1997). There has been a growing divergence in prosperity between dairy farmers and others. Dairying and, to a lesser extent, tillage received huge government support and these high-income enterprises became more concentrated on the larger farms. Small holdings lost much of their pig and poultry production to the large production units and their shares of dairying and cropping diminished greatly. An increasing proportion of total agricultural output was contributed by large holdings, half of production now being accounted for by one-sixth of farms. Family farm incomes in 1996, expressed as percentages of the mean for all sizes of farm, were: <10 ha 24, 10–20 ha 40, 20–30 ha 86, 30–50 ha 139, 50–100 ha 231, 100+ ha 386 and hill farms 65. Obviously the disparities in income between individual farms are much greater than even these differences between the means for farming system and size categories indicate.

The larger and commercial farms have benefitted most from the process of modernisation. The big producers have had most to gain from the huge price support and proportionately more of the investment aid has gone to them also. It is to them that the research and advisory service, the major farmers' organisation and the financial and other institutions were predominantly oriented. Individual social and personal characteristics were also important but tended to reinforce farm size and type, being more favourable on the larger farms and on those with dairying and tillage enterprises. The younger and better-educated farmers who were married and had children were more likely to adopt modern practices and to avail themselves of opportunities, and so to reap the rewards of change.

In contrast, there were many farms which were almost static or declining. Kelleher and O'Mahony (1984) estimated that 55% of farm operators had been left behind in the modernisation process, and four-tenths of these had no alternative source of income from off-farm employment. These farmers were often smallholders, with poor quality land, and most had extensive low-income cattle and sheep farming systems. Many were old and unmarried, widowed or without children at home. There had been little change in their farming systems, so that they had not shared in the benefits of agricultural transformation.

Agricultural development has also been uneven spatially. This has been indicated by the patterns of enterprise change, with western areas generally being the

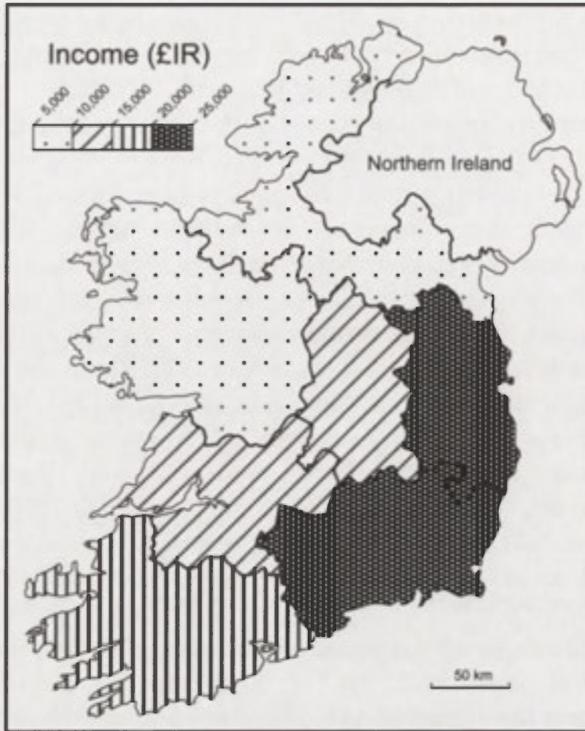


Fig. 1. Cash income per farm by region, 1996

poorest performers. Spatial disparity was clearly demonstrated by patterns of county income change in the years 1960–1980, more recent data on a county basis not being available. In general the growth of income was least in those counties with the lowest income levels, such that disparities were accentuated by development. The regional pattern of farm income in 1996 is shown in Figure 1, the level in the west and north-west being only 47% of that in the east and south (Heavey et al. 1997). The low incomes and poor performance of western and north-western areas are attributable largely to a combination of small farm size, inappropriate cattle and sheep farming systems, land resources of poor quality, and a demographically and socially less favourable workforce. Conversely the higher incomes and growth rates in the east and south tend to be associated with a combination of medium to large farms on good land with dairying and tillage.

ENVIRONMENTAL IMPACTS OF AGRICULTURE

The increased intensification, concentration and specialisation of Irish agriculture have had some detrimental effects on the rural environment. Yet the impacts have been much more minor than in many other European countries

because of the relatively less developed state and predominantly pastoral nature of Irish agriculture. This, combined with the low level of urban-industrial development, means that the high quality of the environment has been largely retained. Increasingly it is being realised that the image of the green Irish countryside as a source of pure and healthy food, especially that derived from grass, can be a potentially huge asset in export marketing, giving Ireland a comparative advantage as the CAP develops an environmental dimension and sets standards for quality food production.

The agricultural impact on the environment which attracted the greatest attention in the 1980s was fish kills, some of which resulted from agricultural activity and indicated the damage being done to rivers and lakes. The number of fish kill incidents attributable to specifically agricultural causes reached a peak of 95 in 1987 but had declined to 23 by 1990. The sources of most of the pollution were the highly toxic effluent from silage storage facilities and organic waste from intensive livestock production units, both being the outcome of modern developments in farming. The number of fish kills in any one year is affected by the weather conditions and associated river levels but the decline in incidents can be attributed to improved information dissemination amongst farmers, to grant aid towards farmyard pollution control and to the strengthening of legislative control. Surface and underground waters are also affected by runoff of chemical fertilisers, for although applications are low by international standards, they are sufficient to cause damage in some areas of intensive farming.

The principal impacts of agriculture on wildlife habitat and landscape have been exerted through the drainage and reclamation of land and some removal of hedgerows. Because of the relatively high rainfall and the nature of the topography and soils, poor drainage is a particular problem for Irish farmers. Nevertheless measures to ameliorate the situation have damaged and destroyed wetlands. An end has been brought to river drainage by the state and grant-assistance to farmers for land reclamation, because the economic benefits were questioned, along with realisation of the environmental effects. Land reclamation has mainly involved the replacement of rough grazing and other upland habitats by improved farmland by farmers wishing to extend their productive area further up the hill slopes. In the uplands, intensification of sheep production in the 1980s caused damage to vegetation and soils through overgrazing. Hedgerow removal to facilitate modern machinery usage and grazing systems has been much more limited than in arable Britain and can be better absorbed because of the high density of hedgerows in Ireland. Nonetheless it constitutes a reduction in an important wildlife habitat and has impaired the characteristic landscape of some areas. The landscape of the countryside has also been affected by the construction of large modern farm buildings.

BROADENING OF POLICIES IN THE 1990s

In both the EU and Ireland, the most distinctive feature of 1990s policies relating to agriculture and rural development is the extent to which they have broadened. This involves a shift within farming from a focus confined to maximising production to one that includes in particular the environmental dimension. Extending beyond agriculture (and in recognition of the fact that farming can no longer be the sole basis of the rural economy), measures have been introduced to promote diversification of economic activity and more comprehensive development in rural areas. The thrust towards this broadening of policy had come initially from the Commission of the European Community (1988) in its report titled *The future of rural society*. It proposed a multisectoral integrated approach involving partnership between the various agencies, empowerment of local communities and coordination of different sectors and spatial levels.

Under the CAP reform accompanying measures, EU agri-environmental policy in the Republic of Ireland has, since 1994, been implemented through the Rural Environment Protection Scheme (REPS). This provides annual payments to farmers who undertake to farm in an environmentally-friendly way for five years, in accordance with an approved farm plan. All farmers in all parts of the country may apply to join REPS, so that it is more broadly-based than agri-environmental programmes in other member states. The benefits are proportionately smaller for the larger farmers, however, as payment is limited to 40 ha while the plan must be implemented on the entire farm. The modifications necessary for participation would be greatest on intensive dairy and tillage farms. Thus it could be argued that the farmers least likely to join the REPS are those with large and intensive farms which have the greatest impact on the environment. Adoption of the scheme was slow at first but by the end of 1997 there were 30,000 participants, representing over one-fifth of the total area used for agriculture in the country.

The EU has provided much of the funding for a major expansion of Irish forestry from the late 1980s onwards, and financed since 1994 from the guarantee side of EAGGF under the CAP accompanying measure. This relates especially to private planting, though state afforestation is supported from the same EU source. This EU encouragement of forestry is based mainly on the favourable market prospects for timber as compared with agricultural produce. With 8% forest cover, the Republic of Ireland remains the least forested country in Europe apart from Iceland. Almost all of the increase from 1% at the time of independence in the 1920s until the late 1980s was through state afforestation. The provision of generous grants towards the costs of planting and annual payments subsequently have led to major involvement in afforestation by private interests, now mainly farmers. The rate of Irish afforestation is perhaps the highest in the world and this is the biggest land-use change occurring in contemporary rural Ireland. It is happening in a largely unplanned fashion, however, and there are

divergent views concerning the role which forestry should have in Irish rural development.

While forestry has become the most common and obvious form of diversification in recent years, a wide array of alternative enterprises has been adopted on Irish farms (Cawley et al. 1995). Agritourism, involving the provision of accommodation and a variety of farm-based leisure activities, has benefitted from a major expansion of Irish tourism since the mid 1980s. Development of horse breeding and equestrian activities has been based on the importance of the horse in Irish rural society. There has been substantial adoption of organic farming. The making of farmhouse cheese and other processing and marketing on farms have increased. Other alternative enterprises include contracting, horticulture, crafts, deer, golf, greyhounds, goats and new crops. Yet diversification has occurred on only a minority of farms and the traditional agricultural enterprises remain dominant.

Substantial financial support for the changing approach to rural development in Ireland has come from the Structural Funds of the EU. They have been expended in two phases, covering the periods 1989–1993 and 1994–1999 respectively. Under the second phase all of the Republic of Ireland receives maximum funding as an Objective 1 area, a designation applied to regions which had a GDP per capita less than 75% of the EU average at the time of the Structural Funds negotiations. The programmes for individual sectors are contained in a series of Operational Programmes, those relating to agriculture, forestry, fisheries, tourism and rural development having particular relevance in the rural context. In association with Structural Funding, 36 County Enterprise Boards were established in 1994 with the main function of developing indigenous potential and stimulating economic activity at local level on a multi-sectoral basis.

The EU-financed LEADER programme, introduced in 1991, has become a major feature of rural development effort. It was preceded in Ireland by a Pilot Programme for Integrated Rural Development in twelve subcounty areas in 1988–1990. In its first phase, the LEADER programme was operated by 17 groups and under LEADER II over the period 1995–1999 this has been extended to 36 groups encompassing much of rural Ireland. The purpose is to follow a ‘bottom-up’ strategy by encouraging local groups to organise themselves, formulate plans for their areas and promote local development. The activities which groups are authorised to undertake and assist include: technical support for rural development; training and recruitment assistance; rural tourism; the development of small firms, crafts and local services; local exploitation and marketing of agricultural, forestry and fishery products; the preservation and improvement of the environment and living conditions; and transnational cooperation. There are also a number of other rural community development initiatives which benefit from state and EU funding.

CONCLUSION

Although farming in the Republic of Ireland retains some traditional features, it differs substantially in many respects from that prior to EU entry. Undoubtedly membership of the EU played a major role in this transformation but it is not possible to isolate and quantify the effect. This is in part because many of the developments had been initiated prior to accession and there have been many influences other than the EU. Also the changes have been mainly in accordance with the process of agricultural modernisation experienced in other developed market economies.

EU membership has brought major benefits to the agricultural sector and consequently to the Irish economy in general. For this reason, farmers have watched with trepidation the efforts to curtail EU agricultural expenditure, the imposition of quantitative controls on production and adjustments towards world price levels. Furthermore there is the prospect of diminished financial assistance from the EU as Irish income levels rise towards the Community average while new member states on further enlargement of the EU will have their own demands. Irish agriculture was for long influenced by external market circumstances but has also now become increasingly subject to external policy formulation under greater internationalisation and globalisation.

While there had been broadly-based rural development initiatives in the 1960s, subsequent attention focused more narrowly on agriculture as it was felt that the CAP would solve the problems of rural Ireland. Under it, the prosperity of many farmers has improved greatly but the benefits have been unevenly distributed. There has been major decline in the farm population, with consequent detrimental impacts on rural services. It has become evident to the EU that under foreseeable circumstances agriculture alone cannot provide the employment and income necessary for the development of rural areas and the retention of their populations. This has provided the stimulus for the broader development efforts of the 1990s in Ireland, belatedly leading to parallels with the 1960s. Agriculture can no longer be treated in isolation by policy but as a lessening though vitally important component part of integrated rural development, something which is as relevant to Poland as it is to Ireland.

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THE SIGNIFICANCE OF REGIONAL TECHNOLOGY POLICY
FOR LOCAL INNOVATION NETWORKS IN GERMANY
– CASE STUDIES FROM BAVARIA
AND NORTH RHINE-WESTPHALIA

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ABSTRACT: The network characteristics are now considered of particular importance to innovation and technological change and to the growth prospects of regions. According to this idea, innovation is a process which results from various interactions among a number of actors in a given region. Such economic (and social) links can be considered 'intangible capital' that has durability, is created by means of an investment effort but deteriorates if not maintained. Although firms generally play the central role in these interactions, a network with other scientific and public institutions has significantly contributed to their R&D and innovation successes as well as to organisational change. Consequently, when analysing a regional innovation system, one should not only investigate the (horizontal and vertical) relations among firms but also the contacts with universities and other research institutions, as well as technology centres, which make the diffusion of technological know-how possible. Furthermore, the role of the government agencies, support companies and interest groups which provide the commercial, technical and information support, as well as of the financial lending bodies, should also be taken into account in the context of the regional innovation system. Apart from offering a critical review of already-existing theoretical and empirical research, this study introduces the present regional technology and R&D promotion policies in Bavaria and North Rhine-Westphalia, and examines the distinctive characteristics of the local innovation systems, emphasising the interaction and networking among the major actors mentioned above. For these purposes, two areas – Landshut (in Bavaria) and Bochum (North Rhine-Westphalia) – are selected for case study.

KEY WORDS: local innovation network, regional technology policy, Germany, Bavaria, North Rhine-Westphalia, Landshut, Bochum.

INTRODUCTION

In the regional and local context, much attention has recently been devoted to technological development, as well as to product and process innovation, as the necessary conditions for the stimulation of economic growth and the enhancement of competitiveness in the rapidly-changing international economic framework. In other words, local economies are now facing both inwards, in devel-

oping their own innovative capacities, and outwards, to compete in global markets (Porter 1990). It has traditionally been argued that the basic innovation engaged in by the entrepreneur leads to the creation of new industries, drives the business cycle and provides the basis for long-term economic growth (Schumpeter 1991). According to this theoretical logic, the growth of a region is stimulated by the presence of innovative industries and/or industries in the rapid-growth phase of the product life-cycle, and retarded by the presence of industries in the slow-growth or decline stage (Nam et al. 1990). Additionally, the incidence of the introduction of new, or modified technology is likely to be lower in those regions that are already disadvantaged economically (Todtling 1990). Apart from varied endowment with infrastructure, differences in such economic and structural localities among regions are significant worldwide and do matter, for example, in a (multinational) firm's choice of location and investment decision (Simmie 1997).

Network characteristics are today considered of particular importance to innovation and technological changes and to the growth prospects of regions (Bergman et al. 1991). According to this idea, innovation is a process which results from various interactions among a number of actors in a given region. Such economic (and social) links can be considered 'intangible capital' that has durability, is created by means of an investment effort and deteriorates if not maintained (Karlsson 1995). Although firms (and entrepreneurs) generally play the central role in these interactions, a network with other scientific and public institutions contributes significantly to their R&D and innovation successes as well as to organisational change. Consequently, when analysing a regional innovation system, one should investigate not only the (horizontal and vertical) relations among firms (e.g. prime contractors, subcontractors, independent enterprises in similar and/or different industries) but also the contacts with universities and other research institutions, as well as with technology centres (which make the diffusion of technological know-how possible). Furthermore, the role of government agencies (promotion), support companies and interest groups (commercial, technical and information support) and lending bodies (lending and the provision of venture capital) should also be taken into account in the context of the regional innovation system.

Apart from providing a critical review of already-existing theoretical and empirical research, this study also introduces the present regional technology and R&D promotion policies in Bavaria and North Rhine-Westphalia, and examines the distinctive characteristics of the local innovation systems emphasising the interaction and networks among the major actors mentioned above. For these purposes, the two German technology areas selected for study are:

- the rapidly-growing Landshut area (near Munich in Bavaria), to emphasise the roles of high-tech-based small firms in local technological development and in co-operative links with big business in R&D, innovation and related activities,
- the Bochum area (North Rhine-Westphalia) – one of several modern technology centres in the traditional industrial region of the Ruhr, to examine development alternatives to declining industries.

MAJOR DETERMINANTS OF THE REGIONAL INNOVATION SYSTEM IN GERMANY AS REVEALED IN THEORETICAL AND EMPIRICAL INVESTIGATIONS

Significant interest has recently been taken in the role of technological change in economic development at different spatial levels. "The arguments supporting technology as important factor in local [and regional] economic development are essentially the translation down to sub-national scale of the arguments expressed on national or global scales. The importance of technological innovation in a regional development context is its ability to provide a possible foundation for new industries and for the creation, broadening and deepening of markets for regional firms through the substituting of existing and competing goods by new economic goods. It can also affect cost, quality and reliability. A region... in which industrial firms achieve substantial technological progress through the generation, adaptation or adoption of new products is seen to have a competitive advantage over others making slower progress. It is perhaps not surprising, therefore, that the issue of technological progress is high on research and policy agendas and that [particularly] those in lagging regions see it as a way of helping to resolve their current [economic and structural] problems." (Wynarczyk et al. 1997, p. 33). Thus, the systematic activation and intensive utilisation of endogenous innovational resources in regional development constitutes a crucial challenge for a technology-oriented regional policy (Koschatzky 1994).

States (Länder) in Germany have traditionally adopted an interventionist approach by creating the public infrastructure of technology institutions which provide a range of services to industry, particularly via technology-transfer centres acting as linkage-points between universities and research centres and SMEs.¹ In the theoretical discussion, (public) research infrastructure has generally been considered a type of public good which should be provided by governments because of the so-called market failure characterised by non-rivalry and non-exclusive use. Positive external and spin-off aspects are expected to result from the endowment of these public goods and the promotion of (basic) R&D activities. Universities in particular are assumed to exploit economies of scope and joint production by creating more-intensive ties with other research and development centres and by improving the links between research and education.

In addition to these common strategies to subsidise the technological development and innovation activities of private firms and to provide research centres publicly (especially for the so-called key-technologies), there have also been

¹ "In Germany, like many other countries, the importance of manufacturing firms with fewer than 500 employees has been growing constantly since the early 1970s... This development has been matched by a partial reorientation of industrial and regional policies which were aimed increasingly at promoting innovative SMEs... In this context, the fostering of technology transfer from universities and research institutes to the small-business sector has become a central means in regional economic policy, especially since the early 1980s" (Grotz and Braun 1997, p. 546).

remarkable efforts made by regional governments in Germany (and some other European countries) to support the flexible adaptation of generated research outcomes and the rapid adjustment of SMEs to new challenges caused by the 'technology-push' and 'demand-pull' in the market (Fischer 1995). The latter 'diffusion-oriented' aspect has generally been described as the major concern of regional technology policy in Germany, while the federal one has concentrated more strongly on the provision of research infrastructure and the promotion of the basic R&D projects carried out in universities and other research institutions (Reinhard and Schmalholz 1996; Sternberg 1995). Furthermore, the 'strategically important' innovation activities in the fields of information technology, biotechnology, new materials, etc. that are engaged in by large German industrial firms including Siemens are also backed by federal funding. Currently, half of the public R&D support at Siemens comes from the federal government and the other half from the EU, with the EU share having increased in past years.

Apart from the fact that SMEs suffer particularly from rapid technological development processes and consequent organisational changes, most regional policy makers additionally assume that the strong locational dependency of small firms leads to so-called 'bounded vision' characterised by, for example, a lack of awareness of innovation possibilities caused by the limited resource and knowledge bases and expertise, etc. (Wiig and Wood 1997). On the other hand, Pavitt et al. (1987) show that small firms have introduced significant new products over time. Rothwell (1986) has also shown small firms to be vital agents in the diffusion of technology where they take generic innovations developed elsewhere and present them in the wide variety of forms essential in meeting the expressed or latent needs of a broader range of users. SMEs are also important in introducing those incremental innovations which surround generic technologies and existing applications which broaden and deepen markets... In technological and market terms, the small and innovative firm could be seen as a potentially powerful force in local economic change. As most small firms, once established, continue to produce in the same locality, their technological activities could increase the vitality of the host economy by adding to its strength and competitiveness" (Wynarczyk et al. 1997, p. 34). However, there are also some doubts surrounding the SMEs and their technology promotion as a long-term solution to regional economic problems. Leaving aside the high rates of insolvency and business failure occurring in recent years among SMEs (Gray 1992; Plougmann 1994), large firm size is quite often seen as a prerequisite for economic progress via technological change, and stress is placed on the leading role in innovation success of large internationally-active companies which have a greater ability to provide capital, information and managerial and technical specialists and to spread related risks over a portfolio of innovation projects carried out by large R&D departments.

There are now lively discussions in Germany as to the advantages and disadvantages of the publicly-promoted innovation and R&D activities engaged in the context of the regional economic and technology-development programme men-

tioned above. To sum up, the major disadvantages of this type of technology policy are seen to be that it:

- disturbs the free-market mechanism, hinders allocation efficiency and generates a culture of dependence,
- creates new jobs in a limited number of cases only,
- can sometimes delay necessary structural changes required immediately for long-term regional growth, as it can also promote R&D activities in traditional declining industries like coalmining, iron and steel, shipbuilding, etc.

On the other hand, these promotion measures:

- offer firms a chance to enter new technology and production fields, thereby accelerating regional growth and structural change,
- provide support for SMEs and create employment in high-tech sectors,
- encourage co-operation and technology transfer between firms and research institutions, etc. (Kerlen 1994).

Apart from direct public assistance and the endowment of R&D infrastructure by regional and/or local governments, the success of innovation is generally seen as the outcome of mutual, consistent and long-lasting interactions, co-operation and networks among innovating firms and their partners, universities and technology transfer centres for diffusing knowledge and technologies, business service firms, etc., which create a sort of innovation system (OECD 1992). In other words, “innovation is systemic, in the sense that firm-level processes are generated and sustained by inter-firm relations and by a wide variety of inter-institutional relationships. Innovation and the creation of technology involve systemic interaction between firms and their environments: central links include those with customers and suppliers, science and technology infrastructure, financial institutions and so on...” (Wiig and Wood 1997, p. 67). Apart from enhancing local creativity, this type of regional co-operation system also acts as ‘an uncertainty-reducing operator’ (Grotz and Braun 1997, p. 546), which reduces the risks related to rapid market development and increasing technological complexity and competition.

Furthermore, the concept of agglomeration economies and the incubator hypothesis have often been applied to explain why the local- and regional-level innovation performance of firms and economic growth are influenced by economies generated by the spatial proximity of the actors and associated externalities (Nam 1995). In other words, such a geographical concentration allows for the better exploitation of the ‘dynamic relative advantages’ in developing the skills and know-how of a given territory that arise from the synergetic relationship between actors in the innovation system and economies of scale in the provision of innovation services and support. Large cities especially seem to provide excellent conditions for firms’ innovation activities. Companies located in those central places have easy and speedy (low transport-cost) business and information access to other service and industrial firms (suppliers, distributors etc.) or to government and research institutions. In addition, the denser the economic activity in an area surrounding a firm, the greater the probability of there being a large

number of innovation suppliers. The recruitment of a specialised labour force is also convenient in such urban areas: modern industrial and (high-value) service firms “that are growing quickly need to be able to recruit specialised, experienced and skilled professionals who can meet specific requirements” (Mills and McDonald 1992, p. 42). It has quite often been suggested that a large number of innovations have emerged recently from the complex knowledge base embodied in the highly-educated professional workforce that has chosen to live in and around those large city areas. Moreover, technology information can be transmitted from one innovating firm to another as these skilled professionals switch jobs within a geographical enclave; a process described as the ‘Marshall-Arrow-Romer externality of knowledge spill-overs between firms’ (Glaeser et al. 1992). As a consequence, internationally-competitive innovations seem mainly to have arisen in large metropolitan areas or their immediate surroundings. For this reason, some regional economists have attempted to apply an ‘epidemic-hierarchical model to describe the subsequent diffusion of innovations down through more minor nodes in international and national urban hierarchies (Simmie 1997).

In contrast to those theoretical arguments that emphasise the advantages of the so-called ‘local milieu’, some empirical analyses suggest that the spatial proximity of firms to technology-oriented partners (like research institutes or other private firms) does not always make a significant contribution to firms’ innovational and R&D activities (Hahn et al. 1995; Wolff 1991). Furthermore, many small firms in Germany are so specialised that they can hardly find a regional partner suitable for co-operation (Grotz and Braun 1997). All this immediately indicates that, although such regional and/or local networks enable indigenous firms to tap into local expertise and knowledge, they need to be linked to interregional and international networks if they are to remain innovative in the long-run and avoid ‘entropic death’, especially in a global context (Camagni 1991). Successful ‘global regions’ are those whose networks incorporate an adequate supply of high-quality knowledge resources along with an ability and willingness on the part of local firms to make use of external sources of knowledge with a clear focus on innovation (Nelson 1993). Such types of global-national-regional innovation and technology networks are generally of different relevance to various local actors and, as Huggins (1997) suggests, it is SMEs that will have most to gain from the tight connection of regional systems to not only the national one but also to the international.

Apart from providing for close co-operation with universities and research institutes, as well as for technology transfer and consulting services (see below), the German technology and innovation centres have also sought to play the role of incubator in the new establishment of SMEs.² In other words, the policies of

² “In contrast, in France and Spain, technology parks... are [generally] larger and seek to change the entire productive system where they are located, through the attraction of large high-tech companies and multinational R&D departments” (Komninos 1997, p. 182).

such high-tech centres focus on the mobilisation and enhancement of local technological and industrial resources and are mainly targeted at creating small new technology-based firms. In the context of the public-private partnership, local authorities (i.e. city or municipal governments), private firms and the local Chamber of Commerce (IHK) are mostly the major sponsors in the development of these centres, and there is rather limited involvement from the universities (Sternberg 1995; Oh and Masser 1995). For a limited period of time (e.g. three to five years), these innovation centres usually provide offices and other commercial facilities at reasonable rents, to make the setting-up of technology-oriented firms more convenient. There are presently around 100 such types of facilities (*Technologie- und Gründerzentrum*) in Germany, with 1800 firms and 15,000 employees.³ “For regions faced with a high concentration of older, declining... industries [these innovation centres] have been viewed as a tool facilitating economic restructuring through the incubation of new technology-based... [SMEs]. For other regions whose economies have been performing well, investment in the new innovational capacities of new technology in [these innovation] centres may represent a long-term insurance policy” (Oh and Masser 1995, p. 299). The many previous studies evaluating the effectiveness of German innovation centres as instruments of regional innovation policy and technology-led economic development have generally been positive about the support given to start-up firms, the value added to the local economy (especially in old industrial areas) and the so-called multiplier effects derived from the concentration of highly-qualified professional employment in those centres (Fiedler and Wodtke 1991; Sternberg 1988 and 1990).

On the other hand, with a few exceptions (like that of Dortmund), the scale of the German centres is relatively small when compared to those more spatially-concentrated ones in the USA (like Silicon Valley) and France (like Sophia Antipolis). Nevertheless, many centres in the western Germany do not fully utilise the capacity of commercial sites for new firms. In addition, assessments have greatly shown that the employment effects on the regional labour market led by incubator activities are less significant than expected, partly because many of the centres dispersed all over the nation are relatively small. In other words, the German regions do not show the so-called Cambridge phenomenon which describes the economic boom and technology-orientation of an entire region following the establishment of technology parks.

As innovation depends significantly upon information and knowledge, these ‘invisible’ elements have emerged as important determinants of regional development (Nijkamp et al. 1994). In particular, “interactions across industrial networks appear to be particularly rich in information and knowledge, with synergies creating further knowledge and often resulting in dynamic technical

³ At present, the 46 technology centres in North Rhine-Westphalia, employ around 6900 in ca. 950 firms (Landesregierung Nordrhein-Westfalen 1994).

accumulation and production improvements...” (Huggins 1997, p. 103). Although co-operation in innovation activities and the establishment of common R&D networks among (particularly small-sized) firms (with partners, suppliers, etc.) seem to achieve economies of scale, firms in Germany tend to avoid close contacts with others when developing new technologies, products and processes. The so-called horizontal co-operation between industrial firms in similar fields seems to occur particularly seldom in Germany, despite the gradual recent increase in the role played by large German industrial firms as ‘technology suppliers’ (Wolff et al. 1991). Apart from the afore mentioned fact that a high degree of specialisation leaves many innovative firms almost unable to find suitable partners in a region, this type of ‘egoistic behaviour’ can also be justified by, for example:

- the achievement of a leading position in the innovation competition with other firms, and the further maintenance of competence in the market,
- the emergence of problems in co-operation with other partners reflecting differences in the setting of major R&D objectives and related solution systems.

However, in practice it is quite common for those firms which prefer the internal means of technology development to recruit (external) R&D experts research institutions and/or other (particularly large) firms with successful innovation experiences.

In Germany, the external procurement of technological knowledge and the results of R&D – from other firms and (private and public) research institutions, via technology-transfer centres and business-service companies – has gradually gained in importance since the beginning of the 1980s. This trend can be observed well in modern high-tech industries such as information technology, biotechnology, materials engineering and the automobile industry (Reinhard and Schmalholz 1996; Mytelka 1991; Hagedoorn 1995). Major reasons for the preference for this type of innovation-oriented co-operation among individual firms are, for example:

- the increasing complexity and inter-sectoral character of new technologies,
- the reduction of product life-cycles forcing firms to establish rapid and just-time connections to the new technology required in production,
- the efforts to reduce costs and to avoid risks related to technological development and, consequently, the constraints on R&D capacity,
- the easy observation of complementary and/or substitutive technologies and product markets, etc.

The major services provided by external suppliers of technology also include the related information, consulting services and company-specific assistance required for the in-house adaptation of new technology of production. Technology transfer is generally said to be efficient when there are simultaneous exchanges of information between those supplying and demanding technology within the innovation network. Table 1 summarises the typical channels of exchange of technology know-how and information, as well as related consulting advice, among these actors, and suggests the functions played in the technology transfer system by (technology) suppliers and demanders, as well as mediators.

Table 1. The Innovation and Technology Transfer Network and the Different Tasks of the Individual Actors

Functions	Tasks of...		Business services for firms and for research institutes by...
Actors	technology supplier	technology demander	external technology mediator
Technology and information transfer	New technology and other results of research and active dissemination of knowledge. Information on: <ul style="list-style-type: none"> - technology application, potential markets, branches and firms, - financial aspects (expenses and sources) for further development and innovation 	Information about: <ul style="list-style-type: none"> - products for future market (strategies and plans) - technology needs - existing technological knowledge in firm - financial constraints on further development and innovation Innovation management and organisation in firms	Provision of information about: <ul style="list-style-type: none"> - technology application, potential markets, branches and firms, - existing technological knowledge in firms, branches, markets and also in research institutions, - financial aspects (expenses and sources) for further development and innovation.
Consulting services and further support in the implementation	<ul style="list-style-type: none"> - Patent registration - Efficient application and implementation of technology in firms' specific production systems - Agreement on further co-operation in the fields of technology application - Assistance in the establishment of firms or within projects (project management or co-operation) - Transfer-oriented training 	Information about economic and technological success in the new production system and/or related firms' specific problems	<ul style="list-style-type: none"> - Consulting services for firms on innovation management, new establishment etc. - Advice for technology suppliers about the market-oriented technology management - Assistance for firms related to patent registration, the efficient application and implementation of technology in firms' specific production systems, problem-solving within projects and transfer-oriented training

Source: Reinhard and Schmalholz (1996), *Technologietransfer in Deutschland – Stand und Reformbedarf*, Munich; Kerlen (1994), *Experience with Technology Transfer in Highly Industrialized Regions – The Case of North Rhine-Westphalia*, Hanover.

As mentioned before, technological co-operation and innovation-oriented linkage between suppliers and customers has been quite significant in Germany and its regions (Hahn et al. 1995; Wolff 1991; Grotz and Braun 1997). The establishment of such co-operative links has recently been led by restructuring and the move of large firms towards 'lean production' which has prompted the externalisation of certain production processes and service activities (Malecki and Todtling 1995; Nam 1997). In many cases, suppliers (i.e. generally SMEs) are forced by their customers (i.e. mainly large international firms) to integrate new technological developments as well as to adjust their products and marketing strategies (Tab. 2). This has, in turn, increased the need for SMEs to innovate and to gain flexibility in their operations. In this context, these large firms seem to play the leading role in the innovation process of the economy of the region in which those suppliers are located.

Although SMEs generally benefit more than large firms from the technology information and advice provided by the local technology transfer centres, a number of experts in Germany criticise the centres for their inadequate integration into the innovation process of those local SMEs and the regional technology network (Staudt et al. 1993). In addition, the quality of their consultancy is often assessed as needing improvement, because the services do not adequately meet the urgent needs of SMEs in many cases (Staudt et al. 1996). According to such discontented opinions, the transfer centres are not familiar with the R&D activities and specialisation of SMEs in the region, partly because of the lack of long-standing formal and informal communication between these two actors. Furthermore, the centres are asked to take the first steps towards actively determining the innovation and technology needs and demands of firms, instead of confining themselves to responding passively to specific requests from firms.

THE R&D PROMOTION AND TECHNOLOGY TRANSFER SYSTEM IN NORTH RHINE-WESTPHALIA

The main objective of technology policy in North Rhine-Westphalia, the traditional industrial region in Germany, is to safeguard and strengthen the competitiveness of the c. 12,000 industrial firms (including SMEs) located in the state. By financial means, the state government supports not only R&D activities in research institutes, universities and private firms, but also technology transfer between (public and private) transfer agencies and companies (Ministerium für Wirtschaft, Mittelstand und Technologie des Landes Nordrhein-Westfalen 1993 and 1995).⁴ At the same time, this policy aims to stimulate structural changes

⁴ The state government of North Rhine-Westphalia has also been seeking the participation of other local institutions in enhancing the regional technology transfer system. Consequently, a small number of technology transfer centres including the Centre for Innovation and Technology in North Rhine-Westphalia (ZENIT) have been established in this region in the form of a public-private partnership. Major shareholders in ZENIT are the State Ministry of Economics, Industry and Technology, the state bank WestLB and industrial associations.

Table 2. Inter-firm Research, Technology Co-operation Agreements and the R&D, Production and Marketing Spectrum

Research and development co-operation			Technological co-operation			Manufacturing and marketing co-operation		
Type 1	Type 2	Type 3	Type a	Type b	Type c	Type i	Type ii	Type iii
University-based co-operative research financed by associated firms (with or without public support)	Government-industry co-operative R&D projects with universities and public research institutes	Establishment of R&D corporations on a private joint-venture basis	Corporate capital in small high-tech firms (by one or several firms)	Non-equity co-operative R&D agreements between two firms in selected areas	Technical agreements between firms concerning completed technology, incl. technology sharing, two-way-and/or cross-licensing in separate product markets	Industrial joint-venture firms and comprehensive R&D, manufacturing and marketing consortia	Customer-supplier agreements, notably partnership	One-way licensing and/or marketing agreements
Many partners		Several partners	Few or very few partners			Few or very few partners		

Sources: OECD (1986), *Technical Cooperation Agreements Between Firms: Some Initial Data and Analyses*, Paris.

Table 3. Technology Transfer Agents in North Rhine-Westphalia

Research institutions	Industrial organisations	Innovation centres	Specific agencies for information and consulting services
50 universities, polytechnics and large (public) research institutes	16 branches of Chambers of Commerce and Industry (Industrie- und Handelskammer-IHK) Branches of industrial associations like Verband Deutscher Maschinen- und Anlagenbau (VDMA), Verein Deutscher Ingenieure (VDI), etc.	48 technology and innovation centres 31 research and development centres	ZENIT (Zentrum für Innovation und Technik) GmbH (Mühlheim) CIM (Computer Integrated Manufacturing) Center NRW (Aachen)

Source: Kerlen (1994), *Experience with Technology Transfer in Highly Industrialized Regions – The Case of North Rhine Westphalia*, Hanover; Landesregierung Nordrhein-Westfalen (1994), Landesentwicklungsbericht Nordrhein-Westfalen, Düsseldorf; Ministerium für Wirtschaft, Mittelstand und Technologie des Landes Nordrhein-Westfalen (1995); Technologie-Handbuch Nordrhein-Westfalen, Düsseldorf.

which are currently taking place in North Rhine-Westphalia. As a consequence, the state has a dense network of transfer and consulting agencies (Tab. 3).

At present, there are a number of initiatives of the state government whose major purpose is to support the innovation activities of private firms and to improve the technology bases of SMEs. These public measures include:

- the *TELETECH NRW Landesinitiative* to support the development of telecommunications technology and its application in different industrial branches,
- the *SOFTECH NRW Landesinitiative* to enhance the competitiveness of approximately 1,300 software firms located in North Rhine-Westphalia and to promote the application of software technology in general (in terms of the establishment of software centres, etc.),
- the *Landesinitiative für Medientechnologie* to promote the development of media technology and the audio-visual sector as well as applications of this modern technology in a post-industrial information society,
- the *Landesinitiative Bio- und Gentechnologie* to achieve rapid progress in the development of biotechnology and genetics,
- selective promotions of other types of key technologies, such as environmental technology and micro-electronics, through the establishment of technology centres, etc. (Landesregierung Nordrhein-Westfalen 1994).

In addition, the government of North Rhine-Westphalia has also promoted:

- the provision of relevant information to innovating firms,
- personnel exchanges between science and business,

- the implementation of innovation management in SMEs and the carrying-out of technology-oriented training for personnel,
- the establishment of a well-functioning technology network among the different actors,
- the development of common projects for SMEs in co-operation with research institutions, etc.

In the framework of the varied regional technology-promotion programmes mentioned above, around 1,800 technology development and innovation projects of firms were subsidised between 1978 and 1992, through which more than 6,400 new high-tech jobs were created in North Rhine-Westphalia while 84,600 jobs were maintained (Ministerium für Wirtschaft, Mittelstand und Technologie des Landes Nordrhein-Westfalen 1995).

Under the German regional policy scheme as established in the programme *Gemeinschaftsaufgabe zur Verbesserung der regionalen Wirtschaftsstruktur* (Joint-programme for the improvement of regional economic structure), a large part of North Rhine-Westphalia (including a major part of the Bochum area) is defined as a region to be promoted. In this common regional policy framework, the company investment supported aims mainly at expanding or modernising production capacity, in parallel with the enhancement of business-related infrastructure. Following the so-called export-base concept that emphasises the role of exports in the regional economic growth, public assistance is mainly addressed to the production of a certain number of goods and services indicated on a so-called 'positive list'. This list includes research and development services for companies, as well as the provision of technical and management information, thereby ensuring that traditional German regional policy also encompasses the promotion of technological development at company level.

RESEARCH AND TECHNOLOGY POLICY IN BAVARIA

Technological progress and innovation are the basis of competitiveness. As is widely acknowledged, Bavarian industries can 'only' compensate for the existing competitive disadvantage in the world market due to higher wages by continuously supplying high-quality (innovative) products and services. For this reason, the improvement, assurance and promotion of research activities has been seen as one of the major determinants in the region's future economic development. Since the beginning of the 1980s, in order to promote R&D, the Bavarian state government has placed strong political emphasis on:

- the selective expansion of universities and research institutes in relation to the R&D activities of urgent need or the future importance to the region (including the recent establishment of the Fraunhofer Institute for Integrated Circuits in Erlangen, the Fraunhofer Institute for Solid Technology in Munich and the Bavarian Institute for Waste Research in Augsburg),

- the establishment of approximately 60 technology-transfer centres to transmit the applicable advanced know-how (developed in universities and research institutes) to private firms,
- the development of state government programmes to promote the innovation and research activities of SMEs, including, for example:
 - * the Bavarian innovation support programme to promote firms' development of new technologies for marketable products,⁵
 - * the Bavarian technology introduction programme to ease the market penetration of newly-developed products,⁶
 - * the Bavarian subsidy programme for the promotion of rational energy production,
 - * the Bavarian programme to support the establishment of technology-oriented companies,
 - * the SME business technology advice programme to support financially the procurement of the external consulting services required in the application of new technologies to company-specific processes and products (*Bayerisches Staatsministerium für Wirtschaft, Verkehr und Technologie* 1996a).

In addition, a new impulse is expected from the Bavarian Research Foundation established in 1992. With annual funding of DM 25 million, the Foundation primarily promotes research in the fields of new materials and micro-electronics.

At the instigation of the Bavarian government, three financial companies were founded in 1972 to cover requirements in implementing a new strategy and innovation plans to safeguard the long-term successes of firms, which include *Kapitalbeteiligungsgesellschaft für die mittelständische Wirtschaft Bayern mbH (KBG)*, *Bayerische Wagnisbeteiligungsgesellschaft mbH (BWB)* and *Bayerische Unternehmensbeteiligungs-Aktiengesellschaft (BUB)*. These companies are backed financially by banks, insurance firms and economic organisations such as interest groups.

– The KBG manages publicly-subsidised investment activities and concentrates on broadening the equity base of SMEs in Bavaria.

– The BWB is the partner of SMEs during the dynamic development phases (expansion, new-product development, increasing competitiveness). It offers fully liable funds and consulting services and also arranges business contacts.

⁵ In this strategic context, 190 projects were subsidised directly with a total of c. DM 59 million in the period 1980–1995, while around 90 projects were supported by low-interest credit with a volume of DM 75 million in the same period (*Bayerisches Staatsministerium für Wirtschaft, Verkehr und Technologie* 1996b).

⁶ From its implementation in 1985 to 1995 this programme had promoted 110 projects via direct subsidies to the value of approx. DM 43 million, while more than 130 projects were additionally supported by lower-interest credit of around DM 146 million in the same period (*Bayerisches Staatsministerium für Wirtschaft, Verkehr und Technologie* 1996b).

– The BUB helps firms' long-term development plans with fully-liable funds, particularly during and/or after the expansion or development phases, after changes in the share-holding situation, or with take-overs, etc. (Bavarian Ministry for Economic Affairs, Transport and Technology 1991).

Human capital (in other words, the availability and quality of qualified labour) is also generally assessed to be one of the most important factors shaping regional competitiveness in Bavaria. The so-called dual educational system (including technologically-oriented professional education)⁷ has contributed significantly to industrial development in Bavaria as well as throughout Germany in past years. This competitive advantage should also be maintained in future through not only the selective expansion and modernisation of education facilities but also the additional establishment of economics- and management-oriented vocational training facilities. Professional and vocational training especially is becoming more and more important, as technological development and structural change now take place very rapidly. In order to support SMEs which depend, to a larger extent, on external training, the Chamber of Industry and Commerce (IHK) created a training network that has been extended continuously. The Bavarian Ministry for Economic Affairs, Transport and Technology has supported the construction and modernisation of these training facilities financially.

The primarily R&D-, SME- and infrastructure-oriented regional policy measures have certainly contributed significantly to the establishment of new (small) firms and job creation, to the modernisation of industrial structure as well as to rapid economic growth in Bavaria, one of the modern industrial and service regions in Europe. This Bavarian style of 'loosely' defined decentralised (industrial and) technology policy⁸ has functioned remarkably well in the state-specific economic framework, in which a few large leading (internationally-known) firms

⁷ The dual education system describes the traditional vocational school (*Berufsschule*) system in Germany. After the basic school (*Grundschule*) from age 6 until about age 10, around half of all children continue elementary schooling in a junior secondary school called the *Hauptschule* (main school) until about the age 15 or 16, at which time they are assigned to a *Berufsschule*, attended part-time in conjunction with an apprenticeship or other on-the-job training in private firms. This programme makes it possible for virtually every young person in the vocational stream to learn a useful technical and/or commercial skill, constantly adapted to the actual demands of the German labour market.

⁸ By no means does the Bavarian industrial and technology policy include a strategy that government officials directly lead industrial companies into profitable future product fields. It is well acknowledged in Bavaria that the government has no information or knowledge advantages over firms as to the quality, materials and technologies of promising future products, and that the state alone can not determine the desirable industrial and economic structure in the region. The main elements of Bavarian industrial policy can be classified into: a) policy promoting dialogue between all economic partners (companies, trade unions and research institutes, etc.), b) the provision of infrastructure, c) 'crisis management' supporting individual firms suffering from structural change and other unavoidable change in economic circumstances (including the disarmament process) with particular consideration of the consequences for the regional labour market, and d) establishment and innovation support for SMEs (Nam 1994).

combine with the strong SME-base to serve as an engine for regional economic and technology development. In addition, this policy has provided favourable business circumstances for the success of innovative Bavarian firms and significantly enhanced their competitiveness on the global market (Nam 1994).

THE LOCAL INNOVATION SYSTEM IN LANDSHUT (BAVARIA)⁹

After World War II, the Landshut region of Bavaria experienced a rapid structural shift from the agricultural to the modern industrial. However, during the initial stage of the restructuring, this city region had a few (large and) medium-sized electrical firms which had been relatively slow in developing new ideas and products. In addition, many firms in the Landshut area have traditionally been suppliers of intermediate goods to large internationally-known Bavarian firms like Siemens, BMW, MAN, MBB and Audi, which are located in the larger surrounding city regions such as Regensburg, Nuremberg, Ingolstadt and Munich. As a consequence, firms in Landshut have quite well-established (formal and informal) co-operation with these large firms in technology development and transfer. To a large extent, SMEs located in Landshut are (directly or indirectly) forced to supply high-quality intermediate products and parts which correspond in quality to the end-products of these large firms (customers). In addition, these large firms often act as the major providers of information and/or new technology which these SMEs need to enhance the quality of their supply. In many cases, such large firms also urge dependent small-scale suppliers to co-operate for their R&D activities in a network.

Although most high-tech firms located in Landshut are SMEs, many also act as global players. These technology-based firms acquire innovative ideas, for example from firms and research institutions in the USA, and compete against European and Asian firms on the world market by adopting these ideas in product development. Although these modern SMEs have usually carried out the development of new products (or intermediates) 'in-house', the final assembly has increasingly been outsourced, for example to partners in the same or related industries in neighbouring countries like the Czech Republic. This reflects in equal measure the advantages of achieving a market presence and the savings that can be achieved. Also, because of their limited production capacity, SMEs in Landshut often produce a small number of high-quality products 'just-in-time' on an order basis; a fact which forces them to be flexible in the production

⁹ Analyses of the local innovation systems in Landshut and Bochum are carried out mainly on the basis of expert interviews conducted among ten selected high-tech-oriented SMEs as well as in the large firms mentioned in the text, in research institutions and among local policy-makers and interest groups in the individual city-regions.

process and product modification. To guarantee such flexibility and at the same time reduce business risks, these firms have established a sort of vertical (supply) network with their intact sub-contractors. This is not only defensive in character but also has mutual complementary effects.

As regards firms' horizontal co-operative relationships within a group of similar industries, relatively active exchanges of experience have recently taken place in the field of innovation management and organisation, etc. Yet the Landshut area has seen only very limited direct transmission of technology between indigenous firms, with the exception of, for example, the between-companies mobility of high-tech experts.

The two technology-transfer institutions located in Landshut (*Fachhochschule Landshut*¹⁰ and *Landesgewerbeanstalt (LGA)*¹¹), are to some extent in competition with each other. The former additionally provides a limited variety of courses related to innovation and technological development, and its education schedule is likely to be much more concentrated on the basic training of the engineers required by large Bavarian firms. Some rapidly-growing modern SMEs in Landshut complain that graduates of this polytechnical university are often less creative in practice, when generating new products and implementing innovative ideas. According to the assessments of these less-satisfied local firms, graduates from the universities in Munich are more practice-oriented and better aware of innovation management. A few relatively-large firms in Landshut (including Hitachi) benefit from close contacts with professors of the *Fachhochschule* when recruiting new qualified personnel. Instructors and students of this polytechnic are often present in local firms to conduct laboratory sessions scheduled in the corresponding teaching and learning programmes. Highly-qualified managers and technicians employed in these firms are also involved in the *Fachhochschule's* education programme as adjunct faculty, and/or invited research and thesis supervisors.

In addition, a number of private business service firms in and around Landshut play the role of local technology mediator. Many SMEs in the industrial sector have experiences with these business service firms on a project basis, seem generally satisfied with their expertise, and plan to co-operate in a more intensive way in the future. However, when interviewed, local high-tech firms quite often complain that the services provided by these private technology mediators in previous years made little contribution to solving firm-specific problems related

¹⁰ The Fachhochschule is a graduate school which concentrates on technical and commercial subjects and is more strongly practice-oriented than the university. In accordance with the curriculum of this type of graduate school, both students and teachers are obliged to carry out internship semesters in private firms.

¹¹ The head office of the *Landesgewerbeanstalt Bayern (LGA)* in Nuremberg and its numerous branches in Bavaria (including Landshut) have the task of bringing together experts and firms seeking modern technology know-how. The technology transfer/innovation department of the LGA Bayern in Nuremberg acts as a kind of sorting office in this respect.

to the application of new technology in the production process. Furthermore, SMEs in Landshut generally wish that the Chamber of Industry and Trade (*IHK für Niederbayern*) and the regional government in Lower Bavaria were more active in providing relevant information and promoting technology development, although most investigated SMEs are quite satisfied with the flexibility previously shown by the Chamber in managing those activities.

The economic development of Landshut has largely been determined by the fact that Munich, Nuremberg, Regensburg and Ingolstadt have more-modern economic structures and are, at the same time, better endowed with basic R&D infrastructure (in the form of universities, research institutions, etc.). Furthermore, as a consequence of the short travel time to these technology and modern-industrial centres in Bavaria, firms in Landshut have always had easy inter-regional access to the required information about technology development. Nevertheless, an attempt was made by the *Fachhochschule Landshut* to establish a co-operation network with the indigenous SMEs in the field of a micro-system technology development programme between 1991 and 1993.

Bavaria's SME-oriented technology policy scheme aiming to support R&D activities and the implementation of new technologies in the production and commercialisation process appears to have been quite helpful for the promoted firms in Landshut, though the latter consider that it needs to be more transparent and project-oriented. Since the collection of specific information about new technology, changes in market needs and regulations world-wide is time-consuming and very costly, many SMEs in Landshut want the different (federal, state and local) levels of German government to join other local industrial and commercial associations in partly relieving them of these tasks.

As an extra way of raising the efficiency of current Bavarian technology policy, experts favouring the concept of central place and economies of scale argue for a stronger concentration of financial means at a reduced number of already-established large technology poles such as Munich and Nuremberg (with better future prospects). This would eventually make Landshut's position weaker. From the point of view of the few existing local firms, Landshut has no urgent need to be equipped with new R&D infrastructure, since firms located in the area have direct access to the technology centres in the larger surrounding agglomerations named above. Yet it should be noted that a development centre for micro-system technology does not exist in Bavaria at present – the establishment of such an institution in this area would be an opportunity for Landshut. Furthermore, Landshut also has great potential to develop as a high-tech centre, especially in the logistic and touristic fields, since the city region is located near the new Munich international airport.

THE LOCAL INNOVATION SYSTEM IN BOCHUM (NORTH RHINE-WESTPHALIA)

The innovation-related activities of firms located in Bochum have generally been stimulated, and also led, by international competition which is becoming increasingly fierce. The quality regulations which are set by the European Commission for example, (such as regulations on machinery products and CE markets. – the Conformity to Europe) have also continuously forced a number of high-tech firms to enhance product quality. Yet this has, in turn, increased production costs significantly, as several local SMEs complain when surveyed.

Large firms in the city region, like Opel and Nokia, have been playing the leading role in the regional innovation system. Their position has become stronger in recent years as they have gradually outsourced production activities. They expect, from their local suppliers, the 'just-in-time' delivery of high-quality (or assembly) parts which guarantee the quality of their final products and as global (or European) players, they generally gain innovative ideas and new technology from their headquarters in Japan and the USA. In many cases, they also exploit and utilise their own R&D capacities to develop new products, parts, design etc., which better satisfy the specific needs of customers in their major market segments. After successful in-house innovation, managers of these large firms examine whether new products (or assembly parts) can be produced (at low cost but the same quality) by suppliers in the region or other parts of Germany. In the affirmative case, they sub-contract to small-scale suppliers. However, such types of 'vertical' business relationship with suppliers are by no means permanent and institutionalised, but rather based mainly on projects.

In their general assessment of location determinants, the large firms interviewed are satisfied with the endowment of technology and research infrastructure in Bochum. However, in regard to the direct transmission of new technology know-how and innovation ideas, it is quite often suggested that these large firms have rather loose contacts with universities, *Fachhochschule* and technology transfer centres located in the region and in the surrounding cities. In Bochum, research activities are often carried out in the form of closed-shops. Large ones carry out their own applied research which is of immediate need in product development or modification, while universities do basic research separately. Unfortunately, there has been insufficient mutual exchange of research results between these two actors, unlike in the cases in the USA, where the mutual co-operation in R&D activities and in the application of results has been better established between firms and universities. Moreover, these large firms also have little experience with the external (private) providers of business services. Closer co-operation is expected in the future, however.

Most interviewed SMEs in the region produce highly-sophisticated intermediate goods and complain about the very time-consuming nature of co-operation with universities in the fields of product development. While these companies are

strongly customer-oriented and should as mentioned deliver their high-quality products to large firms just-in-time, they find universities less flexible and slow to (re-)act when solving immediate problems firms are facing. It is partly for this reason that some (well-established) small firms in Bochum also carry out innovation activities 'in-house' all by themselves. Nevertheless, in many cases, these SMEs share basic testing and measuring machines and instruments in universities, because they can hardly afford such modern R&D equipment.

The Bochum Chamber of Industry and Trade (IHK) provides the service of examining the applicability of new ideas to marketable products and the eligibility of potential new entrepreneurs (regarding the possessed state of technology, target markets, business experience, qualifications, etc.). In the case of a positive judgement, the Bochum IHK and state government of North Rhine-Westphalia promote (the latter financially) the development of products and the establishment of eligible firms. However, – in the experience of the interviewed SMEs – the practical introduction of a new development onto the market generally takes more than one-and-a half years after product innovation (or the establishment of a new firm). In some cases, large firms with R&D facilities could adopt these innovation ideas for practical application more rapidly and, as a consequence, shorten the time required for market penetration.

Bochum's technology-transfer centres with an incubator function (like the *Cooperationsgesellschaft Hochschulen und Industrielle Praxis: CHIP*¹²) generally enjoy a good reputation as major external mediators, especially for new entrepreneurs in the region, and provide the following advantages which reflect the proximity to the university:

- easy implementation for the potential market of product ideas from the university,
- efficient division of tasks and effective co-operation through the research network,
- common usage of labour in the university, personal contacts, exchange of information and experiences as well as feed-back among researchers, businessmen, etc.,
- the image of the innovation system (university, technology transfer centre and firms). For example, when the business concept of a new entrepreneur is approved by the CHIP, it is remarkably easy to receive credit from the bank,
- easy access to the young well-qualified R&D labour forces directly from the university, which particularly provides an incentive for location in the technology centre, etc.

However, the activities of high-tech SMEs located in the centre have generally taken place independently from one company to another, following the

¹² The CHIP, established in 1991 and financed by indigenous industrial firms and the Bochum IHK, also sees its role as being the mediation of information exchange and personal contacts. This institution organises regular seminars on the latest research results from the university.

specific interest of individual firms. The synergy effects which were originally expected from the tackling of common innovative projects by several SMEs within the centre and in co-operation with the universities have unfortunately been quite scant in previous years.

The general assessment from the large firms and investigated SMEs in Bochum is that the general investment and technology-promotion schemes provided by the state government of North Rhine-Westphalia have been quite helpful for their business activities, albeit with the effects of the latter less significant than those of the former. The technology-related information a (large) firm needs is generally collected by the firm itself. In the opinion of some high-tech SMEs in Bochum, some basic institutional changes are necessary immediately if Germany is to develop a well-functioning technology and information transfer network between the regional government, universities, research institutes and private firms, as is the case in the USA and Japan. Unfortunately, however, the German actors still seem to be in the learning phase.

CONCLUSIONS

According to the review of relevant theoretical and empirical investigations and the case studies on Landshut in Bavaria and Bochum in North Rhine-Westphalia, the role of the local innovation and technology co-operation network between regional public bodies, private firms, technology-transfer centres and research institutions appears less significant than expected in these surveyed areas, although a well-established network is a recognised prerequisite for continuous regional economic development. This concluding assessment is quite comparable with the major outcomes of similar research carried out recently for several different German regions like the surroundings of Lake Constance and Neckar-Alb (Baden-Württemberg), Aachen (North Rhine-Westphalia), Lüneburg-Celle (Lower Saxony), etc. (Hahn et al. 1995; Staudt et al. 1996; Grotz and Braun 1997). Consequently, the following findings of the present study seem more or less universally applicable to German areas:

- Local co-operation in innovation activities, and the establishment of common R&D networks among firms to realise economies of scale, are generally limited. Such egoistic behaviour from firms is also dominant in the collection of the latest technology information, although the external procurement of technological know-how and R&D results is gradually gaining in importance.

- The existing innovation-oriented inter-firm linkages are mainly based on the vertical 'supplier and customer relationship', particularly that between large (international) high-tech firms and local SMEs. In particular, the technological success of such a network in the local context is widely determined and triggered by quality standards and norms set by large leading companies. In the future the intensification of such vertical technological co-operation and joint product de-

velopment is expected, but this will increasingly be of a national and international character.

– The local milieu appears to be important for exchanges of information about management and organisation, as well as marketing strategies, while innovative firms (also SMEs) more commonly look for interregional or international contacts to collect innovation- and technology-oriented information.

– Technology-transfer institutions and universities, as well as private technology consulting firms, appear to be playing a less significant role as solvers of the specific problems that local firms have when developing new products or adopting new technologies in the production process. The benefits of co-operative innovation and technology development on the basis of cost- and know-how-sharing between research institutions and firms seem to be underestimated. Nevertheless, the contribution of universities as the basic local R&D infrastructure and the provider of high-quality workforces to technical progress in the regional economy is assessed as positive. Technology and innovation centres with the incubator function seem to be important for new local entrepreneurs but the synergy effects initially expected from the tackling of common large-scale innovation projects by several SMEs within the centre, in co-operation with neighbouring universities, have unfortunately been less significant.

As generally assessed by firms, and as many economists also argue, the different types of (primarily R&D-, SME- and modern infrastructure-oriented) industrial and technology policy measures implemented in German states (including Bavaria and North Rhine-Westphalia) seem to have improved the region's competitiveness and contributed to the establishment of new (small) innovative firms and job creation, the stimulation of SMEs' innovation activities and application of technologies and the modernisation of industrial structure, as well as economic and technology development in these states (see also Maier 1989; Grabow et al. 1990; Semlinger 1993; Schams 1995). In spite of these overall positive effects of regional (economic and) technology policy, the extent to which this type of promotion system – aimed at supporting the new establishment of innovative firms and research institutions in less-developed areas, reducing the existing disparities among regions in the German states, has not yet been assessed systematically. It is likely that the growth poles (respectively 'islands of innovation', e.g. the city regions of Munich and Nuremberg in Bavaria, Stuttgart in Baden-Württemberg, Berlin, Hamburg, etc.) on which high-tech firms and research facilities are concentrated, benefit continuously from those regional (as well as national) R&D promotion programmes. This suggests that those technology policy measures have been more successful in the regions already better-off economically. On the other hand, the so-called 'innovation-oriented regional policy measures in Germany designed to stimulate the rapid establishment of local technology networks (incl. the establishment of new innovative SMEs) in those less-developed (peripheral rural) areas have remained less successful, because in many cases they lack a sufficient mass of know-how, skills and finance,

a socio-cultural and institutional infrastructure and a certain degree of entrepreneurial tradition which can not easily be generated by public intervention within a short period of time (Sternberg 1995; Grotz and Braun 1997; Amin and Thrift 1994). Furthermore, the structural transformation of an old industrial region like the Ruhr area to a modern high-tech one through intensive promotion of technology appears to require a much longer time than initially anticipated in Germany, although "Ruhr-based firms spawned large numbers of innovation activities themselves, and in their suppliers, as they diversified into innovative technologies after the 1980s steel crisis" (Cooke 1996, p. 162).

Additionally, in order to promote the innovation activities of firms and to better exploit technological potentials, the following proposals have been made and should be considered thoroughly in future R&D and technology policy-making:

- enhancement of the efficiency of technology-transfer centres and their services through greater transparency of activities and structure,
- stronger, project-oriented promotion of the innovation and R&D activities of SMEs which particularly produces applicable results for the market,
- the simplification of administrative and bureaucratic procedures required for the approval of the projects to be promoted,
- the stimulation of a more positive public attitude towards rapid technological development and innovative SMEs,
- more-intensive support for the development of the human capital required for firms' innovation management by focusing on the direct institutional links between universities/technical schools and the companies,
- more-systematic public provision of specific information on the latest technological developments especially for SMEs (incl. easy access to the databanks of existing patents), also in co-operation with universities and technological-transfer centres as well as industrial organisations like IHK.

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THE SPATIAL FORMATION OF THE BRAZILIAN ECONOMY: HISTORICAL OVERVIEW AND FUTURE TRENDS

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ABSTRACT: This paper examines the spatial dimension to economic development in Brazil. The analysis focuses on different theories of regional development, which provide a background against which to explore the patterns of regional inequality and structural changes in the country. It is suggested that the new growth cycle of the Brazilian economy will have adverse effects on the regional distribution of income and output, and, regarding the less developed regions of the North and Northeast, and in as far as regional equity is a desirable outcome of economic policy, regional development necessarily demands government intervention.

KEY WORDS: Brazil regional inequality, economic growth, expansion cycle, analysis of outlined tendencies.

INTRODUCTION

The present configuration of Brazil's economic space is heavily rooted in the developmental path followed by the country since colonial times. The uneven distribution of wealth on Brazilian territory is characterized by a high concentration of resources in the Center-South portion of the country.¹

¹ In the classification adopted in the major part of our analysis, the regional setting consists of three different regions – North, Northeast, and Center-South (Rest of Brazil); the latter comprises the more dynamic regions of the Southeast and South, as well as the Center-West. This classification considers the South East, South and Center-West regions as a single region, precluding the analysis of each individually. However, the regional delimitation still offers a great range of analytical possibilities focusing on the less-developed regions of North and Northeast Brazil, and their interactions with the Center-South, which is the objective here.

The degree of regional inequality in Brazil can be gauged from Table 1 below, which shows the proportionality between the average per capita output of each region and the national average per capita output. While the Northeast presented an average per capita output 50% below that average in 1994, and the North reached only 68.0% that average, the other regions, especially the Southeast, showed indicators substantially above the national average.

Table 1. GDP and GRP per capita: Brazil and Regions, 1994 (R\$)

	GRP, GDP per capita	% of national
North	2299.94	68.0
Northeast	1635.13	48.4
Southeast	4490.83	132.9
South	3983.42	117.8
Center-West	3650.90	108.0
Brazil	3380.14	100.0

S o u r c e: IPEA/DIPES.

These differences in regional wealth are accompanied by impressive differences in regional social indicators, which can be summarized by the *poverty incidence indicator* estimated by IPEA: in 1990, 40.9% of the population in the Northeast were considered indigent, as compared to 13.9% in the North, 12.4% in the Southeast, 18.1% in the South, and 16.1% in the Center-West (Guimarães Neto 1995).

The remainder of the paper is organized as follows. The next section introduces a brief discussion of the dynamics of regional inequality, followed by an historical review of the process of spatial formation of the Brazilian economic territory. Attention is directed to three issues: the pattern followed in the evolution of regional imbalances; social distributive dimensions of regional growth; and the spatial impacts of macroeconomic, structural and sectoral policies. The final section concludes with analysis of some policy implications for regional development in Brazil.

ECONOMIC DEVELOPMENT AND REGIONAL INEQUALITY

Economic development is spatially unequal everywhere. At the national level, it is always possible to identify more-developed and less-developed regions. In general, almost all socio-economic indicators of development apply in the same direction; leading economic regions present higher standards of economic and human development.

The description of patterns of regional inequality and the process of economic development has been the focus of attention of prominent economists (e.g. Myrdal 1957; Hirschman 1958; Williamson 1965; Alonso 1968; and more recently,

Krugman 1991; and Barro and Sala-i-Martin 1995). It is agreed that, at the early stages of the development process, growth is, in the geographical sense, necessarily unbalanced. Because of agglomeration externalities, there can be little doubt, that to lift itself to higher income levels, an economy must and will first develop within itself one or several regional centers of economic strength (Hirschman 1958). Historical evidence confirms these hypotheses, be it verified for developed or less developed countries (Williamson 1965). In some cases, it dictates the directions of regional policies. For instance, the concept of growth poles (Perroux 1955), utilized worldwide in the formulation of regional development projects, is based on the conflictive idea that the “cake” has to grow before it can be cut.

Analysis of regional disparities usually assumes that dualism is initially determined by geographical and historical *accidents*. Thus, the initial pattern of regional concentration encountered in different countries depends on particularly favorable natural conditions for the economic activities concentrated in a given location, which give the specific region a competitive advantage over a certain period of time.

Myrdal (1957) and Hirschman (1958) were interested in the interregional interactions derived from the growth process in a region and in their implications for national development. Once growth takes place in one locality, the interaction of two different forces will determine the movements of the national economy towards/against regional inequality. First, there will be a tendency towards inequality. Given the initial dualistic setting, expansion of the rich region increases inequality through migration, capital movements and trade. Selective migration takes place, draining skilled labor force from the poor regions; capital also tends to migrate to the growing regions, driven by higher rates of return connected to agglomeration economies; regional specialization in manufacturing goods in the expanding region, protected by tariff barriers, creates a deterioration of the terms of trade unfavorable to the peripheral area, generating recurrent interregional trade deficits.

These effects, called “backwash” effects by Myrdal, and also characterized by Hirschman as “polarization” effects, work in a cumulative way in a process of circular causation, and might be strengthened through the interplay of non-market forces as well. Actions by government can also contribute towards regional inequality. If government policy is intended to maximize national growth, the regional allocation of public investments will be concentrated in the rapidly-developing region, in order to meet the demands for public infrastructure by the private sector. In addition to direct investment in social overhead capital, the favored regions tend to benefit from implicit regional policies carried out by the central government.² This has been the case for protectionist policies that benefit

² These are essentially macroeconomic or sectoral development policies whose differential regional effects depend on the regional economic structures under consideration.

the growing industrial regions, precluding the poor regions from the consumption of similar goods from abroad, at lower prices.

The second force has beneficial effects to the backward areas. The "spread" effects, also denominated "trickling-down" effects, operate as positive spillovers of the expansion from the centers of economic growth to the other regions. Regional integration might arise from the regional division of labor; as the peripheral regions supply the central regions with agricultural products and raw materials, conditions for growth start to be created in the former from the income generated in those sectors. Thus, the spread effects from a center of industrial expansion to the other localities and regions, operating through increased demands for their products and in many other ways, weave themselves into the cumulating social process by circular causation in the same fashion as the backwash effects, in opposition to which they set up countervailing changes (Myrdal 1957).

However, more important as a growth stimulator in the less developed regions is the action taken by the government. The trickling-down effects generated by market forces are very unlikely to overtake the polarization effects in the early stages of the development process. The lack of economic infrastructure that facilitates the flows of goods, such as transport and communications, represents an obstacle for the operation of the forces for the centrifugal spread of economic expansion in developing countries. Free play of market forces in those countries thus has an inherent tendency to create regional inequalities. In this case, deliberate economic policy comes into play to correct this situation. Interference by the state, to reverse regional inequality takes the form of the provision of social overhead capital for the physical integration of regional markets, tax incentives, and, in some cases, direct investments in productive plants.

The interaction of the adverse and favorable direct economic repercussions from the rich regions to the poor ones will determine the direction of regional inequality in the national economy. Empirically, Williamson (1965) did not reject the long-run hypothesis that the early stages of national development generate increasing income differentials, as the spread effects are very weak. Somewhere during the course of development, as the forces for the centrifugal spread are strengthened due to improved transportation and communication systems, and higher levels of education, for instance, the disequilibrating tendencies diminish, causing a reversal in the pattern of interregional inequality. Thus, instead of divergence in interregional levels of development, convergence becomes the rule, with the backward regions closing the development gap between themselves and the already-industrialized areas.

As far as the effects of business cycles are concerned, industrialized regions are more affected by changes in the path of economic growth, i.e., boom periods are led by the dynamic sectors in those regions, which are also affected more intensively by recession periods. If the relative strength of the spread effects increases during a boom period, the emergence of the depression period drives regional inequality down, as the poor regions are less susceptible to the cyclical

changes and have received stimuli to grow in the previous period. Even though depression decreases the strength of the spread effects, its pervasive effects are felt less intensively by the lagging regions, which benefit from a less integrated economic structure. This fact suggests a cyclical pattern of regional concentration, with short run implications, where the differential behavior of the regions lies in the differential intensity in the expansion/depression phases on those economies.³

The circularity story was recently reinforced by Krugman (1991), embodied in a simple yet rigorous model. More important than providing new ideas for the debate on the emergence of regional inequalities, his work brought to the attention of mainstream economics issues which the profession has, with some exceptions, neglected for a long time.⁴

Finally, the subject of regional inequalities has returned to the stage under the impact of the New Growth Theory. The incorporation of growth-determining factors endogenous to the regions (e.g. human capital, information, R&D, institutions) helps to explain the pattern of regional growth, emphasizing the role of such non-traditional locational factors in determining differential regional growth. Economic growth is not constrained by decreasing returns to capital and there is thus a possibility for regional inequality to increase over time. Using this framework, there has recently been a proliferation of country studies trying to analyze the problem of the convergence and divergence of regional income levels over time. The results challenge the traditional inverted U-shaped hypothesis, showing that regional disparities have increased in mature economies (e.g. Amos 1989; Barro and Sala-i-Martin 1995). Studies for the Brazilian economy (Azzoni 1995; Zini Jr. and Sachs 1996) point to a recent convergence of regional income without any reliable indication of its future trend. In the next section, the path of regional inequality in Brazil is examined in the light of historical developments and the theoretical background outlined above.

REGIONAL INEQUALITY IN BRAZIL

The process of spatial formation of Brazilian economic territory can be divided into four different stages. First, from as early as in colonial times until the first decades of the twentieth century, development was based on the external

³ See, for instance, Guimarães Neto (1996) for empirical evidence in the Brazilian case. The study shows that, up to the 1980s, whenever the Brazilian economy experienced rapid growth, the Northeast followed the upward trend, but at a slower pace, increasing regional imbalances; in recession periods, the adverse effects were felt less intensively by the Northeastern economy.

⁴ In general, the rediscover of the spatial dimension by economists has largely ignored the work developed in the field of Regional Science. Some of the contributions of researchers in the field are documented in Malecki (1991) and Higgins and Savoie (1995); other sources of information are the specialized academic journals.

linkages of the regional economies through international trade. Before the sources of economic growth became internalized with the industrialization process, economic growth was induced by exports of primary products. Regional growth was constrained by the availability of export commodities. Internal linkage effects would not expand further than the surroundings of the geographical centers of production and commercialization.

At that time, the pattern of regional concentration was determined by the location in these regions of what were primarily export-oriented products. Alternate growth cycles benefited the regions in which the production of export commodities took place; they included the sugar cycle in the Northeast, the gold and coffee cycles in the Center-South, and the rubber boom in the North. However, the historic shifting of favored economic regions came to an end in the early years of the twentieth century, when the emerging industrial sector in the Center-South of the country established its position as the leading region of Brazil's economy (Baer 1995).

In general, it is assumed that geographical and historical facts determine the initial concentration pattern in a country. In the case of Brazil, it can be argued that the facts determining the North-South dualism were a product of the late nineteenth century. As Denslow (1978) observes, the economic differences between the Northeast and South of Brazil could not be perceived easily in the 1870s. At that time, the economy of the Northeast was heavily based on the exports of sugar and cotton, while the South depended on its coffee exports. Export revenues in both regions were very similar.

In an open economy depending on external linkages derived from trade in a few primary products, as Brazil was in the last century, external exogenous shocks dictated the trends to national growth. At the regional level, export composition, or more precisely the roles of the leading regional export products – sugar and cotton in the Northeast, and coffee in the South – were strongly subject to fluctuations on international markets. In addition, supply-side considerations were somehow important in determining the spurt in coffee exports *vis-à-vis* the relative stagnation of Northeastern exports.

From 1840 to 1910, coffee demand increased by an average of almost 5% per year. Increases in demand for coffee in the last half of the last century and the first decade of this century were accompanied by supply responses from Southern producers. British investments in infrastructure, the better human capital by European immigrants, and technological progress in the sector all established Brazil as the main world supplier of coffee. The weight of coffee in the country's exports increased dramatically, bringing prosperity to the producing region. The incoming revenue was decisive in speeding up development and in financing industrialization in the region. Moreover, trade policies pursued in the last years of the nineteenth century included a series of currency devaluations and tariff protection, benefiting coffee exporters and the incipient manufacturing sector in the São Paulo area (see Baer 1965).

On the other hand, the development in the Northeast lagged behind in that period. Sugar production faced competition on the part of substitutes (sugar beet) and, more strongly, competition from Caribbean cane sugar, that took over the US market. Regional production, hampered also by the decrease in international prices, did not follow the new technological developments of the sector, resulting in declining shares in international markets. Sales shifted towards national markets in the South. World demand for cotton almost stagnated in the last decades of the nineteenth century, and the producers in the South of the United States, with better technology and lower internal transport costs, dominated the main markets in Britain. The production of the Northeast shifted towards the markets of the South, where a protected textile industry emerged. By the turn of the century, internal trade had become an important component in the uphold of the productive structure of the Northeast.

Regional dualism had already been established in the Brazilian economy by the first decades of the twentieth century. Estimates from the *Inquerito Industrial* for the year 1907, show that the Southeast accounted for 58.2% of total industrial output; the Northeast had a share of 16.7%, and the North 4.3%. In 1900, the population shares for the Southeast, Northeast, and North were 44.5%, 39.0%, and 4.0% respectively.

The second stage in the process of spatial economic formation in Brazil is characterized by the increasing role of the industrial sector in the GDP. Industry became the leading growth sector, bringing about important structural changes in the economy. However, the Southeast was the main beneficiary of the industrialization process, which contributed to a higher degree of regional concentration. This is a transitional period in which the economy, primarily agricultural and based on the coffee sector, with a relatively high degree of free trade, embarked on a path of inward-oriented growth, with rigid control of external transactions. Until the 1930s, agriculture was still the leading sector of the economy, presenting higher rates of growth. Spurts of industrial growth were common in the three decades preceding World War II; by the early 1930s the industrial sector already presented consistent higher rates of growth, leading national economic development.

Regional equity was not part of the country's development agenda, and central government policies contributed to a worsening of regional imbalances. In the 1920s, the formulation of coffee support policies, whose main beneficiaries were the producing regions of the South, represented one of the main government actions. In one of the first attempts at planning in Brazil, the Cooke Mission of 1942–1943 provided the first regional analysis of the Brazilian economy for policy purposes. Efforts should be concentrated in the South, so that spread effects would operate towards the other regions (Baer 1965, 1995). That seems to agree with the implicit beliefs of policy-makers in the import-substitution industrialization era.

When import-substitution industrialization expanded, especially in the post War period, the regional distribution of income in the country became more

concentrated. In the 1950s, the focus of attention of the central government was the development of the industrial sector in the Center-South in order to solve balance-of-payments problems and promote an industrial complex. This harmed the less-developed regions of the country, which somehow subsidized the industrialization process. By facing protection walls, these regions were constrained to consume the more expensive manufactures produced in the South. In the case of the Northeast, which continued to depend on its exports of primary products to generate a foreign trade surplus, an artificial deterioration of its terms of trade was imposed by its interactions with the Center-South, characterizing an income transfer towards the latter (Furtado 1963; Baer 1965, 1995).

Efficiency concerns were translated into government action in the period. For instance, the goal of the *Plano de Metas* (1956–1960) was to increase the rate of industrialization of the country, and it did not contain any explicit regional concern. The net result was to accentuate the regional concentration of economic activities in the Southeast (Maimon et al. 1977). The country grew at high rates in the period, providing an example in which the choice of investment in the leading sector of the economy, i.e. the choice of maximizing national development, may tend to increase still further the degree of regional inequality. By the end of the 1950s, regional disparities reached a critical level, calling the attention of the government to the less favored regions, especially to the Northeast. In 1960, the Southeast's share in the national population was 43.7%, while its share of national income was 62.8%; the Northeast's share of national income was only 14.8%, with 31.7% of the Brazilian population living in the region.

The period from the early 1960s to the 1980s represents the third stage of economic spatial formation of Brazil. The explicit concern of public authorities with regional imbalances was manifested in actions such as direct investments in regional development projects and tax incentives in the poorer regions of the country. These efforts helped to reverse the regional concentration trend, promoting more development in the North, Northeast and Center-West.

Before 1960, the economic base of the North relied only on rubber production as the source of external linkages. The rubber boom in the last decades of the nineteenth century gave some push to the development of the Amazon region. However, international competition resulted in the loss of almost its entire share of the world market. Since then, regional production, lagging technologically and locationally, survived from the low revenues from its rubber exports. In the 1960s, motivated by the appropriation of and access to natural resources, and the occupation of the territory, the public authorities began to pay more attention to the region. Federal government intervention in the 1970s, in the form of tax and financial incentives to the private sector, public investments in infrastructure (especially roads connecting the region with the rest of the country), and direct investments of state enterprises, was crucial to the development of dynamic spaces in the region. Even though environmental degradation and a worsening of income distribution accompanied the regional economic growth, the issue of

regional equity achieved positive results. The regional share of national GDP increased from 2.16% in 1970 to 4.36% in 1985. In the same period, its share in terms of population rose from 3.87% to 5.54%; while GDP per capita grew from 44.7% to 73.64% of the national average.

Azzoni (1995) shows that the states of the North and Northeast have experienced increasing differentiation in terms of per capita income in the last few decades. In the case of Brazil's North, growth has been markedly uneven across space. Three dynamic areas, which have benefited directly from government intervention, can be identified (Buarque et al. 1995). First, the western agricultural pole in Rondônia (an area characterized by recent settlement whose production is oriented towards regional and national markets) became viable after access to cheap land was facilitated by public investments in infrastructure in the region, especially in roads. Second, following the basic orientation of regional policies to the Amazon region in the late 1960s, a measure which determined the creation of development poles and the establishment of settlements in the region, a free trade zone was created in Manaus. The industrial sector benefited from huge tax incentives and was behind spectacular growth in the 1970s and 1980s. Today, the *Zona Franca de Manaus*, as it is known, presents an industrial profile heavily concentrated in the electrics and electronics sectors and oriented to domestic markets outside the region, especially to the Southeast. Finally, a third dynamic area in the region is located in the state of Pará. Even though the state has a mixed economy, with relatively strong agricultural and industrial sectors, the mining-metal complex of Carajás represents its most dynamic center. The existence in the region of natural resources, valuable on international markets attracted heavy government investments in infrastructure as a first stage, and later direct investments by public enterprises in the development of an economic complex which induced growth in the region. These three areas were the main sources of economic growth in the North in the 1970s and 1980s, and in the case of Carajás and Manaus, structural changes accompanied growth, in that the share of the industrial sector in the North's GRP increased from 15.1% in 1970 to 39.8% in 1985.

In the Northeast, government intervention contributed to growth by providing the region with artificial locational advantages in the form of tax and financial incentives. Direct investments by state enterprises were also made in the region, especially in intermediary goods (petroleum refining and chemicals).

Segmented regional spaces also appeared in the region, strengthening the dual character of the economy; areas of intense modernization coexist with traditional economic structures averse to technical changes. On one hand, the Northeast encompasses dynamic regional poles developed from private investments reinforced by government incentives, as well as from government investments; they include the petrochemical complex of Camaçari, the textile and clothing pole in Fortaleza, the mining-metal complex of Carajás, which also encompasses part of Brazil's North, and scattered areas of modern agriculture. On the other hand, the

sugar cane and cocoa plantations represent areas resistant to change, incorporating traditional methods of land cultivation with low standards of production (Araújo 1995).

It is important to point out that the redistribution practised by the government via the federal fiscal system was common practice in the 1970s and 1980s. As is apparent from Tables 2 and 3 below, the regional shares of central government revenues from the poorer regions were consistently smaller than the shares of central government expenditures taken by those regions. These figures suggest an effective redistribution of public funds to the North and Northeast over the period.

Table 2. Regional Shares of Central Government Revenues

	1970	1975	1980	1985	1991
North	1.4	1.5	1.7	2.2	2.3
Northeast	10.0	8.2	7.2	8.3	9.9
Center-South	88.6	90.3	91.1	89.5	87.8

S o u r c e: SUDENE, Boletim Conjuntural, August 1996, p. 397.

Table 3. Regional Shares of Central Government Expenditures

	1970	1975	1980	1985	1991
North	3.2	2.5	3.0	3.5	3.6
Northeast	13.4	10.9	10.3	10.4	11.2
Center-South	83.4	86.6	86.7	86.1	85.2

S o u r c e: SUDENE, Boletim Conjuntural, August 1996, p. 400.

The pioneering efforts of Rolim et al. (1996) provide a more complete interpretative scheme on interregional flows in Brazil, based on available statistics on trade balance, government accounts, investments by the public sector, and savings. The preliminary results for 1985 are summarized in Table 4, and reinforce the character of interregional government transfers suggested above. Even though the analysis covers only one year, it can give a rough idea of how interregional flows were oriented in the years preceding 1985. The repeated pattern of government fiscal transfers depicted in Tables 2 and 3, together with the estimates of interregional and international trade balances for the Northeast and North in the same period, support the following generalization of the results presented in Table 4.⁵ The North and Northeast presented recurrent trade deficits

⁵ The Northeast presented a recurrent surplus in the international trade balance in the period: 1970 (US\$ 229 M); 1975 (US\$ 796 M); 1980 (US\$ 707 M); 1985 (US\$ 1 692 M). In the same period, the North achieved repeated deficits: 1970 (-US\$27 M); 1975 (-US\$173 M); 1980 (-US\$312 M); 1985 (-US\$55 M). Even though estimates for interregional trade flows are not systematically available, it is acknowledged that the Northeast historically presents deficits in relation to the rest of the country (Araújo 1995).

Table 4. Interregional Flows by Regions, 1985 (in Cr 1,000,000,000)

	North	Northeast	Center-South
Interregional trade balance	-2 016	-13 071	15 088
International trade balance	-207	4 383	56 573
Government current account balance	4 208	13 651	-117 273
Government capital account balance	2 269	16 874	80 470
Allocation of government resources (3+4)	6 477	30 525	-36 803
Private capital flows (1+2+5)	4 254	21 873	34 898

S o u r c e: Rolim et al. (1996).

over the period. In the case of the Northeast, the perennial interregional trade deficits were partially compensated for by international trade surpluses, indicating a transfer of foreign exchange earnings to other regions of the country. The continual overall interregional trade deficits of these two regions had to be financed by public and/or private savings, so that the conditions for macroeconomic balance were met.⁶

The conjecture, taking 1985 as a typical year, is that the transfers of federal resources to the Northeast, for instance, had to be greater than the trade gaps in order to compensate for the interregional flows of private capital oriented towards other regions. Even though the figures show a net outflow of private capital from the Center-South, less aggregated figures, for 1985, show a tendency for net private capital gains to characterize the states of São Paulo and Rio de Janeiro, as well as the Center-West. The orientation of public capital to the less-developed regions has often been offset by the flight of private capital. Rolim et al. (1996) argue that this represents the synthesis of bad allocation of government funds from the point of view of an efficient regional policy. However, it might be argued, based on the previous discussion, that government transfers to the North and Northeast, during the 1970s and early 1980s were necessary to build the social overhead capital in those regions, in order to strengthen potential spread effects from the Center-South and create self-reinforcing mechanisms whereby the regions could generate their own sustainable growth. In other words, government transfers might have taken on greater relevance in the less-developed regions by creating the necessary infrastructure to foster development and attract, in a second moment, private investments to directly productive activities. This hypothesis would be better tested by looking at estimates of investments in the region; if it is somehow relevant, the relationship between the share of public investments in the target region and the share of public investments in the country should show an upward trend during the 1970s,

⁶ This condition establishes that income inflows should equal outflows, in equilibrium. Thus, if a region presents a trade deficit with the rest of the country and the rest of the world, in equilibrium, this has to be compensated for by net inflows of resources from government expenditure and/or private investment (see Rolim et al. 1996)

with an inflection point after the necessary time for the economic infrastructure to have matured. From the estimates for the Northeast, however, an increasing path in the share of public investment in the region, compared to the national average, is apparent from 1973 to 1989 (Fig. 1). Even though there seems to be a downward trend towards the national average in the first years of the 1990s, empirical evidence to support the conjecture on the existence of a change in gear is very weak.

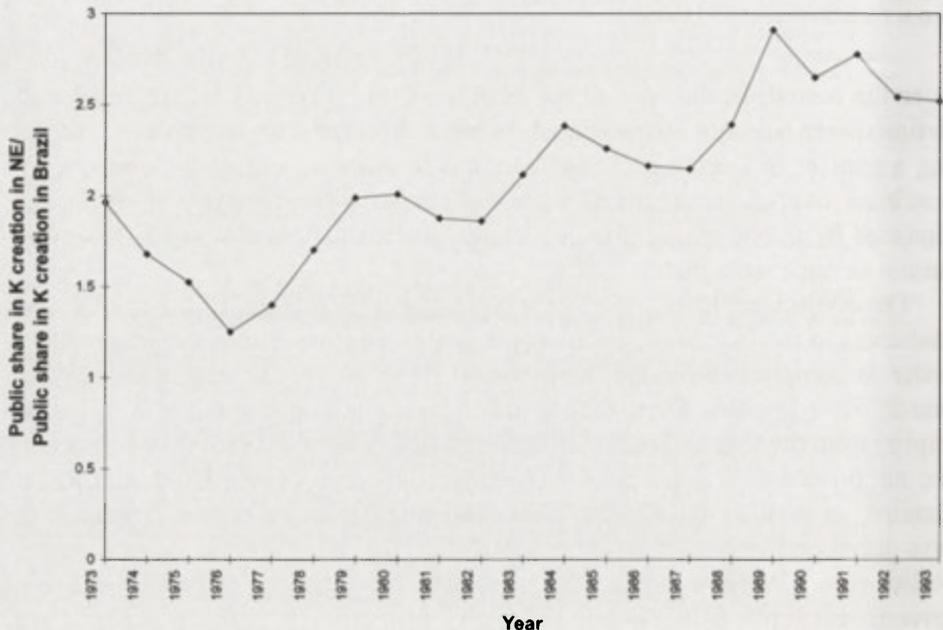


Fig. 1. Northeast: Ratio of Public Share in Regional Investment to Public Share in National Investment for Capital Creation: 1973–1993
 Source: SUDENE, Agregados Econômicos Regionais, 1996 and FIBGE, Anuario Estatístico, several years

Hence a pattern was clearly delineated, in the first three stages identified here. Initial increasing spatial concentration was followed by a reversal of this trend in recent decades, as can be seen from Figure 2. It should be mentioned, however, that the decrease in regional inequality has been accompanied by a remarkable increase in the concentration of both intraregional and personal income distribution in those regions, in the same period (Azzoni 1995 and 1996).

Finally, the fourth stage encompasses deep structural changes in the Brazilian economy. After 1988, with the new Constitution, the central government was hampered by a profound loss of revenue to the state and municipal governments. Nevertheless, the fiscal crisis reached all levels of government, decreasing their financial capacity to pursue new investment ventures. The lack of investment in

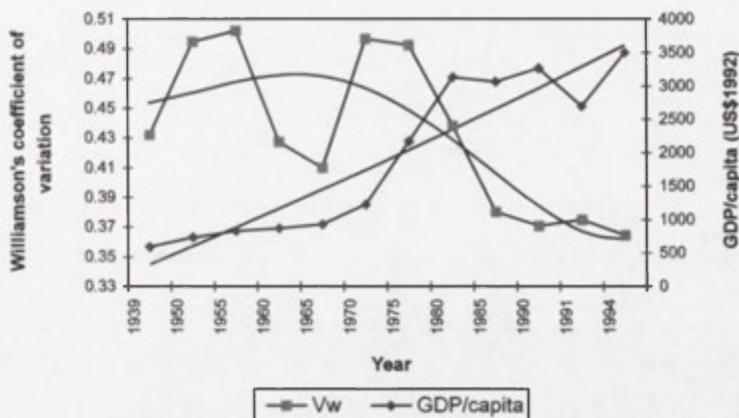


Fig. 2. Brazil: Time Path Relating Regional Inequality and GDP per capita
 Source: Author's calculations using data from Anuario Estatístico, several years

economic infrastructure increased the average cost of production; producers were facing increasing costs due to the inefficient mechanisms of trade and transportation, which lagged behind technologically. A new paradigm of development had to be defined, in the context of increasing globalization, high rates of inflation in the country and the fiscal crisis of the State. In 1994, the Brazilian government introduced a so-far successful stabilization program to stop inflation. This action, together with trade liberalization measures introduced since the early 1990s has made the country more attractive to foreign investments once again. Direct investments in high linkage industries, such as the automobile sector, have increased in recent years. Brazil is now going through a new expansion cycle, whose directions should be analyzed carefully.

Estimates of regional shares in GDP for the period 1985–1994 show an unchanged picture in the decade. The North's share oscillated slightly around its average of 4.75%, and the same was true of the Northeast (average 14.10%) and the Center-South (81.15%) [Table 5].⁷ Regional inequality, as measured by Williamson's coefficient, also presented stable behavior (Fig. 2).

The effects of the new growth cycle of the Brazilian economy have generated renewed debate on the future of the regions. The stable regional setting shown above is not likely to persist; estimates from the national accounts point to a weak tendency of regional divergence of state per capita income after 1992 (Lavinás et al. 1997). The possible reversal of the secular tendency of regional income convergence established in the late 1960s coincides with changes in the economic environment of the economy.

⁷ Disaggregated estimates for the Center-South show that there was a gain of approximately 2% for the Center-West, in the period, proportional to the loss for the Southeast (Lavinás et al. 1997).

Table 5. Regional Share in GDP

	North	Northeast	Center-South
1985	4.36	13.93	81.71
1986	4.52	14.18	81.30
1987	4.65	14.09	81.26
1988	4.80	14.10	81.10
1989	5.06	14.29	80.65
1990	5.02	14.02	80.96
1991	4.89	14.15	80.96
1992	4.63	13.90	81.47
1993	4.79	14.32	80.89
1994	4.82	13.97	81.21

Source: IPEA/DIPES.

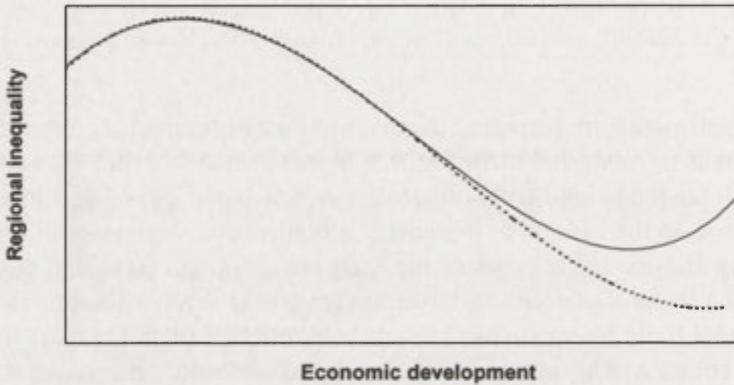


Fig. 3. Brazil: Alternative Paths Relating Regional Inequality and Economic Development

At the macro regional level, similar questions are raised (Fig. 3). Will the regional concentration continue its downward path, as implied by the inverted U-shaped curve hypothesis, which states that, during the early stages of development, the per capita income of regions becomes more unequal, but during the later stages, more equal – as suggested in the Brazilian case up to the mid-1980s? Or will there be a new concentration period, suggesting a cyclical pattern, with alternating cycles of expansion and contraction in regional inequality?

In this context, a thorough study by Haddad (1997) examined the effects of the changing macroeconomic environment of the Brazilian economy on the patterns of regional concentration and structural change. Trade liberalization policies, the infrastructure component of the *Custo Brasil* – the costs of doing business in Brazil – and the new industrial investments were examined using simulation exercises, with the focus being impacts on regional inequality and structural change. The simulations were carried out using an interregional computable general equilibrium (ICGE) model. The choice of the CGE method to

address the regional impact of macroeconomic, structural and sectoral policies is justified by its ability to address the issue of regional inequality and structural change based on the theoretical framework of the dynamics of regional development described in pages 90–93. It borrows from the input-output framework the capability of handling details at the sectoral level, providing a detailed picture of the regional economies. Input-output linkages also incorporate the static dimension of regional development by revealing the strength of interregional spread effects through the specification of existing trade flows in the economy. However, the CGE approach goes one step further; regional competitiveness is captured by incorporating price effects in those models. Differential regional prices play a major role in the theories of regional development, in which regional competitive advantage is addressed through differential production costs and activities allocation. In summary, the discussion of regional and sectoral impacts of alternative strategies of regional development in the present macroeconomic context of the Brazilian economy has shown that the open policies of the 1990s and the national strategies for increasing international competitiveness are very likely to increase regional imbalances in the country.

Of particular relevance is the simulation of the effects of declines in tariff-barriers discussed in another study by Haddad and Hewings (1998) using the same interregional CGE model.⁸ Trade liberalization is an important element of the range of structural changes that the Brazilian economy has undergone in the last few years, especially in the context of the creation of regional trade agreements (Mercosul). The rapid growth in the volume of trade among the Mercosul countries, recorded since the *Asunción Treaty* was signed has resulted to a great extent, from a reduction in trade barriers. Although most of the gains tend to be concentrated in the South and Southeast regions of Brazil, more remote regions, such as the Northeast, have also increased their exports to Mercosul. To explore the effects of such policies, the model was used to simulate the short-run and long-run regional impacts of tariff changes in the Brazilian economy. The results suggest that the interplay of market forces in the Brazilian economy favors the more-developed region of the country (Center-South): all the regions are positively affected in the short-run, and, in the long-run, only the less-developed region (Northeast) presents negative results; in both cases, however, the tariff reduction worsens the Northeast's relative position in the country. The polarization effects from the Center-South dominate, even though the trickling-down effects attenuate the adverse impact in the less developed regions, especially in the North, which benefits from stronger interregional linkages with the Center-South.

⁸ More thorough descriptions of the model are available elsewhere (Haddad 1997; Haddad and Hewings 1997, 1998).

POLICY IMPLICATIONS

The regional de-concentration trend verified in the period from the 1960s to the early 1980s was heavily induced by active government intervention, manifested in actions such as direct investments in regional development projects and tax incentives in the less developed regions of the country. However, with the fiscal crisis generalized to all levels of government, little room for new public ventures was available.

The agreed agenda for the coming years includes the competitive integration of the country in the global trade network, with the domestic concern of sustainable stabilization. This implies the attraction of foreign investments and a responsible (balanced) budget policy for all levels of government. The latter precludes regional policies based on heavy redistributive expenditure, as was the case in the 1970s. Foreign investors search for better financial returns, and are not therefore, concerned with regional equity; location is defined on a purely economic basis.

Haddad (1996) points out that the new growth cycle of the Brazilian economy will be intensive in technology, reflecting greater exposure to international competition. In many cases, conventional industrial location theory fails to explain the patterns of the new investments. Technical skills and urban agglomeration are two important factors that will influence the location of incoming investments in the regions, as interregional competition will be based more heavily on non-traditional locational factors such as the quality of universities, educational attainment, and quality of life, than on conventional locational factors such as low wages and tax incentives.

On the basis on international comparisons, Malecki (1991) concludes that advanced technology has had some positive effects on national and local policy. It has prompted a more long-term perspective regarding economic development; and it has shown the significant advantages to be gained from investments in human capital, especially through education. The creation of new high-technology complexes will not be an everyday, or ubiquitous, occurrence. Large urban regions, especially those where university research is abundant, are the prime locations, in no small part because of the entrepreneurial "climate" and opportunities present. Other places, if they can attain some – even if not all – of the attributes of large urban areas, might obtain at least a small development benefit. In the case of Brazil, the Center-South concentrates the human capital stock of the country, which is the most required factor to attract new investments.

The results provided in Haddad (1997) suggest that the interplay of market forces in the Brazilian economy favors the more-developed region of the country. In other words, the trickling-down effects generated by market forces are still very unlikely to overtake the polarization effects from the Center-South. If regional equity is part of the country's development agenda, an active regional policy on the part of the central government is still needed, in order to reduce

regional economic disparities, and specifically to address the problems of the North and Northeast, traditionally backward areas reliant on low-technology activities. The improvement of the economic infrastructure in those regions, as well as the establishment of enduring competitive advantage through a consistent human capital policy, are necessary to attenuate the adverse regional effects of the development strategy pursued by the public authorities.

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SHIFTS IN URBAN HIERARCHY? THE CASE OF FINANCIAL SERVICES IN THE NETHERLANDS

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ABSTRACT: This paper is concerned with interurban competition. Although large cities are still the focal points of information flows, creativity and innovation, particular medium-sized towns seem to offer good opportunities for economic growth. Against this background, the paper investigates whether medium-sized towns have improved their position at the expense of large towns in recent decades. To this end, an analysis has been made of the way in which companies in the financial sector have adapted their domestic networks across the Dutch urban system and their connections with larger cities abroad. Particular attention has been paid to the influence of the use of information and communication technology.

The paper is organised as follows. In the first introductory sections, dynamics in city systems are discussed from a conceptual point of view, and important structural adjustments of the banking sector in The Netherlands are considered. The paper proceeds with an analysis of the location pattern of national control functions and regional functions in banking. This is followed by an analysis of the location pattern of venture capital banking and global banking in connection with first-order financial centres abroad. The paper concludes with a summary of results in terms of competition between cities, and with a few interesting lines for future research.

KEY WORDS: interurban competition, The Netherlands, financial services, office networks, venture capital activity.

INTRODUCTION

There are signs of increased competition between cities, particularly between those of medium- and large size (e.g. Camagni and Salone 1993; Cheshire 1995; Lever 1993). Although large cities are still the focal points of information flows, creativity and innovation, particular medium-sized towns seem to offer good opportunities for economic growth, such as that based on their knowledge infrastructure and access to trans-European transport networks (Andersson 1991; Cheshire 1995). This phenomenon touches upon an important theme in the urban economics literature, namely the positive influence of population size on economic performance. A large population size imposes certain advantages upon an urban area which manifest themselves on both the supply and demand sides of

economic activity, and are often referred to as economies of scale or agglomeration economies (Pred 1977; Thompson 1965).

This article focuses on the banking sector, as an example of the fast-growing commercial services in advanced economies (van Geenhuizen 1993). A second reason for the selection of the banking sector is its hierarchically-built domestic network of offices, with the national head office heading various regional control offices and local branch offices. Large and medium-sized banks have adapted the functional and spatial organisation of their domestic networks various times. They have extended the number of local branch offices since the mid 1960s, with a concomitant establishment of regional control centres. Since the early 1980s, this has been followed by a progressive rationalisation, reinforced by the use of new information technology, and leading to important impacts on the domestic networks.

Banking systems and their reorganisation have attracted considerable attention since the early 1980s (e.g. Holly 1987; Marshall and Bachtler 1984; Taylor and Hirst 1984). Focal points of interest have been the changing spatial organisation, particularly the changing location of bank activities at different levels, and the size and shape of the branch networks. More recent studies have focused on the impact on banking activities and organisation since the early 1980s of structural changes such as the shift to a global financial system, the breakdown of structural regulation, and the emergence of an integrated European market (e.g., Leyshon and Thrift 1992; Lee and Schmidt-Marwede 1993; Leyshon et al. 1993; Leyshon 1994; Thrift and Leyshon 1988; Warf 1989). Various studies in the United States have considered the relationship between the banking system and the urban system (cf. Green 1993; O'hUallachain 1989). Here, the focus has been on whether population size or a specific production environment is the primary drive concentrating financial services in large metropolitan areas. Further, the adoption of information and communication technology and implications for the spatial organisation of banks have received rather limited attention to date, but form an increasingly popular subject (Van Asch and Tijdens 1984; Diederer et al. 1991; Marshall and Bachtler 1984; Marshall and Richardson 1996).

This article seeks to connect structural analysis of financial services and urban economic analysis in terms of competition in the Dutch urban system. It focuses on various functional types of bank offices in domestic networks, such as head-offices, regional control centres, and local branch offices, and on the connections with first-order financial centres abroad. The basis of the investigation is a location analysis of all banks (including foreign banks) and venture capital firms, and an in-depth retrospective study of all four large banks in The Netherlands.

COMPETITION WITHIN URBAN SYSTEMS

Competition between cities for economic activity becomes significant when particular conditions hold. First, when the activity that takes place in particular

cities may be carried out in a range of alternative locations, and the companies involved can make a choice. Second, when the economic activity is in the process of restructuring (contraction) in order to increase customer services and/or profitability, or new types of economic activity emerge based on (technological) innovation. Third, when there is geographical *selectivity* involved in (re)location and closing down, based on particular needs of the economic activity at hand.

In financial services, the conditions of production are such that there is geographical *selectivity* between the cities involved. For example, the need for intensive personal contact with supporting-service providers and customers in particular sub-markets, and specific labour market needs can only be satisfied in a limited number of places (cf. Ter Hart and Piersma 1990). In addition, the production of services is subject to economies of scale, reinforcing selectivity between cities in investment in financial production. On the other hand, economies of scope may drive financial service producers toward specialisation and open the way to complementary relationships between selected cities (cf. Camagni and Salone 1993). Selective locational dynamics may include the following shifts in the urban hierarchy:

- Centralisation or decentralisation, meaning a shift of functions at particular levels to other levels in the urban hierarchy; this is often concerned with control functions (administration).

- Concentration or deconcentration, meaning a change of location of economic activity in a smaller or larger number of cities at particular levels.

- Changes in specialisation, e.g., particular types of economic activity concentrate at particular levels, at the expense of other levels, or spread over a larger number of levels.

- A selective emergence of new economic activity at particular levels.

This article investigates the above dynamics in the financial sector as the *end-result* of processes of competition in the Dutch urban system. Competition in terms of the active strategies of urban actors (such as in city marketing and improving the urban production environment) falls outside the scope of the study.

STRUCTURAL ADJUSTMENT IN DUTCH BANKING

The present structure of the Dutch monetary system dates back to the late 1940s. In 1948, monetary control was delegated to the central bank (De Nederlandsche Bank) in that this bank was entitled to issue important directives, such as for the liquidity and solvability of banks, and for control of credit (Bosman 1986). In this context, an important policy has been the so-called *structural supervision*. This restrictive policy sought to prevent an undesirable concentration of power (and risks) along three lines, namely among banks, between banks and insurance companies, and between banks and non-financial industry (anti-merchant bank policy). The policy has particularly been effective in causing

decades of separate development between banking and insurance. However, it was largely abandoned in 1990 in view of the less restrictive situation in other European Union states. The structural policy concerning merchant banking is still valid today, meaning that – in contrast to the situation in Germany and France – Dutch banks are forced to adopt relatively low upper limits for share-holding in non-financial companies (5% of all shares and 20% of the total assets of the bank).

From the 1960s onwards, banks from overseas emerged in the Dutch market (Catz 1975). Major US national banks became active abroad by opening branches in order to serve their corporate clients and to operate in the Euromarkets. This was followed by the internationalisation of US regional banks and various European banks. The major reasons for the latter strategy were saturation on domestic markets and regulatory restrictions. During the 1980s, Japanese banks started to enter the Euromarkets rapidly, following a yen-dollar realignment and driven by the demand to serve Japanese corporate clients abroad.

As in many other advanced economies, retail banking has grown since the mid 1960s in The Netherlands. This development is rooted in the increased prosperity of the population, the automation of salary payments, and a wide diversification of financial services. In order to serve local customers, many banks have extended their office networks enormously. Toward the end of the 1970s, however, the retail market began to show signs of saturation, at the same time that margins decreased and large investments were needed to keep pace with new information and communications technology. A major response to this situation has been to rationalise office networks.

The financial system remained rather stable until around 1980. Then, following the developing countries' debt crisis, the world system underwent deep restructuring in that the operation of financial markets were subject to various significant changes (Thrift and Leyshon 1988). The first change has been increased *globalisation*, which means that many financial markets turned into (near) 24-hour markets. Trade occurs successively in New-York, Los Angeles, Tokyo, Hong Kong, Singapore, Bahrain and London (cf. Warf 1989). In this system, Amsterdam qualifies as a second-level centre. A second change is increased *securitization* involving the issue of loan paper on securities markets rather than borrowing from banks. Finance is then raised in the form of marketable debt and banks are increasingly used as intermediaries rather than as lenders. Both developments have required a continuous large input of information and communications technology throughout the entire bank organisation. A third major change in the financial markets has been *deregulation*, resulting in smaller international barriers to the movement of money. Deregulation has also been important within national markets, in that many forms of structural regulation have broken down since the late 1980s (cf. Leyshon and Thrift 1992). Thus, traditionally-separated financial institutions and markets (like the previously-mentioned banking and insurance) have integrated progressively in recent years. In The Netherlands, this trend became evident in various mergers, such as those

involving VSB (savings bank) and AMEV (1990) (now within Fortis), as well as NMB-Postbank and Nationale Nederlanden (1991), leading to ING Group.

The adoption of information technology in Dutch banking took off in the early 1960s with head office automation of data processing (Van Asch and Tijdens 1984; Diederens et al. 1991). This was followed in the early 1970s by the establishment of separate computer centres at sites easily accessible for the physical transport of magnetic tapes, diskettes, etc., such as Amstelveen (suburban Amsterdam) and Zeist (suburban Utrecht). Decentralised automation and data-transmission networks have been established in the 1970s, followed by important improvements in the 1980s¹. We are now at the stage of the rapid introduction of electronic banking, with the implementation and improvement of information networks. An information network emerges when the management at (local) offices can retrieve data (about accounts and clients, and external financial data, etc.) from central or local computers, use the data for information and management purposes, and send the newly-processed information back to the central computer systems or clients. Associated with this are electronic banking services, such as cash dispensers and point-of-sale payment.

Various factors suggest that information technology will continue to have a strong impact on the banking sector. Due to the emergence of new suppliers in the market there is increased pressure to compete as regards efficiency and productivity, particularly to reduce wage costs. Regarding the pace of adoption, however, there are signs of evolutionary changes. The reasons for these are the heavy investment by banks in existing technology and physical infrastructure (including buildings) (Marshall and Bachtler 1984; Porteous 1995), and various institutional factors concerned with issues of privacy and safety for both banks and clients, such as in the case of the use of the Internet for financial services.

By far the largest category of banks in The Netherlands is that comprising the so-called *universal* banks (Tab. 1). These provide financial services in the broadest sense ranging from investment banking to stock broking, and private savings. The largest bank in The Netherlands is ABN-AMRO, which takes fourth position in Europe after HSBC Holding, Credit Agricole and Deutsche Bank (The Banker, 1997) (Annex 1). RABO Bank is the second largest and ING Bank the third largest Dutch bank. The Rabobanks were originally established as co-operative societies to provide savings and credit facilities for the agricultural community. Today, the range of services is similar to that found in universal banks but there is still an emphasis on financing the food industry and agribusiness. Various other financial institutions operate on the Dutch market, such as mortgage banks, savings banks, and security credit institutions (stockbrokers). The largest mortgage banks are controlled by insurance companies.

¹ There have also been important developments in interbank transfer systems, like the Society of Worldwide Interbank Financial Telecommunications (SWIFT), set up in 1977.

Table 1. Structure of Dutch Banking (1996)

Institutions	Number
Universal Banks	97
Rabobanks	1 (510)*
Mortgage Banks	6
Savings Banks	26
Security credit institutions	18
Foreign banks	24

* Within brackets: number of affiliates of RABO.

S o u r c e: DNB (1997).

NATIONAL CONTROL

The Dutch banking sector is highly concentrated. ABN-AMRO contributes a good 30% to the total balance sheet, whereas RABO Bank and ING Bank add almost 20% each (DNB, 1997). A total share of 70% for the three largest banks is unprecedented in the European Union. For comparison: the share of the three largest banks in Germany is approximately 35% (DNB, 1993).

This strong concentration is due to systematic acquisition and merging by large banks in recent decades. ABN-AMRO is typically the 'product' of this process, culminating in the birth merger of the two predecessors (each in 1964) and the birth merger of the present bank (1990). Acquisition and merging were clearly evident in space, i.e., 50% of all mergers and take-overs between 1950 and 1985 were conducted by banks headquartered in Amsterdam and concerned banks in the rest of the country (van Geenhuizen 1993). In addition, almost 20% of all take-overs took place within Amsterdam. The second largest city, Rotterdam, was much less important in this process. Thus, banks at the top of the urban hierarchy strengthened their position at the expense of banks located lower down. The acquired regional banks were integrated subsequently, with former head offices often turned into a regional office. It can be concluded that merging and acquisition have reinforced the concentration of national control functions in the financial services in the largest city.

The emergence of foreign banks on the Dutch market has strongly contributed to the presence of head offices in Amsterdam. In the first decades of foreign banking, Amsterdam has been the overwhelming preference where location is concerned. Between 1960 and 1985, almost all (83%) of foreign banks established here (van Geenhuizen 1993). Foreign banks thus point most clearly to the leading position of Amsterdam as the national decision centre in finance. Apparently, they feel the need for physical proximity to the financial and supporting business here, including the Stock and Options Exchange.

Today, 62.5% of all banks in The Netherlands are headquartered in Amsterdam (Tab. 2). This is evident in the high concentration quotient (312.5) compared

Table 2. Distribution of head offices* (1995)

City size (× 1000 inh.)**	Percentage of cities (1)	Percentage of head offices (2)	(2):(1)
<50	91.1	0	–
50–100	5.3	6.3	1.2
100–150	2.4	4.2	1.8
150–200	0.5	0	–
200–300	0.2	8.3	41.5
400–500	0.2	8.3	41.5
500–600	0.2	10.4	52.0
700–800	0.2	62.5	312.5

* Universal and mortgage banks with a minimum balance total of 100 mln NLG; N = 48.

** Municipal level. The classes of 300–400,000 and 600–700,000 inhabitants are empty.

S o u r c e: Annual reports; Interviews; NIBE 1996.

with those of Rotterdam (52.0), and The Hague and Utrecht (both 41.5)², pointing to the absence of a strong secondary centre. It is not easy to compare this pattern with those of other countries, because concentration is measured in different ways, while the spatial unit is also often taken differently. Nevertheless, some indications for the United Kingdom can be derived from McKillop and Hutchinson (1991). Their evidence clearly points to a concentration of various bank types in Greater London, but at the same time – unlike in The Netherlands – to important secondary (regional) centres like Birmingham, Manchester and Glasgow. Another example is the changing banking system in Poland (Strykiewicz and Potrzebowski 1995). Compared with Amsterdam, Warsaw seems a smaller national centre, as is indicated by the 44% share of all bank headquarters and the emergence of various regional centres such as Poznań, Łódź, and Gdańsk–Gdynia. But comparison is difficult because The Netherlands is a much smaller country from which regional centres have disappeared in past decades due to the acquisition of regional banks by banks located in Amsterdam. It seems plausible that there is no place for strong secondary centres in a small domestic market and geographical area.

It is interesting to note that recent developments – connected with deregulation – have tended to weaken the concentration of national control functions in the largest city. Since the early 1990s, various insurance companies and savings banks have extended their activities and become a universal bank. Most of them are headquartered lower down the urban hierarchy, in The Hague, Utrecht, Amersfoort and Den Bosch for example. As far as the large cities are concerned,

² The concentration quotient indicates the level of concentration in the urban hierarchy. A quotient value of 1 indicates a perfectly even distribution, i.e. each city-size class locates a share of offices at a given tier (national head-office, regional office) equal to its share in all cities. The concentration quotient is defined as: O_i/C_s , where

O_i = Offices (as a share) at a given tier i ,

C_s = Cities (as a share) in a given size class s .

this pattern is partly connected with historically-grown complementary relationships (van der Knaap 1994). For example, The Hague and Utrecht have developed a specialisation in insurance services.

REGIONAL FUNCTIONS

Since the mid-1960s, the fast growing retail market has urged the large banks to establish an extensive nationwide network of local offices. This adjustment occurred partly through the acquisition of small (regional) banks and partly through the opening of new offices. In the early 1980s (the peak), the number of local branches had roughly doubled for ABN and AMRO, and almost tripled for NMB (Tab. 3).

Following the saturation of the retail market after the late 1970s, and the restructuring of the global banking system, the large banks have rationalised their networks. A drastic contraction can be observed for RABO Bank, as attested to by the closing-down of 40% of the offices since size peak (1974). ABN-AMRO shows an even more dramatic reduction in later years, i.e., one of almost 30% in the four years following the recent merger (1991–1995) (Tab. 3).

Table 3. Branch networks of large banks

Years	Comment	No of Offices	(2):(1) × 100	(3):(2) × 100
ABN				
1964 (1)	Merger	358	–	–
1982 (2)	Maximum	724	202	–
1988 (3)	–	711	–	98
AMRO				
1964 (1)	Merger	505	–	–
1981 (2)	Maximum	877	174	–
1988 (3)	–	762	–	87
ABN-AMRO				
1991 (1)	Merger	1441	–	–
1995 (2)	–	1050	73	–
ING Bank*				
1964 (1)	–	178	–	–
1982 (2)	Maximum	493	277	–
1995 (3)	–	400	–	81
RABO				
1972 (1)	Merger	3072	–	–
1974 (2)	Maximum	3155	103	–
1995 (3)	–	1879	–	60

* Predecessor NMB (Postbank excluded).

S o u r c e: Annual Reports; NIBE 1996.

The contraction of local branch networks is also associated with the adoption of information technology, though it is impossible to disentangle its separate influence (Marshall and Richardson 1996). The adoption of this technology can be illustrated by reference to RABO Bank, which started to build cash dispensers in 1984 and has increased the number ever since, to the point where it now exceeds the number of local offices (Tab. 4).

Table 4. Cash dispensers, point-of-sale machines and branch offices of RABO

Year	Cash dispensers (No of Machines)		Point-of-sale (No of Machines)		Local Branch Offices		Cash dispensers (No of Payments)		Point-of-sale (No of Payments)	
	Abs.	Index	Abs.	Index	Abs.	Index	Abs. × 1000	Index	Abs. × 1000	Index
1992	1.445	100	6.340	100	2.056	100	91.200	100	8.340	100
1993	1.649	114	12.280	194	1.989	97	104.300	114	16.600	199
1994	1.723	119	20.090	317	1.923	94	113.100	124	34.200	410
1995	1.873	130	28.050	442	1.879	91	119.200	131	62.500	749
1996	2.056	142	35.320	557	1.854	90	124.700	137	97.400	1168
1997	2.267	157	42.420	669	1.823	89	133.100	146	133.900	1606

S o u r c e: RABO, Personal Communication 1998.

Whereas cash dispensers seem to have reached the stage of saturation, point-of-sale payment has been growing rapidly in recent years. A further indicator of the adoption of information technology is the share taken by electronic banking in payment transaction. In the past five years, this share has increased from 9% to 39% of debit transactions in the business segment and from 0.7% to 7.0% of debit transactions in private banking (RABO, 1998). At the same time, one can observe a continued decline in the number of local offices (Tab. 4).

With a view to control and co-ordination, many banks have since the mid 1960s established intermediate tiers between the head office and local branches (*regional offices*). In the case of large banks, regional offices have authority over local branches in their geographic areas, whereas in the case of medium-sized banks the emphasis is more on the co-ordination of specific knowledge and services towards customers. A clear characteristic of the current distribution of these types of regional office is the strong presence in both large cities and larger medium-sized towns (100,000 to 200,000 inhabitants) (Tab. 5). Almost 50% of all offices are located in the latter towns. Their importance is also evident in small differences in concentration quotients with large cities. Remarkably, most of these medium-sized towns are outside the Randstad (van Geenhuizen and van der Knaap 1998). The regional authority function in the Randstad is apparently performed by the large cities here.

With regard to individual large banks, one can make a distinction between (I) regional authority centres (as previously discussed) and (II) market-oriented re-

Table 5. Distribution of regional offices* (1995)

City size (× 1000 inh.)	Percentage of cities (1)	Percentage of offices (2)	(2):(1)
<50	91.1	6.4	0.1
50–100	5.3	9.7	1.8
100–150	2.4	32.3	13.5
150–200	0.5	16.1	2.2
200–300	0.2	6.5	2.5
400–500	0.2	6.5	2.5
500–600	0.2	11.3	6.5
700–800	0.2	11.3	6.5

* Large and medium-sized banks (DNB included); N = 62.

S o u r c e: Annual reports; Interviews; NIBE 1996.

gional branches providing the highest level of services. The size of tier (I) was roughly the same for large banks at the time of the (re)establishment (twelve to fourteen) but has been declining ever since. On the aggregate level, this decline amounted to 35% (1988–1995). Thus, it can be stated that regional authority has been centralised in a smaller number of cities. There are two spatial models involved in this process, namely: (a) centralisation at the expense of medium-sized towns and in favour of large cities (ABN and AMRO, and their successor), and (b) centralisation at the expense of large cities and in favour of medium-sized towns (NMB including its successor ING Bank, and RABO Bank) (Tab. 6). These different models seem to be associated with different spatial markets. The banks displaying model (b) traditionally serve local trade, small and medium-sized business (NMB, later ING), and domestic agriculture and related business (RABO). The latter activities are found in regions outside the Randstad, thus explaining why the large cities are less relevant. Four towns and cities are now important centres for regional authority, i.e., Haarlem, Groningen, Eindhoven and Arnhem, of which three are outside the Randstad (van Geenhuizen and van der Knaap 1998).

Further, in the transformation toward a 'market-oriented' organisation occurring since the early 1980s, large banks have introduced a new tier of regional branches or a new 'profile' of existing ones (II) (Tab. 6). In this way the supply of competence and specialist know-how has been *decentralised* to some degree. In the 1980s, the number of offices was roughly the same for each bank, viz. around thirty, but since then the tier has been extended, at the aggregate level by a good 200% (1988–1995). It needs to be mentioned that RABO is different in that the co-operative structure gives autonomy to local (affiliated) banks in determining the range of services. Accordingly, there is no formal structure of service levels.

It can be concluded that the observations concerning the 1980s and 1990s comply with what Marshall and Bachtler (1984) indicated as impacts of the use of information technology, i.e., the closing down of smaller local branch offices,

Table 6. Distribution of regional offices of large banks (a) (b) (1964–1995)

Bank	Year	Large cities	Medium-sized towns	Small towns	Total No of offices
ABN					
I	1964	4	10	0	14
I	1988	4	7	0	11
II	1980	4	25	6	35
II	1988	4	25	6	35
AMRO					
I	1964	4	9	0	13
II	1974	15	36	20	71
II	1987	8	21	2	31
I	1987	3	2	0	5
ABN-AMRO					
I	1995	4	6	0	10
II	1995	20	53	71	144
ING Bank c					
I	1968	4	7	1	12
I	1988	1	5	0	6
I	1995	1	4	0	5
II	1979	6	21	0	27
II	1988	6	21	0	27
II	1995	7	24	2	33
RABO d					
I	1979	1	6	2	9
I	1988	1	6	2	9
I	1995	0	5	0	5

a. I = Regional authority; II = Services of the highest level; b. Large cities: > 200,000 inhabitants; Medium-sized towns: 50,000–199,999 inhabitants; Small towns: < 50,000 inhabitants; c. Predecessor NMB (excludes Postbank after merger).

S o u r c e: Annual Reports; Interviews.

and an increased importance of the activities of market-oriented regional offices. In fact, the latter development represents a compensation for some of the disadvantages of electronic banking, which reduces the opportunities for banks to talk with their customers and to support the latter's bank loyalty as new suppliers emerge on the market. Accordingly, established banks feel the need to provide more attractive specialist customer services, based on face-to-face contact at regional offices.

VENTURE CAPITAL BANKING

The recession in the early 1980s and the concomitant search for ways to innovate economic activity partly explain the emergence of venture capital firms. In The Netherlands, the establishment of these firms has been enhanced by law,

Table 7. Venture capital activity (1983–1993)

Year	PPMs*		Equity Participator	
	Number	Index (1983=100)	Number	Index (1983=100)
1983	25	100	81	100
1984	29	116	180	222
1985	42	168	304	375
1986	52	208	538	664
1987	68	272	876	1081
1988	90	360	1133	1399
1989	99	396	1376	1699
1990	98	392	1662	2052
1991	104	416	1793	2214
1992	99	396	1741	2149
1993	99	396	1582	1953

* Particuliere Participatie Maatschappijen; no recent data available.

S o u r c e: DNB (various years).

i.e., by a relaxation of structural restrictions on investment, and by a law on risk (1981), the latter reducing the risk of capital loss for the supplier by 50% (van Geenhuizen and van der Knaap 1998). An explosive growth of venture capital activity is clearly visible under this law, with approximately 100 firms (in Dutch Particuliere Participatie Maatschappijen) involved in 1991, and 1800 equities (Tab. 7). This parallels a similar development in many advanced economies, such as the United Kingdom and Germany (Martin 1989). However, since the early 1990s a slight downturn has become evident, which may be attributed to saturation of the market and a recent change in the aforementioned law, making venture banking more risky for the supplier (DNB, 1993).

The spatial distribution of venture capital firms³ points to a relatively strong presence in large cities (53.7%) and large medium-sized towns (10,000 to 200,000 inhabitants) (26.9%) (Tab. 8). This pattern is also reflected in the concentration quotients, i.e., 110.0 for Amsterdam, 85.5 for Utrecht, and 19.5 for the largest medium-sized towns. The latter towns are all outside the Randstad. This is in line with the previous observation that medium-sized towns in the Randstad are more or less in the 'shadow' of large cities there, and corresponds to a general under-representation of quaternary services in the medium-sized towns of the Randstad (van Geenhuizen and van der Knaap 1998).

³ Official statistics on the population of venture capital firms are not available. In addition, venture capital firms encompass a few more firm types than the Particuliere Participatie Maatschappijen (operating under the 1981 law). A further source of problems is the fact that one venture capital firm may encompass various different PPMs, due to the legal construction of the funds. The data base used here is derived from data provided by the branch organisation (NVP). It does not cover the entire population of firms but the majority. Accordingly, the interpretation needs to focus on broad trends.

Table 8. Distribution of venture capital firms (1995)

City size (× 1000 inh.)	Percentage of cities (1)	Percentage of firms* (2)	(2):(1)
<50	91.1	12.1	0.1
50–100	5.3	7.3	1.4
100–150	2.4	17.1	7.1
150–200	0.5	9.8	19.6
200–300	0.2	17.1	85.5
400–500	0.2	7.3	36.5
500–600	0.2	7.3	36.5
700–800	0.2	22.0	110.0

* N = 41; See Note 3.

S o u r c e: Venture Capital Gids, 1996.

By considering venture capital firms to be new services developed in a situation of deregulation, it can be concluded that large cities still have a prominent position but that large medium-sized towns outside the Randstad are catching up slightly.

GLOBALISATION AND GLOBAL CONNECTIONS

Today, many banks serve important markets abroad. Although transactions on global markets using telecommunications are quite possible, important negotiation and problem-solving activity cannot be carried out by merely using the screen. In particular, if interaction and transaction continuously bring up new partners and new problems and the building of trust is required, then physical presentation that enables face-to-face contacts is absolutely necessary. Good examples are lead management of syndicates, management buy-outs, and stock trade in large amounts and locally-listed shares (Ter Hart and Piersma 1990).

This section explores the connectivity of Dutch banks with the first-order financial centres of New York, London and Tokyo. To this end, it examines whether the banks operate a full branch office or a subsidiary there. In addition, included with regard to foreign banks is direct presentation through the mother bank in one of the three first-order centres.

Table 9 indicates that connections with the global financial centres and their cities is largely confined to banks headquartered in Amsterdam. The quotient of 391.5 for Amsterdam represents the largest concentration so far measured in the present study. The banks on hand include all large banks and a large number of small specialised ones, among others operated by foreign banks. The fact that various globally-oriented banks outside Amsterdam have been taken over by banks in Amsterdam in the past decade has caused a relative increase of the connectivity of Amsterdam with the global financial system and their cities.

Table 9. Distribution of bank connections* with first-order financial centres (1995/1996)

City size (× 1000 inh.)	Percentage of cities (1)	Percentage connections (2)	(2):(1)
<50	91.1	0	–
50–100	5.3	4.3	0.8
100–150	2.4	0	–
150–200	0.5	0	–
200–300	0.2	8.7	43.5
400–500	0.2	4.3	21.5
500–600	0.2	4.3	21.5
700–800	0.2	78.3	391.5

* Physical presentation through branch offices, subsidiaries, or headquarters in London, New York or Tokyo.; N = 23.

S o u r c e: Annual Reports; Interviews; NIBE 1996.

The few regional banks in The Netherlands that have survived acquisition by large banks are apparently not very active on global markets. In addition, there are no signs to date that newly-established banks are strongly active in global banking. They rather focus on domestic markets and their niches.

CONCLUDING COMMENTS

The previous analysis has examined the spatial distribution of financial services in The Netherlands, as a result of processes of interurban competition. Within this context, a distinction has been made between different functions and specialisation (Tab. 10). In recent decades, national control functions have increasingly been concentrated in the largest city (Amsterdam). The basis for this has been

Table 10. Patterns and shifts in the urban hierarchy*

Function and Present Pattern	Developments
<i>National Head Office Functions</i> Strong concentration in the largest city (312.5)	Recently: Downward move in the urban hierarchy
<i>Regional Office Functions</i> Concentration in some large cities (56.5) and some large medium-sized towns (32.2)	Upward and downward move in the urban hierarchy
<i>Venture Capital Activity</i> Concentration in some large cities (110.0 and 85.5) and some large medium-sized towns (19.6)	Recently: Slight downward move in the urban hierarchy
<i>Global Connections (First Order)</i> Strong concentration in largest city (391.5)	Recently: Upward move in the urban hierarchy

* Within brackets is the concentration quotient of the offices involved.

a systematic acquisition of small (regional) banks and the decision of almost all foreign banks to locate in Amsterdam. There is some recent evidence of a downward shift in the urban hierarchy due to the emergence of new suppliers in the market. With regard to connectivity with first-order financial centres around the globe, however, Amsterdam has remained the primary centre in The Netherlands.

The analysis has also focused on regional offices of large banks that exert authority over particular geographical areas. The evidence at this level pointed to opposite developments, i.e. ones that are both in favour of large cities, and at the expense of large cities. Furthermore, the emergence of new financial services in the business segment indicated a modest shift downward in the urban hierarchy in favour of medium-sized towns. The conclusion that particular medium-sized towns have improved their position compared with large cities seems to be justified. However, the results also point to a clear difference between medium-sized towns in this interurban competition. Those located outside the Randstad at fairly large distances from the large cities, appeared to have better opportunities for competition than the ones in the Randstad.

There are various interesting avenues of research connected with further deregulation and integration within Europe. Due to deregulation, new types of suppliers of financial services will continue to enter the Dutch market, being licensed by the Dutch or European Central Bank. Some originate from the insurance business and operate without local and regional offices, as do banks that merely operate as an electronic bank. Others may focus on niche markets and operate by using a limited number of offices. Research should preferably focus on the impact of these newcomers on the concentration of national head offices at the top of the urban hierarchy and of regional offices in large medium-sized towns, as well as on principles of selective location (if there are any). In addition, European integration calls for attention to be paid to the increasing need for scale enlargement in the financial services. Important questions deal with the consequences of potential mergers and acquisition between banks in Amsterdam and banks abroad, i.e., in other secondary financial centres like Frankfurt and Zurich, or in primary financial centres like London. The national competitive position of Amsterdam may develop in a different way when first-order centres are involved compared with secondary centres. For example, will Amsterdam lose strength, in such a way that (large) medium-sized towns can 'regain' some of their previously lost financial activity, or will Amsterdam strengthen its position? A final interesting point is the influence of the size and geographical scale of domestic markets in enhancing or preventing the growth of secondary centres in national financial systems. While the Dutch system exemplifies a strengthening of the primary centre due to major mergers and acquisition in recent decades, larger countries may show the rise of strong secondary centres, based upon independent regional banks holding firm positions in large regional markets or based upon specialisation and complementarity.

Furthermore, the results of the study support views as to the influence of the

application of information technology on domestic office networks. This is particularly true for the growth of branchless banking and the associated increasing importance of regional offices in serving customers on a face-to-face basis. The repercussions of these developments for the situation in The Netherlands are not known. For example, the retreat of local offices may be highly selective according to the economic potentials of regions and living quarters, bringing particular services beyond the reach of small and medium-sized enterprises in depressed areas (cf. Marshall and Richardson 1996; Steen 1992). The same holds for the concentration of regional decision-making in a smaller number of towns, and for the location of venture capital firms. Accordingly, the role of banks in supporting local and regional business needs to be investigated, particularly in places where there is a retreat of bank offices.

ANNEX 1. Largest Dutch Banks (1995/96)

Name HQ	Balance Sheet (a)	Rank Europe	No of Jobs (b)
ABN-AMRO Amsterdam	546.5	4	63,694 (29,107)
RABO Bank Utrecht	293.5	11	37,437 (2,010)
ING Bank (c) Amsterdam	247.2	21	29,106 (8,861)
Bank Nederlandse Gemeenten (d) The Hague	101.9	78	304
FORTIS Bank Nederland (e) Utrecht	31.5	85	6.155

a. In NLG mln (as on December 31, 1995); b. Within brackets: abroad; c. Excludes Postbank; d. Focus on public and semi-public clients; e. Former VSB Group; Fortis is a Dutch-Belgium Group.

S o u r c e: NIBE 1996/1997; Annual Reports; The Banker, September 1997.

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ETHNIC MINORITIES IN CENTRAL-EASTERN EUROPE

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ABSTRACT: This article presents the demographic and ethnic situation of Central and Eastern Europe. For geographical, political and ethnic reasons the region was split up into five separate groups, namely:

- the Baltic countries (Estonia, Latvia, Lithuania, Kaliningrad district),
- Poland, the Czech Republic and Slovakia,
- Belarus and Ukraine,
- Hungary, Romania and Moldova,
- Balkan countries (Slovenia, Croatia, Bosnia and Herzegovina, Yugoslavia, Macedonia),
- Bulgaria and Albania.

The article discusses the abundance and spatial distribution of ethnic minorities living in the region. Its aim is to show the political consequences of intricate ethnic structure.

KEY WORDS: ethnic structure, minorities, Central-Eastern Europe.

The evolution of the political transformations taking place throughout the 20th century in the Eastern part of the European continent has been one in the direction of the emergence of nation states. As a result of the historical events connected with World Wars I and II, and with the breakdown of the Soviet Union at the turn of the 1990s, definite geopolitical changes occurred in Central and Eastern Europe. They tended to shape state boundaries to conform to national and ethnic ones. This was supposed to better guarantee the prevention of conflicts between individual ethnic groups, differing as to nationality, language, or religion, while minimizing the scale of the problem of ethnic minorities. During the whole 20th century these tendencies can be said to have driven consistently towards the formation of nationally-homogeneous state organisms in Central and Eastern Europe. Such an idea was in accordance with the aspirations of the more than a dozen nations inhabiting this area. This is true of both nations with a long historical tradition (likes Poles or Hungarians), and those which ultimately formed at the end of the 19th century (like Slovaks or Belarussians). A specific perspective on questions of the state and the nation took shape in this part of Europe. These questions were perceived differently to in Western Europe. Almost all the nations living in Central-Eastern Europe were deprived of state sovereignty over a longer or shorter period. The nation and the state were only

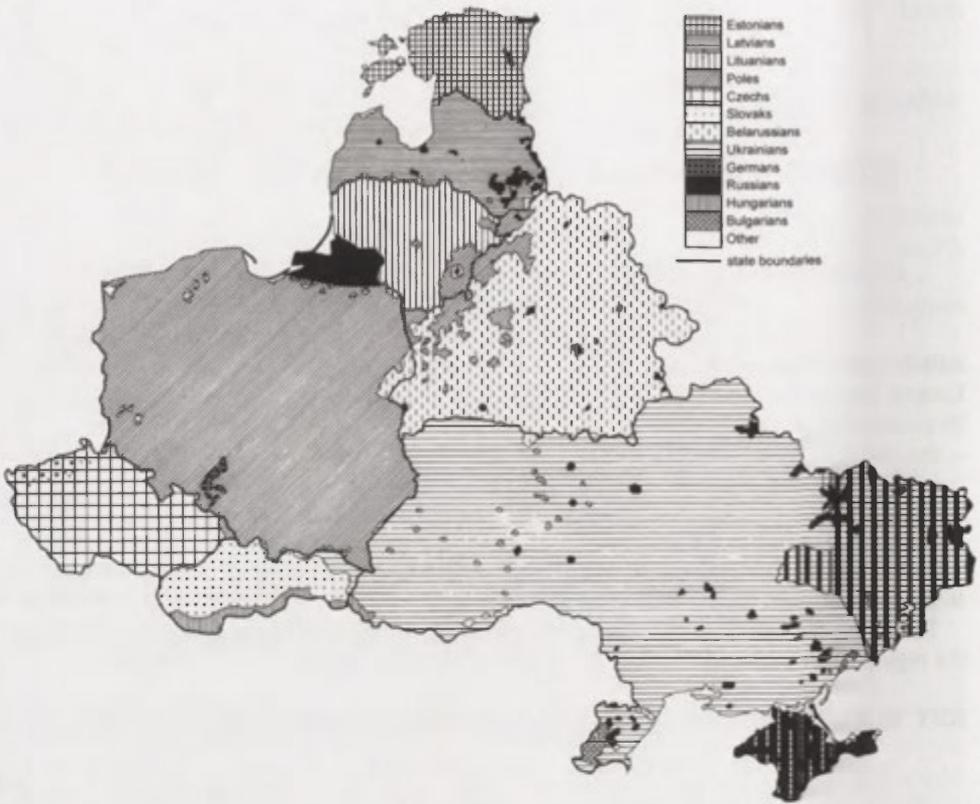


Fig. 1. Nationalities

infrequently corresponding notions in this area. The ethnic groups of the region professed virtually unanimously the virtues of resistance and struggle against the external invaders and occupants, with these virtues taking various forms, but being quite uniform in content, emphasising the superiority of the fight for national objectives. A consequence of such attitudes were postulates aiming at the formation of nation states, grouping ethnic communities linked together by a language, and, though less frequently, by religion. In all the countries of the region a struggle was going on – with varying intensity and various effects – between the influences of Western and Eastern Christianity, Latin and Greek philosophy, Roman and oriental state concepts, and the Latin language and the Old Church (Orthodox) Slavonic language. As a result of these various influences mixed formations would take shape in many areas, bearing the signs of both the East and the West.¹

¹ The complex national and ethnic issues of Central-Eastern Europe are explained in greater detail in a more wide-ranging book by the same author (Eberhardt 1996).

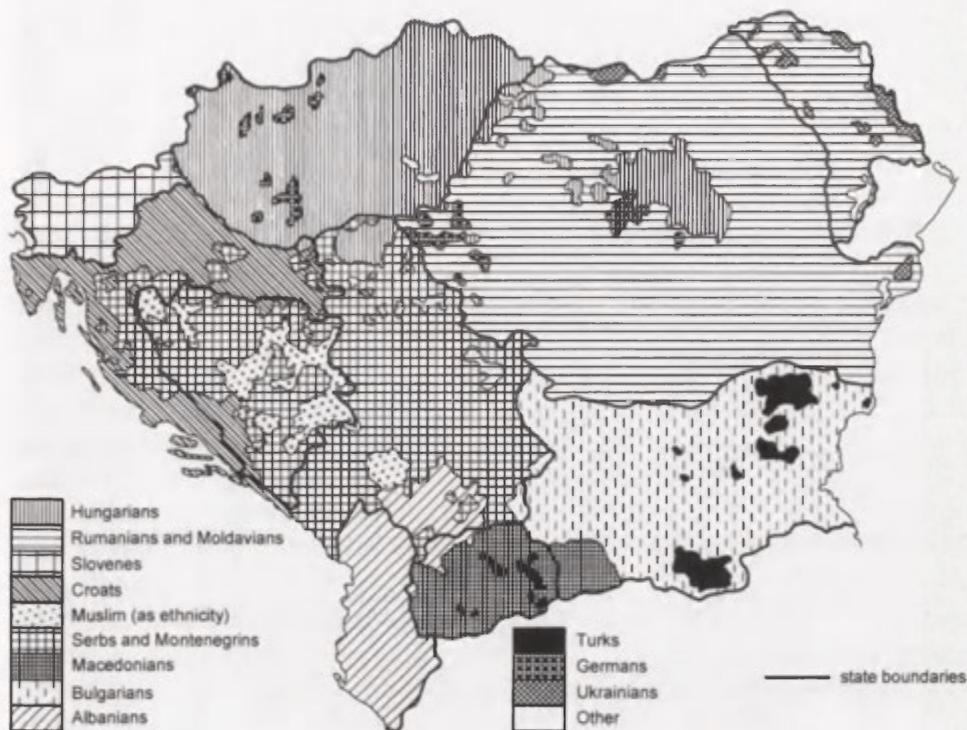


Fig. 2. Nationalities

The whole history of the region has seen uninterrupted border changes (Magocsi 1995). The lack of stabilization created an atmosphere of temporariness and hanging threat. In the 19th century the area in question belonged to the zone of influence of the large external powers, primarily Russia, Germany and Austria, and partly also Turkey, all of which treated it as a potential area for expansion. After the political elimination of Turkey, and then, also of Austria after the Great War, there still remained a strong Russia and Germany. As a consequence of World War II, the whole part of the European continent considered here found itself in the zone of influence of the Soviet Union. Deeply fixed resentments functioned among the inhabitants of the region, as a hangover from periods of annexation, occupation, or repression. Defence against the external threat took the form of intensifying nationalism, directed not only against the external powers, but also and above all against closest neighbours, differing in language, religion, or culture. It was commonly held that orientation towards the creation of nation states without ethnic minorities could alone satisfy the expectations of the inhabitants and guarantee political and military stabilization (Balcerak 1974). At the Versailles conference after the Great War an effort was made to adjust the

boundaries of the newly-emerging states of Central-Eastern Europe to the course of ethnic limits. For numerous and complex reasons this was not possible. There were many areas of differentiated national structures, to which claims were laid by several bordering states. During the period between the wars the unresolved problem of ethnic minorities antagonized relations among the states of Central-Eastern Europe. This also became the pretext for the territorial expansion of the German IIIrd Reich and bolshevik Russia. During World War II this part of Europe was a place of bloody conflicts of national character. At Yalta, and especially at Potsdam, the concept agreed upon involved mass population translocations with the aim of ethnic homogenization of the states of Central-Eastern Europe within their new political frontiers. Although the scale of the translocations effected, both voluntarily and by force, was enormous, they did not result in the liquidation of ethnic minorities. In the years of domination of the Soviet Union and the existence of the communist system this question did not play an essential political role. However, at the beginning of the 1990s, in new systemic conditions, circumstances arose conducive to the resurfacing of the national aspirations of individual ethnic groups living outside their respective mother countries. These tendencies took various forms, from the struggle for equal rights and the possibility of a minority cultivating its own separate identity, up to attempts at modifying borders to date as well as the removal or extermination of closest neighbours differing in their language or ethnic origin.

For this reason, explanation of these problems has recently gained special importance not only in cognitive, but also in political terms. However, when considering so-called Central-Eastern Europe as an object of study, a scholar first encounters significant difficulties with delimitation. In the respective literature one comes across a variety of regionalization schemes for this part of Europe. The schemes adopted depend, on the one hand, on the nationality of the given scholar, who would give preference to the views that conform to the interest of his/her own country, and on the other hand – on the professional specialization. Thus, different delimitation criteria are preferred by historians and geographers, and still others by politologists. Destabilization of political boundaries has not facilitated the task. In view of this, the notion of Central-Eastern Europe has been understood and interpreted in a variety of manners during the 20th century. Without going into the details of this quite complex and not-entirely-resolved question we should recall that the scholars of the inter-war period who used political criteria, classified the group of states located between the Soviet Union and Germany as belonging to this part of Europe. In view of the bridge-like location of these countries between the Baltic, Black and Adriatic Seas, the term “Intermare” was used in Poland and understood in a differentiated way. It was, however, most common to include in this specific region of Europe the ten then-existing states, namely seven countries which emerged after the Great War, i.e. Poland, Czechoslovakia, Hungary, Yugoslavia, Lithuania, Latvia and Estonia, and three which had existed before 1914, that is – Bulgaria, Romania and Albania.

After the transformations caused by World War II, in the period when geopolitical and systemic prerequisites dominated the respective considerations, Central-Eastern Europe was usually said to encompass all of the European socialist countries located within the zone of direct or indirect influence of the Soviet Union. Thus, the eight states classified as belonging to the region were: Poland, the German Democratic Republic, Czechoslovakia, Hungary, Romania, Bulgaria, Yugoslavia and Albania. There have been such important geopolitical changes with respect to the pre-war period that the possibility of making any kind of comparative analyses has disappeared.

The great historical transformations related to the collapse of Soviet Union, the unification of Germany, and the disintegration processes taking place on the territories of Yugoslavia and Czechoslovakia all diametrically changed the political image of this large portion of the European continent. It can be proposed that the stage of formation of homogeneous nation states finally terminated after a sovereign Ukraine, Belarus and Moldova had appeared, the three Baltic States had regained independence, Yugoslavia had disintegrated, and Czechoslovakia had divided. In a very short period of time there emerged, side by side with the five existing countries, i.e. Poland, Hungary, Romania, Bulgaria and Albania, thirteen new political units, namely: Ukraine, Belarus, Estonia, Latvia, Lithuania, Moldova, the Czech Republic, Slovakia, Slovenia, Croatia, Bosnia and Herzegovina, "the new" Yugoslavia, and Macedonia (recognised as the Former Yugoslav Republic of Macedonia). One ought additionally to count within this set of countries the Kaliningrad District of the Russian Federation.

The political changes mentioned may constitute the basis for the delimitation of the new geographical reach of the Central-Eastern European countries. When adopting formal political prerequisites as the basis for the delimitation procedure we must note that in relation to both pre-war and post-war periods the territory covered by the sovereign nation states after 1990 increased almost two-fold and now also includes areas previously classified as Eastern European (e.g. Eastern Belarus and Ukraine). However, this is of no essential significance when national and ethnic questions are being considered in a static rather than dynamic setting.

When classifying selected countries as belonging to Central-Eastern Europe one should be aware of a high degree of arbitrariness or even the nominal nature of such a choice. Specifically, the classification adopted was largely influenced by the current geopolitical situation. The issue was joint consideration of all the states located between the European Union and the Russian Federation, the latter taking shape on its new foundations. The countries listed, after the systemic changes have occurred, face the necessity of constructing sovereign nation states. They have to resolve effectively, the delicate questions related to ethnic minorities. Otherwise, they are doomed to persistent instability. Although the scale of the problem is much more serious in the polyethnic countries than in the traditionally mono-ethnic countries, the proper solution to questions of ethnic minorities presents a very important problem for any country.

The area encompassed by the analysis includes a total of 18 states and the Kaliningrad enclave. In view of this large number of units there is a need to order these units and aggregate them in classes of similar geographical situations and political conditions. One can nominally distinguish five distinct groups of countries. From the geographical and ethnic point of view the set of the three Baltic states and Kaliningrad district distinguishes itself very clearly. There are numerous features common to Poland, the Czech Republic and Slovakia. The whole of the eastern part of the region in question is taken by Ukraine and Belarus; two Slavonic countries which have long been subject to Russification. At the instant they acquire the capacity to manage their fate themselves they are faced by similar threats, and so constitute a true group. Similar arguments underpin the formation of the group containing Hungary, Romania and Moldova. In spite of the cultural differences which separate the linguistically Ungro-Finnic and denominationally Catholic (or Protestant) Hungarians from Romance and Orthodox Romanians and Moldovans, joint consideration of the national and ethnic problems of the three countries mentioned will facilitate the analysis and evaluation of complex problems of their ethnic minorities.

We are thus left with the countries of the Southern part of Central-Eastern Europe, i.e. Bulgaria, Albania, and the republics formed after the disintegration of the former Yugoslavia. These states are located within one geographical region – the Balkan Peninsula. Except for Albania they are all inhabited by the Southern Slavs, belonging to the same linguistic family. Over centuries of history, distinct religious and cultural differences have however appeared there, leading to the separation of well-defined nations.

Hence, taking into account the definite geographical, demographic, and ethnic assumptions, Central-Eastern Europe was ultimately divided up into five separate areas encompassing:

- the Baltic states (Lithuania, Latvia, Estonia, and Kaliningrad district),
- Poland, the Czech Republic and Slovakia,
- Belarus and Ukraine,
- Hungary, Romania and Moldova,
- the Balkan states (Slovenia, Croatia, new Yugoslavia – i.e. Serbia, Bosnia and Herzegovina, Macedonia, Bulgaria, and Albania).

By adopting this quite nominal and discussion-prone division we seem to obtain a possibility of presenting national and ethnic problems in a more orderly manner. It is especially important to determine the sizes and spatial distribution of those ethnic groups which live outside their own nation states. An inquiry into this question first necessitates precise statistical analysis. Without a well-founded quantification, all assessments and evaluations will have an arbitrary character, and will be easily put to doubt. Determination of the precise statistical data concerning ethnic relations has always been, and still is, a very difficult task. In the past, nationality statistics were often used for political purposes and deformed in a variety of manners. The results of all censuses were assessed quite critically

from this point of view. They require a lot of care in interpretation. Irrespective of the reliability of statistical reporting, the very notion of nationality or ethnicity was defined in an ambiguous way. In border areas; ethnic groups are themselves uncertain as to their affiliations, and can be classified in various manners. The statistical result obtained is therefore only an approximation of the reality.

Instead of going into the details of these difficult issues one should as a rule accept the official census data, which can potentially be verified thereafter in a more precise analysis. National Censuses take place, as a rule, every ten years, so the last data we have at our disposal are for the turn of the 1990s. They have become somewhat outdated, but constitute the only source of information.

The three Baltic States, together with Kaliningrad district, belonging to Russia, occupy 190,100 km². The last (1989) population census, still carried out within the Soviet Union, showed that this territory was inhabited by 8,778,300 people altogether. The nationality structure of this area was very differentiated (Tab. 1).

Table 1. Ethnic structure of the Baltic States in 1989

States	Population totals in '000	Native population*		Ethnic minorities	
		totals in '000	in %	totals in '000	in %
Estonia	1,565.7	963.3	61.5	602.4	38.5
Latvia	2,666.6	1,387.8	52.0	1,278.8	48.0
Lithuania	3,674.8	2,924.3	79.6	750.5	20.4
Kaliningrad district	871.2	683.6	78.5	187.6	21.5
Totals	8,778.3	5,959.0	67.9	2,819.3	32.1

* The notion of "native population" may be understood and interpreted in many various ways. In the present statistical calculations it is unambiguously assumed that the "native population" corresponds to that most important ethnic group which formed its own nation state and which features complete identification, in terms of consciousness, with this own state.

Within the area now considered there lived 2,977,000 Lithuanians, 1,396,000 Latvians, and 966,600 Estonians. These three Baltic nations together accounted for 5,339,600 people. The remaining nationality groups accounted jointly for 3,438,700 people, i.e. 39.2% of the total population. Among this remaining population the largest group was constituted by Russians – 2,408,400 people altogether. The thus numerous Russian minority resulted from the settling of Russians in Kaliningrad district, which thus became ethnically Russian, as well as from the steady post-war inflow of Russians to the three "Baltic Republics".

The situation of the Lithuanian, and especially of the Latvian and Estonian, nationalities in their own respective countries is difficult. These three nations have limited demographic potential, and a low rate of natural increase is not a good prognosis for potential future improvement. Significant Russian minority

resides in all these countries. On the top of this, Russians inhabit the key locations of the region (capitals of the respective countries and industrial centers). At the dawn of their independence Latvia and Estonia have a large ethnic minority, whose loyalty to the newly-reestablished statehood is unknown. A mass return of Russians to their home country is not very probable. The Russian minority – and in fact the Russian-speaking minority, for it encompasses representatives of other nationalities of the former Soviet Union as well – will remain a constant element. Until quite recently, the immigratory population was the privileged group. It has now lost this position. The change of the civil status to date, along with the introduction of the official languages of the native populations, has caused apprehension among Russians, and become a source of conflict made use of by the authorities of Russia as an element of pressure and destabilization. This remark does, of course, not apply, to Russians living in Kaliningrad district, where the domination of Russians and of the Russian language is unquestionable. The emergence of a Russian national enclave on the Baltic coast is, though, a very significant fact, especially for political reasons.

The remaining ethnic groups do not play a greater role. According to the Soviet census analysed here the fifth minority in terms of population were Poles, altogether 322,700 people. They are concentrated in eastern Lithuania, around the capital Vilnius, and in South-eastern Latvia (i.e. in Latgalia). The next most important minorities are Ukrainians and Belarussians, who constitute immigrant populations, very much dispersed spatially. In view of the fact that they speak Russian, their interests are closer to those of Russians than to those of the native nationalities. A historically significant event was the removal of the German population from this area as a consequence of World War II. A German population had been, over the centuries, a very significant economic and civilisational factor in this region. The northern part of Eastern Prussia, presently constituting Kaliningrad district, had until 1945 been inhabited almost exclusively by Germans. The extermination of the Jewish population during World War II, and the outflow of the Polish population, complemented the enormous scale of the ethnic changes. The scale of the nationality-related transformations was unprecedented and resulted in the fact that nowadays only the Russian – or, more adequately, the Russian-speaking – minority constitutes an essential element conditioning the future of the three Baltic countries. The situation of the Lithuanian nation is more advantageous, for minorities are less numerous in Lithuania. On the other hand the Russian-speaking minorities in Latvia and Estonia will to a large extent influence the fate of these two countries. The regaining of independence and the formation of nation states, of course, provides a basis for the rebirth and strengthening of local tradition and culture. Although the three Baltic nations were under the domination of foreign nationalities over the centuries, they were capable of preserving their separate identity. The linguistic, religious and cultural specificity of Estonians, Latvians and Lithuanians creates an opportunity for reconstruction and stabilization of the three nation states.

The present territory of Poland, the Czech Republic, and Slovakia has been changing its political status and affiliations through the 20th century. The present boundaries result from World War II decisions taken at the Yalta and Potsdam Conferences. During the latter conference the victorious powers took a decision concerning the mass resettling of the German population. The purpose was to achieve national homogeneity and to finally resolve the question of the abundant German minority. The extermination of the Jewish population by the Germans, as well as the war and post-war mass migratory movements of Poles, Czechs, Slovaks, Ukrainians and Hungarians changed the ethnic picture of this part of Europe entirely (Schechtman 1946).

The territory of the three countries now being considered, covering a total of 440,600 km², was inhabited by 53,994,500 people at the beginning of the 1990s (Tab. 2).

Table 2. Ethnic structure of Poland, the Czech Republic and Slovakia in 1991/1992

States	Population totals in '000	Native population*		Ethnic minorities	
		totals in '000	in %	totals in '000	in %
Poland	38,418.0	37,486.3	97.6	932.4	2.4
Czech Rep.	10,302.2	9,726.1	94.4	576.1	5.6
Slovakia	5,274.3	4,519.4	85.7	754.9	14.3
Totals	53,994.5	51,731.5	95.8	2,263.0	4.2

S o u r c e s: for Poland: M. Hańuszko (1992), *Mniejszości narodowe i etniczne w Polsce (National and ethnic minorities in Poland; in Polish)*, [In:] *Spółeczeństwo otwarte*, Warszawa; for Czech Rep. and Slovakia: *Predležne výsledky sčítania ľudu, domov a bytov 3 Marcu 1991 r. Českej a Slovenskej federatívnej Republiky (1992) (Initial results of the population and household census of March 3rd 1991 of the Czech and Slovak Federal Republic; in Czech)* Praha.

The three Slavonic nations – the Poles, Czechs and Slovaks – constitute 96.6% of the total population in this group of countries. Ethnic minorities do not play a greater role, with the exception of Hungarians in Slovakia. Political boundaries usually coincide with the ethnic ones. The nationality structure is stable and does not pose the threat of ethnic conflicts. This concerns, in particular, Poland and the Czech Republic historically, the region considered has always been subject to tensions and conflicts of ethnic background. It is now evolving towards ethnic unification. The consequences of transformations which took place here during the 20th century have essential political consequences. The territory became safe. It is not threatened by centrifugal tendencies which could rock the stability of this part of Europe. The potential frictions at the Slovak-Hungarian interface, having local reach, cannot have a significant impact on the European geopolitical setting. The relatively marginal national minorities (Germans, Ukrainians and Belarussians) do not constitute a threat to the existing political order. Ethnic stabilization within the framework of the nation states is

a positive element, making it possible for closer ties to develop between Poland, the Czech Republic and Slovakia.

The largest national minority in Poland is constituted by Germans, whose number is estimated at 350,000 (some German sources quote a number reaching 700,000). These live in the vicinity of Opole. It had in the past been an ethnically-Polish population, which due to quite complex ethnic processes started to change nationality preferences and in recent years became organized as German minority in Poland. The next most important minorities in Poland are Ukrainians, dispersed throughout the country, and Belarussians, residing to the South-East of Białystok.

The last population census carried out in the Czech Federation showed that there were 8,363,800 Czechs and 1,362,300 Moravians in the country. Taking into account the fact that the differences between Czechs and Moravians are of a regional rather than national nature we can treat these two groups as one nation. The largest national minority in the Czech Republic are the dispersed Slovaks, followed by Poles that are less-numerous, but concentrated in Cieszyn Silesia.

An important problem for Slovakia concerns relations with the well-organized Hungarian minority concentrated in the southern part of the country. According to the recent census, 567,300 people belong to this minority. In spite of the shrinking of the Hungarian ethnic area, and even the weakening of its spatial compactness, there remains a belt along the southern border of Slovakia, with a predominant Hungarian population inimical to Slovakian statehood (Kocsis, Kocsis-Hodosi 1995).

The whole of the Eastern part of the Central-Eastern European region considered coincides with two Eastern-Slavonic countries: Ukraine and Belarus. Their joint areas are 811,300 km², and they are inhabited, according to the last Soviet population census, by 61.6 million people, of which Ukrainians and Belarussians account for 45.3 million (Tab. 3).

In spite of many differences resulting from their location and magnitude, Ukraine and Belarus, which gained independence simultaneously, share similar demographic and ethnic problems. There is, in particular, an interesting affinity between the two countries in the spatial distribution of certain specific demographical characteristics, conditioned by a similar historical past. Thus, as we

Table 3. Ethnic structure of Ukraine and Balarus in 1989

States	Population totals in '000	Native population*		Ethnic minorities	
		totals in '000	in %	totals in '000	in %
Ukraine	51,452.0	37,419.1	72.7	14,032.9	27.3
Belarus	10,151.8	7,904.6	77.9	2,247.2	22.1
Totals	61,603.8	45,323.7	73.6	16,280.1	26.4

S o u r c e s: *Natsionalnyi sostav naseleniya SSSR. Perepis naseleniya 1989* (1991) (*National structure of the population of the USSR. Population census 1989*; in Russian) Moskva.

pass from West to East in both countries we encounter increasingly persistent Russian influences, and better and better-rooted consequences in social consciousness, in language and in national culture.

The demographic potential of the region analysed is quite significant. It is relatively unified in ethnic terms, since more than 96.0% of the population is Slavonic, but this monolithic façade is but an appearance. The situation is disturbed by the very large Russian minority amounting to a total of 12,697,700 people, at best neutral, at worst inimical towards the two newly-formed nation states, Ukraine and Belarus. Due to the political changes of recent years, the Russian community traditionally residing in the two countries, has changed its political status, becoming a national minority. In practice, though, the situation is more complex, in view of the universal presence of the Russian language, which is still the common language for the vast majority of inhabitants of this large region. Thus, ethnic statistics, when presented in a static framework, do not properly reflect the actual ethnic processes which took place during the Soviet period in Ukraine and Belarus. As the years went by, the shares of Belarussians and Ukrainians treating their national languages as home languages have been on the decrease. There has been a systematic increase of the shares of so-called Russian-speaking Belarussians and Ukrainians.

The country-level data are the resultant of quite significantly differentiated regional patterns. Thus, for instance, in the Western part of Ukraine, which was until World War II within the confines of Poland, Czechoslovakia and Romania, a strong Ukrainian national consciousness and language have been preserved. A more complicated situation exists within so-called Right-Bank (of the Dneper) area, to the West of the river, which was incorporated into Russia only at the end of the 18th century. These areas, were subject to shorter and less intensive Russification pressure. On the other hand, the whole of Eastern Ukraine (e.g. the Donbas basin), as well as the major part of Southern Ukraine (including the town of Odessa and the Crimean peninsula), are largely inhabited by ethnic Russians and Ukrainians speaking Russian, detached from Ukrainian culture. These territorially very-important areas may become the object of disputes and confrontations. An example very much to the point is the question of the status of Crimea, which is still a burning point in Russo-Ukrainian relations.

The conditions which took shape in Belarus were more unambiguous. As a consequence of the very long and intensive Russification processes, a situation arose in which the very existence of the Belarussian nation as a separate national group capable of maintaining its own state organism, is put in doubt. Many observers draw attention to the possibility of the disappearance of the Belarussian language. Recent political events indicate a tendency towards significant limitation of Belarussian statehood and towards reintegration with Russia.

The remaining non-Russian national minorities, which inhabit Ukraine and Belarus, do not constitute a more significant problem. This applies in particular to Ukraine. Two ethnic groups which played an important role over centuries of

the country's history, Poles and Jews, are now small and dispersed. Romanians, Hungarians and Bulgarians reside in border areas of Ukraine. On the other hand, in western Belarus, and above of all in the border zone close to the Lithuanian border, a Polish minority persists. In spite of the fact that these people underwent Russification or Belaruthenization in terms of language, they maintain their national awareness and Roman Catholic faith.

An entirely different set of demographically- and ethnically-specific features characterize the subsequent three, or in fact – two – nations of Central-Eastern Europe, namely Hungarians and Romanians, with the latter including the culturally-affiliated Moldavians. The three respective sovereign states, whose territory covers 364.2 thousand km² are home to more than 37.5 million people (Tab. 4).

Table 4. Ethnic structure of Hungary, Romania and Moldova in 1989/1992

States	Population totals in '000	Native population*		Ethnic minorities	
		totals in '000	in %	totals in '000	in %
Hungary	10,374.8	10,172.5	98.0	202.3	2.0
Romania	22,810.0	20,408.5	89.5	2,401.5	10.5
Moldova	4,335.4	2,794.7	64.5	1,540.7	35.5
Totals	37,520.2	33,375.7	88.9	4,144.5	11.1

Sources: for Hungary: *A Néesség anyanyelv és nemek szerint 1900–1990* (1993), Budapest; for Romania: *Recensământul populației și al. Locuitorilor din 7 ianuarie 1992* (1993), București; for Moldova: *Natsionalnyi sostav naseleniya SSSR. Perepis naseleniya 1989* (1991), Moskva.

The demographic data presented, showing the numbers in ethnic minorities, do not fully reflect the reality, which is extremely complex, and conflict-prone in its political aspect. This is especially visible at the regional level, since the area has been subject to several border changes during the 20th century. Until World War II this area was constantly the stage of conflicts with an ethnic background (Waldenberg 1992). After the Soviet Union had started to dominate and the communist system had been introduced a relative calm reigned. It was commonly held that ethnic conflicts had become less important and belonged to the past and this conviction lasted until the early 1990s. Since then we have witnessed an activation of nationalistic tendencies and the reemergence of old national animosities (Sugar, Lederer, eds, 1993). This is above all true of Hungarian–Romanian relations. The boundary between these two countries, determined after World War I and adopted in the Trianon Treaty, did not satisfy Hungarian aspirations as it resulted in a large Hungarian minority finding itself outside Hungary. According to the 1992 Romanian census there were 1,624,900 members of this minority in Romania. They traditionally inhabit the eastern part of Transylvania, as well as the border areas around Oradea and Timisoara (Kocsis 1992). The Hungarian minority is constantly demanding the establishment of an Autono-

mous Hungarian Region, but the ruling Romanian administrations will not give in to these demands, suspecting that such postulates hide a Hungarian drive towards the separation of this region from Romania. This issue is a the source of constant tensions and friction between Budapest and Bucharest.

The other minorities living in Romania do not play a more significant political role. The large and well-organized German minority is undergoing self-liquidation through on-going outmigration to Germany. Those Jews who were spared in the war have also largely left for Israel, Western Europe, or the United States. The question of the relatively numerous Gypsies is more of a social than political nature.

A particular result of the collapse of the Soviet Union was the sovereign Moldovan Republic, which faced difficult national and ethnic problems from the very start. The essential problem was related to a dilemma which remains unresolved. Namely: is there a separate Moldovan nation, or is it in fact a part of the Romanian nation? The new state adopted the Latin alphabet, and the Romanian language and symbols. Still, local Moldovan patriotism took shape as well, and was reflected in the results of a referendum in which the vast majority of Moldovans opted for an independent Moldova, and against union with Romania. Two large national minorities live in the country: Ukrainians and Russians. They are primarily concentrated in the Eastern part of the country, in so-called Transdnies-ter. The moment independence was announced, the secessionists living on the Eastern side of the Dniester river proclaimed the establishment of the Transdnies-ter Republic. The authorities in Chisinau (Kishinev) did not recognize this act, so starting a conflict, which has not yet been resolved. On top of this, there is a small region in Moldova inhabited by Gagausis, a Turkish-speaking ethnic group of Orthodox denomination, which has also announced its "independence". In this situation the central authorities have also lost control of Gagausia.

Thus, the information provided here suggests that ethnic conflicts do not only threaten Hungary, a homogeneous country nationality-wise. Frictions of an ethnic nature may constitute a danger for the stability of Romania and Moldova in the future.

The situation of the nationalities in the Balkans has been the cause of numerous wars which have ravaged not only the whole of the Balkan Peninsula itself, but also neighbouring European countries. That is why consideration of the locations and sizes of various ethnic minorities in this part of Europe is important not merely for cognitive reasons. As the respective problem area is highly complex, it cannot be presented adequately, to say nothing of interpreted, in such a short report. Attention can only be directed to the most important issues, whose consequences might be particularly telling for the future of the Peninsula. At the beginning of the 1990s the area delimited, of 395,600 km², was inhabited by 35,729,000 people of a variety of nationalities, languages and religions. Conforming to the criteria adopted it can be said that 9,749,900 of these people lived outside so-called own national state (Tab. 5).

Table 5. Ethnic structure of the Balkan Peninsula in 1989/1992

States	Population totals in '000	Native population*		Ethnic minorities	
		totals in '000	in %	totals in '000	in %
Slovenia	1,966.0	1,727.0	87.8	239.0	12.2
Croatia	4,784.3	3,736.4	78.1	1,047.9	10.5
Bosnia and Herzegovina*	4,366.0	1,905.0	43.6	2,461.0	56.4
Yugoslavia	10,394.0	6,504.0	62.5	3,890.0	37.5
Macedonia	2,038.9	1,314.3	64.6	724.6	35.4
Bulgaria	8,997.4	7,674.8	85.3	1,322.6	14.7
Albania	3,182.4	3,117.6	97.9	64.8	2.1
Totals	35,729.0	25,979.1	72.7	9,749.9	27.3

* In the Republic of Bosnia and Herzegovina the native population is composed of Muslims, Serbs and Croats. For the purposes of the present statistics (in an obviously debatable manner) Serbs and Croats were treated as minority groups.

S o u r c e s: for Slovenia: *Statistični Letopis Republike Slovenije 1992* (1993), Ljubljana; for Croatia: *Statistički Ljetopis 1993. Stanovništvo Prema Nacionalnom Sostavu* (1993), Zagreb; for Serbia: *Statistički Godišnjak Jugoslavije 1993* (1993), Beograd; for Bosnia and Herzegovina, and for Macedonia: *Britannica Book of the Year 1993* (1993), Chicago; *The Statesman's Year Book 1993-1994* (1993), London; *Calendario Atlante de Agostini* (1994), Novara; for Bulgaria: *Britannica Book of the Year 1991* (1991), London; for Albania: *Vjetari Statistakor I. R. P. S. Te Shqiperise 1990* (1990), Tirana.

This whole territory, was until the 1990s, in three states. After the disintegration of the former Yugoslavia, there were seven, but only two have a clear mono-ethnic setting with minorities playing a marginal role (Slovenia and Albania). In four of the countries, ethnic minorities are very numerous. A very distinct property which can be observed here is that the higher the share of the minorities in a country, the bigger the difficulty with the maintenance of political stability. The authorities of each of these countries, aware of the fact that the ethnically-alien groups are disloyal with respect to the given country, have been subjecting these groups to repression or forced assimilation. This kind of policy, has usually stimulated the existing mutual antagonisms still further.

The most pronounced role in the contemporary history of the Balkan Peninsula has been played by the rivalry between the Serbs and the Croats, two nations so close ethnically. This rivalry is the heritage of a complex past. At the beginning of the 20th century there was a short period when it seemed that one nation would emerge. The common statehood of Yugoslavia was not, however, effective in wiping out the differences between Serbs and Croats. The disintegration of Yugoslavia initiated a war which ended with mass translocations of population with a view to the liquidation of the mutual national minorities. The situation was made even more complex by border areas changing their political status over time. An essential prerequisite to explain the potential scope of conflicts is the determination of polyethnic areas. The most complex situation exists in Bosnia

and Herzegovina, inhabited by three separate communities using the same language but professing different religions. Religious denomination is a so-essential and unambiguous factor, that it determines the national consciousness within this region. The formation of the polyethnic Republic of Bosnia and Herzegovina after the war was meant to create a buffer zone between the Serbs and Croats, which would prevent construction of a hegemonistic Serbia or Croatia. This concept proved to be non-viable once Yugoslavia collapsed, and a fratricidal war ensued, in which representatives of all three nations took part.

The extensive borderland areas located between pairs of ethnic groups (Croat–Serb, Serb–Albanian, Macedonian–Albanian, Muslim–Serb, etc.) have territorially-important, ethnically-mixed areas (Magocsi 1995). Ethnic boundaries are not linear, but form broad belts within which the very same village may often have cohabiting populations differing as to their religion and the national traditions cultivated.

The most difficult problem of the contemporary Balkans may be said to be the resolution of the Albanian question. The Albanian population dominates in a clear manner in Kosovo, an integral part of the new Yugoslavia. This population now demands autonomy and may even try to force the creation of their own national state, or unification with the neighbouring Albania in the future. The Albanian population, concentrated in the Western part of Macedonia also proclaims ideas of a centrifugal character. At the same time, the Albanian population features high demographic dynamics. Not quite forty years ago there were slightly over 2 million Albanians. Today there are more than 5 million. The demographic expansion of this nation full of vitality may bring essential geopolitical repercussions.

The most stable situation is observed in Bulgaria, but here too there is a problem of the local Turks which has not found an adequate solution.

The only traditional national minority, declining in significance, is constituted by the Hungarians living in Voivodina. Until World War I, a Hungarian population dominated in this province, but today this is a steadily decreasing national minority in the area (Kocsis, Kocsis-Hadosi 1995).

At the beginning of the 20th century, most of Central and Eastern Europe was within the boundaries of the external powers. Currently, a dozen sovereign states function on this territory. The nation-forming processes, resulting from both objective tendencies and from random or spontaneous events, has ended with success. The concept of the nation state won ultimately. But in spite of many efforts it did not turn out to be possible to establish ethnically-homogeneous states. Within the confines of the present-day Estonia, Lithuania, Latvia, Kaliningrad district, Poland, the Czech Republic, Slovakia, Ukraine, Balarus, Hungary, Romania, Moldova, Slovenia, Croatia, Bosnia and Herzegovina, Yugoslavia, Macedonia, Bulgaria and Albania, that is – on territory covering 2,090,800 km² there are almost 200 million people (more precisely: 197,416,200). Among them, so-called national minorities, as defined in accordance with the criteria adopted

here, amount to 35,256,800 people, or 17.8% of the total. This simple calculation implies that there is a very numerous demographic category of persons having the citizenship of a given country and not identifying themselves with the nation forming this country. This is frequently the cause of treatment as second-rank citizens. It is not possible to overlook the scale of the problem, which takes various forms in particular parts of this large geographical area located between Estonia and Albania (Magocsi 1995). The two maps appended to the present text illustrate this spatially differentiated image. The first of them shows the situation in the Northern part, the second that in the countries located in the Southern part of the region in question.

Empirical analysis indicates that, alongside ethnically-homogeneous countries, such as Hungary (98.0% Hungarian) or Poland (97.6%), there are others in which the shares taken by national minorities are very high. Leaving aside the very particular situation existing in Bosnia and Herzegovina one can mention Latvia (with 48.0% of the population belonging to minorities), Estonia (38.5%), Yugoslavia (37.5%), or Moldova (35.4%).

The largest national minorities, in terms of absolute numbers, are the Russians, numbering 15,579,600. This puts them fourth with respect to absolute populations among the nationalities of the region, after Ukrainians, Poles and Romanians. Russians are primarily distributed in the Eastern part of the territory which previously belonged to the Soviet Union.

A significant role is played by the Hungarian minority, which is traditionally concentrated in Romania, Slovakia and Yugoslavia. According to census data – whose reliability is questioned by Hungarians – this minority comprises 2,548,000 people. A different kind of geopolitical problem is linked with the Albanian diaspora. There are 2,095,200 Albanians living outside their own nation state. Even without more-refined statistical analyses, we can state the very important fact that there are quite significant areas over which national minorities dominate. Thus, the respective problems have not only a populational, but also a territorial, aspect. The situation in both these respects has changed greatly over time. Let us only mention the fact that the Holocaust virtually ended the several-centuries' presence of Jews in Central and Eastern Europe (Hilberg 1981). Jewish communities of large size, and highly differentiated as to culture and wealth, had been a persistent element of life in this region. Side by side with the Western type of Jewish community (as in the Czech Republic or Hungary) were the Eastern Jews, more traditional, living in far deeper isolation from their environment. Both types of communities were almost entirely exterminated by the Nazis during World War II. Similarly, the large German diaspora, which had been taking shape over centuries, was removed by post-war mass resettlement, followed by gradual emigration to Germany.

The considerations presented here in relation to national and ethnic questions indicate conditioning by complex political, social and demographic processes. The primary postulate of the nationalities living in this part of Europe was

independence or autonomy (Balcerak 1974). They attempted, usually by military struggle, to unify their national territories into compact political units. The events of the recent period connected with the downfall of the communist system and systemic transformation, have again destabilized the situation in this part of Europe. Within the Soviet system, the smaller nationalities were deprived of the attributes of sovereignty. As soon as a change in the situation occurred, the tendency to seek compensation for the wrongs suffered at the expense of yet-weaker ethnic groups would usually appear. The gaining of political freedom is an act of historical justice, but one ought not to forget that the regained freedom can bring about new injustices and the fight for new domination.

Freed from imposed ideology and Soviet hegemony, the societies of Central and Eastern Europe, have not yet been able to rid themselves of mutual animosities and enmities, which may destroy them. Continuing economic difficulties and deepening social frustrations always create an opportunity for those ideologies and populist leaders who blame harsh living conditions on fellow citizens of different nationality, language or religious denomination. National minorities then become the victims of persecution. It is hard to predict what the future will bring, even the near one, to say nothing of the farther. One can hope that the evolution of political relations within the whole of the European continent will tend consistently towards the creation of open and tolerant societies, in which the attitudes of enmity with respect to the closest neighbours will gradually vanish. The time of potential achievement of such a desired state of affairs will depend upon hard-to-predict political events and the direction of economic, social and demographic transformations.

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REGULARITIES IN THE TIME SERIES OF MEAN DAILY TEMPERATURE IN POLAND 1956–1990

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ABSTRACT: Mean daily temperatures for 10 Polish meteorological stations from the period 1956–1990 were examined from the point of view of their periodicity. Classical spectrum estimation based on the Fourier transformation of the autocorrelation function was used. Particular attention was paid to similarities in power spectra for different stations. Two significant and well-marked periods are characteristic of time series for all the stations analysed: ~7.3 years and 196 days. Other common climatic fluctuations such as quasi-biennial, quasi-five-year or quasi-eleven-year oscillations were not found and neither were shorter cycles of the order of days or tens of days.

KEY WORDS: Poland, temperature, spectral analysis, climate dynamic.

INTRODUCTION

As one of the most fundamental aspects of their determinism, the periodicity of different atmospheric phenomena, has long been the subject of study. Papers touching upon the problem are numerous and difficult to synthesise analytically (e.g. Burroughs 1994; Lamb 1981). The possibility of an influence of external, astronomical factors has been suggested, as well as those of changes in the Earth's geophysical parameters or internal fluctuations of the climatic system. On the other hand, available time series for various meteorological parameters and proxy data have been examined from the point of view of their regularity. A review of these works could lead to the conclusion that one can find almost any frequency as a dominant in climatic variability, especially for short (<10-year) time scales. To avoid this problem, more sophisticated statistical algorithms have been used beside classical spectral estimation based on the Fourier transformation of the autocorrelation function (Blackman and Tukey 1959). Among them the most widely used are: maximum entropy spectral analysis (Burg 1967; Barrodale and Ericson 1980), the non-integer method (Schickedanz and Bowen 1977), the G-spectral method (Gray et al. 1978) and the maximum likelihood method (Lacoss 1976). More recently Ghil and Vatuard (1991) analysed global

temperature records with the fully non-parametric, data-adaptive, singular spectrum method (Broomhead and King 1986, Fraedrich 1986). However, the problem of the existence of non-trivial cycles in meteorological phenomena still seems to be open.

Stability in the time of the detected periods is a separate issue. The concept of the “dynamic” (temporally mobile) spectral analysis has been applied to both temperature and precipitation data (Junk 1983; Brázdil 1986; Schönwiese 1987; Malcher and Schönwiese 1987; Kozuchowski et al. 1994), and the results show clearly that the power spectra themselves change with time. This corresponds well with the approach treating the atmosphere as a non-linear dynamic system (e.g. Zeng et al. 1993) having a strange attractor. In such cases power spectra are not an invariant of the system in general and might vary randomly with time (Abarbanel et al. 1993).

Although numerous investigations testify to the existence of various periods in climatological data, some of rhythms deserve to be recognised as more probable either because of their repeatability or because of their hypothetical genesis. Maksimov et al. (1977) suggest 2–3, 5–7, 10–11, 18–21 and ~100 year cycles as the most important. Such cycles have also been detected in global records as in data from particular places or regions. Northern Hemisphere temperatures fluctuate with frequencies of 2.05, 2.4, 5.3 and ~100 years (Schönwiese 1983). Similar (2.2, 3.1, 5.2, 7.3, 15, 23, ~100 years) cycles have been observed in the spectrum of temperature from Central England (Schönwiese 1981). In the case of the Polish climate, Kozuchowski et al. (1994) found a few significant signals in the interval from 2 to 11 years in long-term temperature data for Kraków. Miętus (1994) detected 7.35- and 2.27-year periods for winter temperature on the Polish coast which coincide with similar results for Baltic Sea ice conditions (Girjatowicz and Kozuchowski 1995).

The main purpose of the present work is to test Polish temperature records from the point of view of their regularity¹. Investigations focus on the relatively short cyclic behaviour of the order of between one month and ten years. In spite of many theoretical suggestions concerning quasi-biennial oscillations (e.g. Landsberg and Kaylor 1976; Schönwiese 1974), quasi-five-year oscillations (e.g. Fleer 1981; Schönwiese 1974), seven-year oscillations (Maksimov et al. 1977) or the well-known 11-year solar cycle, the problem of their existence in meteorological records does not seem to have been definitely solved yet. Particularly suspicious is incoherence of the power spectra from neighbouring stations. Since annual or monthly data were used in the majority of previous work, it is possible that some spurious cycles appeared as a consequence of the smoothing procedure. Hereafter original daily data are analysed. If the postulated few-year oscillations exist in the temperature data, they should become visible in such series, too. Similarities of power spectra should be treated with particular caution. As a manifestation of the

¹ Terms such as regularities, periodicities, cycles, oscillations and fluctuations are synonyms.

governing dynamic they might be an even more important criterion of peaks' significance than sophisticated statistical tests (see section 3 for details).

DATA AND METHODS

Tests of periodicity made use of observed mean daily temperature series for 10 Polish meteorological stations for the period 1956–1990. The map in Figure 1 indicates the locations in Poland of the stations for which data were analysed. The length of series (35 years = 12784 days) is too short to detect long climatic variations, but would seem sufficient for the research undertaken. The first step before further analysis consists of the removal of the annual course which masks other potential cycles. This fundamental harmonic was detected using the Fourier analysis (35-th Fourier harmonic). Thus the time series, $x(t_i)$, values of temperature ($i = 1 \dots 12784$) are well fitted by the following expression:

$$\tilde{x}(t_i) = A_0 + A_{35}\cos(2\pi \cdot f_{35} \cdot t_i) + B_{35}\sin(2\pi \cdot f_{35} \cdot t_i), \quad (1)$$

where: $A_0 = \bar{x}$, $A_{35} = \frac{2}{n} \sum_i x(t_i) \cdot \cos(2\pi \cdot f_{35} \cdot t_i)$, $B_{35} = \frac{2}{n} \sum_i x(t_i) \cdot \sin(2\pi \cdot f_{35} \cdot t_i)$,

and $f_{35} = 35/12784$. $\tilde{x}(t_i)$ stands for the original series $x(t_i)$ estimation by the mean and the annual course. The values of parameters A_0 , A_{35} , B_{35} for analysed stations are grouped in Table 1.

As an example of goodness of fit, Figure 2 shows both the plot of the theoretical annual course (solid line) estimated from the above equation (1), and 35-year mean values of temperature for each day of the year (dots) for the Łódź station. Once the model had been defined, the seasonalities were removed from the time series in the usual way:

$$u(t_i) = x(t_i) - \tilde{x}(t_i) \quad (2)$$

and these reduced temperatures, $u(t_i)$, were next investigated from the point of view of their periodicity. Such methods remove only the pure sine signal related to the annual course leaving other cycles undisturbed. Thus it is more appropriate

Table 1. Fourier components for the annual course model for analysed stations

STATION	A_0 [°C]	A_{35} [°C]	B_{35} [°C]	STATION	A_0 [°C]	A_{35} [°C]	B_{35} [°C]
Gdańsk	7.53	-8.93	-3.77	Łódź	7.72	-9.96	-3.15
Suwałki	6.11	-10.64	-3.55	Wrocław	8.37	-9.43	-3.00
Szczecin	8.47	-9.02	-3.21	Kraków	7.97	-10.00	-3.01
Poznań	8.23	-9.70	-3.13	Przemyśl	7.93	-10.15	-3.18
Warsaw	7.93	-10.32	-3.18	Zakopane	5.16	-9.14	-3.19



Fig. 1. Map of Poland indicating stations for which data were analysed

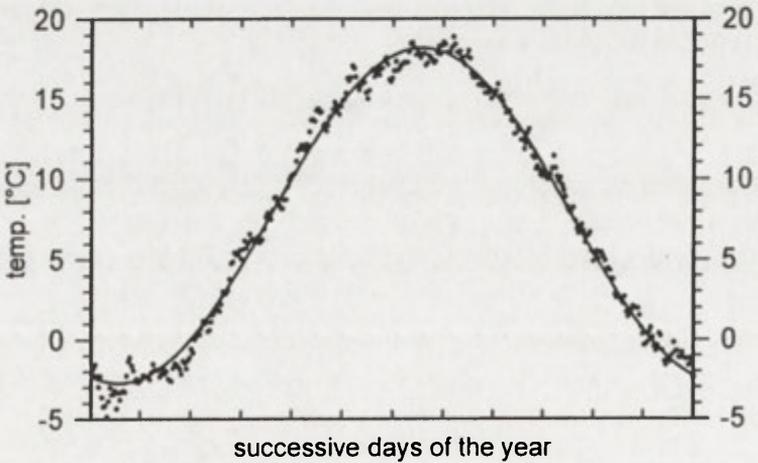


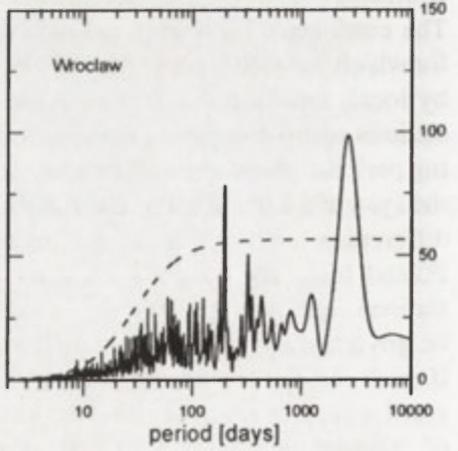
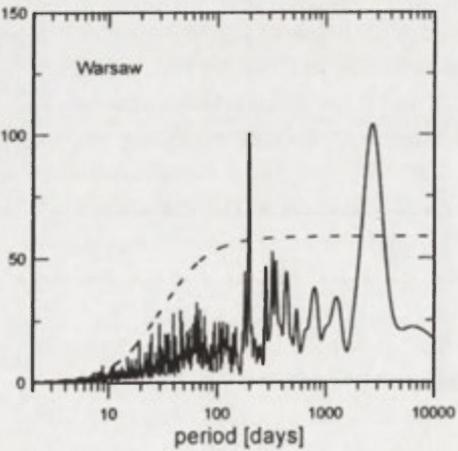
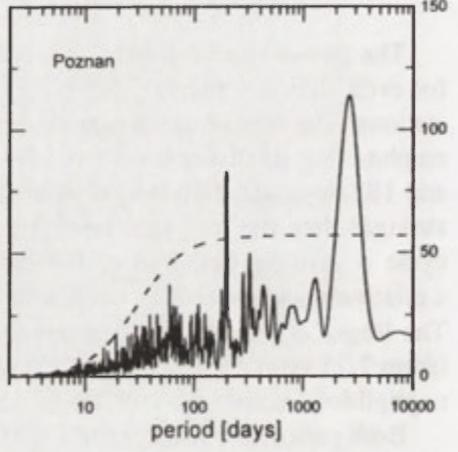
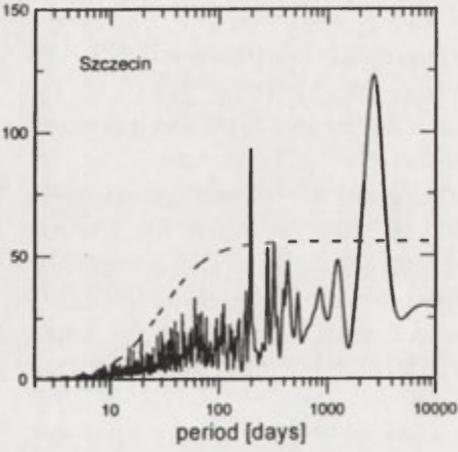
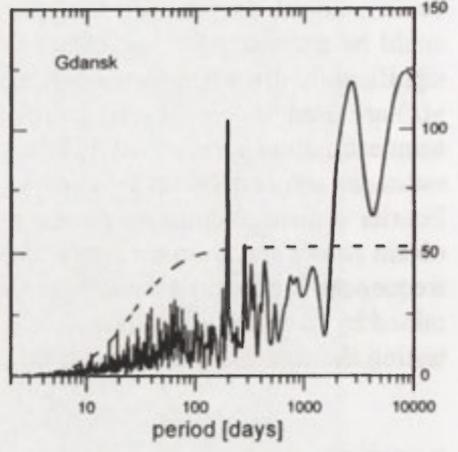
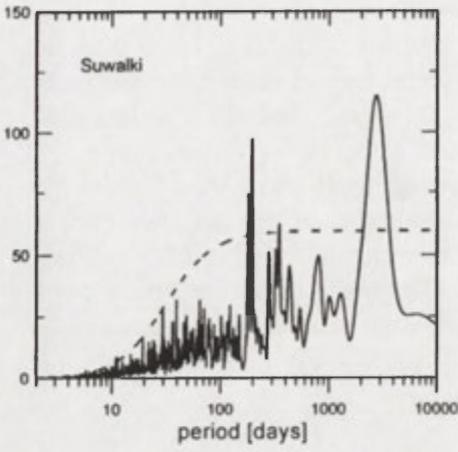
Fig. 2. Annual course of temperature in Łódź. Solid line indicates fitted model; dot: represent averaged values from the period 1956–1990

for the assumed goal than the subtraction of average (35-year) values for successive days of the year. Dividing each $u(t_i)$ by the appropriate standard deviation could be necessary for particular statistical analysis of the data, but it does not significantly disturb detected periods. In the next section reduced temperatures $u(t_i)$ are used to detect cyclic components of the signals with the classical spectrum estimation popularised by Blackman and Tukey (1959). The technique first estimates autocorrelation function values (for lags from 1 to 6392), and discrete Fourier transformations of the estimated autocorrelation lags are then used to obtain power spectrum estimates. A slight modification is the use of non-integer frequencies to obtain a smoother spectrum. The choice of the method is determined by its relative suitability for computing large numbers of the data and for testing the significance of spectrum peaks.

RESULTS

The power spectra for the reduced temperatures, $u(t_i)$, are shown in Figure 3 for each station separately. Two very well-marked peaks are evident for all the stations. The first of the dominating periods is equal to 196 days, and it is worth emphasising its distinctness from half-year fluctuations. The two peaks (of 196 and 182 days) are definitely separated, with the former component usually much stronger than the half-year one. An exception is Przemyśl, where the 186-day cycle is stronger than that of 196 days. A second regularity is characterised by a relatively wide spectrum band with a maximum around 7.37 years (2690 days). The length of the strongest harmonic fluctuates a little depending on the station (from 7.25 years for Poznań to 7.50 years for Suwałki), but these fluctuations are negligible as compared with the band range.

Both peaks (of 196 days and 7.37 years) are statistically significant at the 99% confidence level for the theoretical red noise spectrum for most of the stations. The confidence level only exceeds the peaks for Zakopane, a mountain station for which the global properties of temperature variation in Poland may be masked by local, topoclimatic, features. The fact that both cycles are observed for all stations seems even more important than the statistical validation. When analysing periodic phenomena one should keep in mind that they are a manifestation of the system's dynamic. For the analysed time scale it is hard to believe that major differences might appear at stations separated by only tens of kilometres. Across Poland there are no physical boundaries changing the physical conditions of stations significantly, so there is no reason to suspect that climate variation might be governed by a completely different dynamic in such closely-situated places. If such differences appeared on a climatological time scale over the relatively small area, they attest to either the stochastic nature of the signals or to some kind of 'climate turbulence'. In both cases, the detected cycles, being random or non-stable, would be of very limited importance.



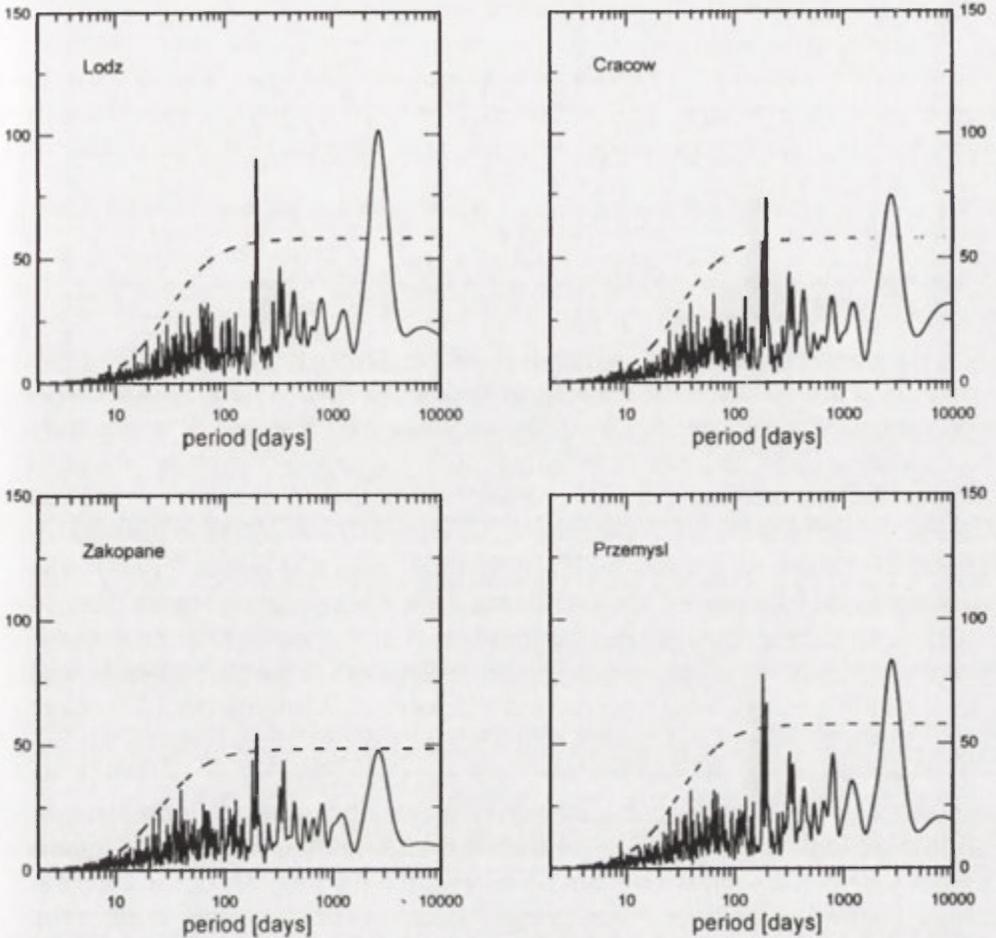


Fig. 3. Power spectra (in arbitral units) of mean daily temperatures for analysed stations. Dashed line indicates 99% confidence level for theoretical red noise spectrum

In line with the above remarks, other peaks marked at particular stations only, even ones exceeding the critical level for red noise, are not regarded here as representative of real cyclic behaviour of temperature. High peaks usually appear for waves a few (4, 6, 9 or 20) days long and probably reflect the persistence of various weather types over Poland. Unfortunately, such frequencies are represented by a very narrow spectrum which tapers only with high values mixed with low ones. For instance, the 3.984-day cycle is strong, whereas those of 3.986 and 3.982 days are weak. It is quite difficult to give reasons for such separation, or for the fractional value of cycle length (based on daily means). Thus, these cycles

are excluded from further analysis as probable random fluctuations of the power spectrum of neither physical nor practical significance.

Some comments are necessary in regard to the upturn at the end of the (very long-lasting) spectrum for Gdańsk. It is a spurious cycle which appeared due to inhomogeneity of the time series. Changes in the station's location caused a shift in long-term mean temperature which has been detected by the procedure as a very long fluctuation.

DISCUSSION

The results presented in the previous section testify to the existence of two non-trivial regularities in the temperature time series from Poland: a quasi-seven-year regularity and one of 196 days (~6.5 months). The first is a relatively well-known cycle and one detected by different authors for many places in Central Europe. Malcher and Schönwiese (1987) found 7.7-year periods to be as characteristic of the last few decades for all region III (according to their classification). Their results were confirmed by Charvátová and Štréštic (1994), who pointed to the existence of 7.8-year fluctuations in temperature records from 13 stations in Central Europe. As was mentioned in the introduction, the quasi-seven-year cycle was found in changes in the ice cover of the Baltic Sea, as well as for Polish coastal temperatures and the local circulation index. The more than-150-year long record from Kraków exhibits similar periodicity for the annual and lowest mean monthly temperatures (Kožuchowski et al. 1994). At present, no certain explanation can be given for the-quasi-seven year oscillations. However, some prerequisites of meteorological situations, appearing as quasi-seven-year pseudo-periodicity, can be drawn from the time run of the temperatures. Figure 4 presents the mean monthly values of reduced temperatures, $u(t_i)$, from the Łódź station (courses for other stations are similar). A few instances of very cold winter months immediately spring to mind: Feb. 1956, Jan. 1963, Dec. 1969 and a triple 1985–1986–1987. Probably these winters with extremely low temperatures are crucial for detecting quasi-seven-year oscillations by the proce-

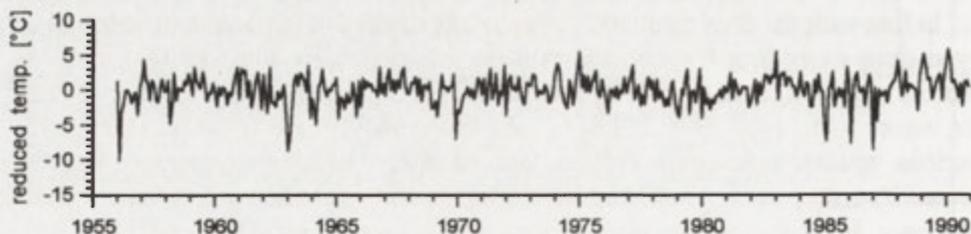


Fig. 4. Long term run of mean monthly values for reduced temperatures $u(t)$

ture used. The above remark does not solve the question as to whether they are a manifestation of regular periodic behaviour or just a random sequence of severe conditions, but emphasises the synoptic situation in the winter season as the most important for possible regularities.

A separate issue is the spatial distribution of the detected periods. The seven-year cycle is strongest for the station situated in North-West Poland and becomes weaker to the South and South-East. To find a spatial domain of the cycle annual averaged temperatures from the period 1951–1990 from about 150 European stations (World Climate Disc) were examined using the MESA method. The results attest to the existence of a quasi-seven-year oscillation in all Central and Western Europe – very similar to Malcher and Schönwiese's (1987) region III enlarged by the South Baltic, Hungary and Romania. The fact that the cycle vanishes in northern Scandinavia and Iceland goes against suggestions regarding possible causes in the Greenland region (Nikiforov and Shpaikher 1980). Moreover, the regional character of the regularity appears not to confirm suggestions regarding external, astronomical causes of the cycle (Charvátová and Šteštic 1994).

The second of the significant periods is even more difficult to interpret, 196-day oscillations are not common in the literature. As was stressed in the previous section, they are different from half-year oscillations and no physical causes for such cycles are known. However, a non-linear dynamic system does not require an external periodic force to generate periodic fluctuations. Some cycles could occur as a consequence of the system's inertial dynamic or as interferences with spectral noises (James and James 1989; Weaver et al. 1992). Moreover, in the case of a strange attractor, the phase trajectory may stay near an unstable periodic orbit for a limited time only with its further behaviour becoming unpredictable. As neither a power spectrum nor an autocorrelation function are invariants of the system in the non-linear case (Abarbanel et al. 1993), they have only limited, local (short-term) meaning. Such suggestions seem to be supported by the results of investigations in which moving spectral analysis was used (Brázdil 1986; Schönwiese 1987; Malcher and Schönwiese 1987; Kozuchowski et al. 1994).

When analysing periodic features of climatological time series it is useful to raise the question of the importance of the detected regularities. The confidence levels of spectra peaks may be one indicator of this, but it is good to supplement them with information on percentages of variability of original time series connected with the detected periods. In the case analysed both cycles explain only 2–3% of the variability in time series for the original daily values of reduced temperatures $u(t)$. However, one must remember that the inter-diurnal changes of temperature are determined by synoptic-scale processes, whereas detected cycles are characteristic for climatological-scale fluctuations. The situation changes when monthly and annual averages are calculated for the reduced temperatures (Tab. 2).

Table 2. Percentage of variability of mean monthly and mean annual values of reduced temperatures, $u(t)$, explained by the detected cycles (7.37 years, 196 days)

Station	Mean monthly temp., cycles 196d+7.37y	Mean annual temp., cycle 7.37y
Gdańsk	10.6	22.4
Suwałki	10.5	34.1
Szczecin	12.6	44.7
Poznań	12.1	47.2
Warsaw	11.6	42.5
Wrocław	11.5	49.4
Łódź	11.8	44.1
Kraków	8.7	32.9
Przemyśl	9.6	41.5
Zakopane	8.0	38.9

While for monthly values the two cycles explain as much as 7–12% of the variability, for the annual means the situation is even better with 30–50% of the variability being explained by a quasi-seven-year fluctuation for almost all of the stations. Such a conclusion is not in contradiction with the visual impression as to the long-term run of annual averages for reduced temperatures (Fig. 5).

The computed power spectra do not attest to the existence of other commonly-postulated cycles characteristic for the analysed time scale. In particular, quasi-biennial oscillations, which according to Burroughs (1994) must be regarded as a real feature of almost all meteorological records, have not been found. Neither high peaks nor similarities in power spectra are observed for such frequencies. The fact that quasi-biennial oscillations have been detected for the area of Poland by authors working with annual data suggest that they could be a numerical consequence of using averaged data. They should thus, be re-examined with more frequently-measured values, even if physical backgrounds for such cycles exist. Cycles of ~ 5 and ~ 11 years do not appear either, but the low spectral resolution of the method for long periods does not allow for resolution of the

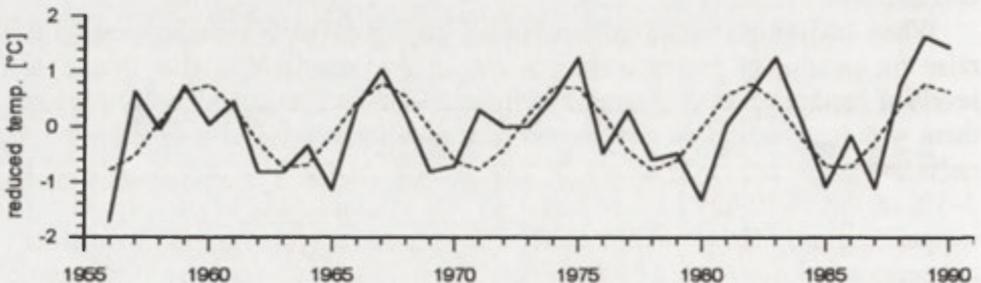


Fig. 5. Long term run of mean annual values for reduced temperatures, $u(t)$, (solid line) and model of 7.37-year periodicity calculated with the aid of Fourier analysis (dashed line)

question as to whether they do not exist in general in the analysed time series, or are simply grouped together with the dominating ~ 7.37 -year one. Similarly, no meaningful cycles of the order of tens of days, which could be interpreted as periods of persistence of weather regimes, were found. In the synoptic time scale the 8.82-day periods possess the strongest peak (even statistically significant at the 99.9% level for most of the stations). The origin of this frequency is unknown, but even if it could be interpreted as a characteristic synoptic scale (the opposite explanation is that it is an echo of 'Kelvin waves'), it should be understood as an average period for the existence of a weather system over Poland. It leads to the rather trivial conclusion that some types of weather can persist for a few days.

CONCLUDING REMARKS

This study aims to find characteristic temperature fluctuations over Poland and to compare them with regularities postulated by other authors. The results confirm the existence of ~ 7.37 -year and 196-day periods. Although the presented power spectra exhibit strong values for these frequencies, one should keep in mind the non-linear character of the weather system. As pointed out in the previous section, detection of cycles in the analysed period does not in such a case prove their existence in the past as well as the future. It imposes restrictions on their utility in predictions and reconstructions of the temperature regime over the area of Poland. On the other hand, it is possible that the cycles are stable over a longer period and that they describe real regular weather fluctuations. The observation that very cold winter events are crucial for the possible quasi seven-year cycle suggests that it should be understood as a repeating, state of the atmosphere with such a frequency, rather than as a smooth sine oscillation.

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