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Industrial Clusters and Cluster Policies in Austrian Regions

by Franz Tödtling[19]

Conceptual Introduction

The cluster concept has become highly popular in recent years, leading to considerable variation and even confusion regarding the understanding of the term. A recent OECD publication (1999a, 56) defines clusters as "networks of interdependent firms, knowledge-producing institutions, bridging institutions and customers, linked in a production chain which creates added value. The concept of cluster goes beyond that of firm networking, as it captures all forms of knowledge sharing and exchange .... and it also goes beyond traditional sectoral analysis". There are vertical links between suppliers and customers, horizontal links between competitors, as well as links to various support organisations. Some of those relationships go beyond mere market transactions and can be considered as networks. Geographically, relevant parts of clusters may be concentrated in specific regions or countries, but often they reach beyond these borders and become linked into international or even global networks (e.g. through international firms, alliances and market links). Due to this insertion into the large-scale markets and networks, clusters are rather dynamic phenomena leading to various forms of global-local interaction.

There are a variety of cluster approaches, both conceptually and methodologically (see e.g. OECD 1999b, Steiner 1998, Bergman and Feser 1999). In terms of levels of investigation we find them at the macro-, meso- and the micro levels, where usually different intentions and goals are followed. As far as methodology is concerned, we observe the use of input-output analysis, multivariate statistical techniques, graph and mapping techniques, surveys, as well as the use of more qualitative analysis based on interviews. There is also variation regarding the role of policy: While many clusters can be regarded as rather spontaneous phenomena, others seem to be strongly influenced by regional or industrial policy (e.g. the in cases of Wales, the Basque Country or Styria, see Cooke et al. 2000).

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Clusters often become elements of wider regional or national innovation systems to which they relate in various ways. Such systems are usually made up of several clusters which may partly overlap. In the Austrian region of Styria e.g. we find a more recent automotive cluster which is related to an older metal and materials cluster and its institutions in various ways. Compared to clusters, innovation systems comprise more generic and diversified knowledge and support organisations, while in the clusters these are focused on the respective industries or technologies. The manner in which clusters are integrated into wider regional and national innovation system is important for their long-term capability to adjust to new conditions and to innovate. An example of such might be the Styrian metals and materials cluster, which seems to have been successfully restructured partly through support of the wider regional innovation system, as will be shown below.

Why are clusters considered as beneficial for the economic development of a region or a country? We can find several arguments in the literature. The first has to do with static efficiency, i.e. the saving of transaction costs through spatial proximity and economies of scale. This applies e.g. to just-in-time concepts of production organisation or the provision of collective infrastructure for the cluster. Secondly, we find that clusters are often used as tool to market the region to foreign investors and to give the region a distinctive profile (location policy, attraction of investment). Thirdly, there is the expectation that clusters enhance the learning capability of regional firms and other actors. There may be various levels of learning involved (Steiner and Hartmann 1997). At the lowest level there is simple learning (1) through faster transfer of new technologies as well as of new organisational and management practices to regional firms. In this case regional firms are modernized and upgraded to best practice technology e.g. through the integration into supply chains, quality improvement and certification. Then there is interactive learning (2) which implies a collective search for new solutions and joint innovation activities. Learning to learn (3) would be at a higher level and refers to the collective enhancement of the learning capability of firms and organisations in the region.

Many cluster activities and policies seem to be related to economies of scale, the focused marketing of regions and knowledge transfer. True interactive learning and innovation, as well as learning to learn probably occur less frequently than is stated by many proponents. Nor should it be forgotten that cluster policies not only have benefits but may also imply considerable risks due to a high degree of specialisation and potential processes of “lock in” (Grabher 1993, Steiner 1998). The following discussion gives a brief overview of cluster approaches in Austria at the national level, followed by an investigation of the cases of Styria and Upper Austria, in particular.

Cluster Approaches at the National Level in Austria

At the national level the cluster concept became more prominent during the first half of the 90s influenced by Porter's writing (1990). Studies were undertaken by IWI (Institute for Industry Studies) and WIFO (Austrian Centre for Economic Research) which tried to identify clusters in the Austrian economy and draw respective policy conclusions (Lehner et al. 1998). The Austrian TIP program (Technology, Information, Policy consulting) and related OECD activities have served as an umbrella for some of these efforts (Peneder 1999).

Two studies followed Porter's approach to identify *internationally competitive clusters*: The WIFO study (Peneder 1994) classified industries (3-digit level) into Porter's *product groups*. Based on five indicators (international market share, specialisation, rank in international division of labour, export price level, export distance) the international competitiveness of product groups was measured. Through statistical cluster analysis, 13 internationally competitive product groups belonging to eight clusters were identified. These were timber-wood, materials-metal, rail-transport, engines-motors, food, textiles, glassware, and TV sets.

A study by IWI (Weiss 1994) chose a different method. It started with 4-digit product groups of the trade statistics (8609 export groups) and classified them according to their competitiveness using the indicators of "unit values" and "cash flow". Information on linkages was gathered through various kinds of information, as well as through interviews with key persons. Competitive products were grouped into 11 clusters of different levels of development. This produced the following cluster landscape for Austria:

- Strong clusters (ski winter sport, automobile parts),
- Semi-strong clusters (construction, metals-metal products, textiles-clothing, paper-wood, rails),
- Potential clusters (environmental technology, medical technology, measurement techniques, biotechnology), and
- Latent clusters (food, plastics, chemicals).

Hutschenreiter (1994) from WIFO had another approach. He tried to identify *technology clusters* based on the analysis of patent data for companies. He used a sample of 156 firms with 3053 patents which were grouped into 19 clusters and 5 cluster groups according to the similarity of the patent activity. The identified cluster groups were electro/electronic-telecommunication, transport, construction/housing, ski-sports-utilities, pharma-chemicals. Comparing these macro approaches we find some overlap in the identified clusters but also some differences, demonstrating that the methodology used matters.

Finally, detailed *case studies of specific clusters* were undertaken within the TIP Program by WIFO and Austrian Research Centre Seibersdorf in the following areas:

- Wood/paper,
- Telecommunication,
- Pharmaceuticals,
- Multimedia and culture.

At the national level the results of all these studies did not bring direct results in an explicit cluster policy for several reasons: Firstly, there are no clear industrial policy competences in Austria, since several ministries and agencies are involved. Secondly, there was the feeling that cluster policies were too targeted and that it is too risky "to put all the eggs in one basket". At a lower level of policy intensity, however, the conclusions of the above studies have informed policy makers and had some results:

- There was an "umbrella" research effort for wood and paper production.
- There were regulatory changes regarding the telecommunications sector.
- Cluster ideas, such as interactive innovation and networking, were taken up in the 1996 technology policy concept.
- New technical colleges (Fachhochschulen) have been set up to strengthen university-industry links and to tailor the supply of education to the qualification demands of industry in specific regions.
- "Competence centres" are in the process of being established (K+ program). These are centres where universities, research organisations and firms work together on mainly applied research and technology development.

Like the new colleges, the competence centres reflect the industrial specialisation and partly the clusters of a certain region. The selection occurs in a bottom up approach, i.e. the initiative and proposal has to come from the region and there is a competition with other regions.

Cluster Approaches at the Regional Level – Styria as a "Cluster Pioneer"

At the regional level the cluster approach has been used more often in a policy context and in a few regions we could speak of an explicit "cluster policy". Styria has taken the lead and Upper Austria and other provinces have followed.

In Styria the field was prepared through concepts of endogenous regional development in the 1980s as well as through the development of a well functioning regional innovation system (Tödtling and Sedlacek 1997, see Fig. 1). In a European research project on regional innovation systems (REGIS project, see Cooke et al. 2000) Styrian firms were found to be quite innovative and had well-developed innovation networks both in the region and beyond. Compared with other regions the multilevel character of the innovation networks of firms in Styria was pronounced and in particular the larger firms were linked with European and global firms to a high degree (Tödtling und Kaufmann 1999).

A more explicit technology and cluster policy started in Styria in the 1990s with two studies, the "Technology policy concept" (Steiner et al. 1996) and "Wirtschaftspolitisches Leitbild" (Fabris et al. 1995). The first study, by Joanneum Research, addressed the broader issues of technology policy and has aimed at a coherent approach for the region. The second study, by IWI, investigated clusters in Porter's understanding for Styria. It used the same methodology to identify competitive clusters as the IWI study for Austria (Weiss 1994). 107 industries (3-digit level) were grouped into 11 clusters, based on criteria of similarity and complementarity with respect to markets, distribution-structure and supplier-client relations. The authors did the clustering on the basis of secondary data and on their experiences of industrial studies in Austria, not on the basis of primary data gathered from Styrian firms. The result is pictures of "potential" clusters rather than "real" clusters based on interaction data. The largest cluster identified in the Styrian economy was in "materials-metals" (30% of Styrian industry sales), followed by "wood-paper" (20%), "construction-housing" (12%), "food" (11%) and "vehicles-transportation" (10%). In relative terms (as far as Austria is concerned) "wood-paper" and "materials-metals" were dominant, followed by "vehicles-transportation".

Materials and Metals

This cluster represents the industrial core of Styria and is both the oldest and the largest one. The IWI study (Fabris et al. 1995) counted 155 firms, employing a staff of 23,300 and contributing about 1/3 of the total Styrian industry sales. The cluster includes mining, iron and steel, non-ferrous metals, metal processing and metal goods, tools and machinery. The dominant product groups are iron and steel production (48% of cluster sales) as well as steel construction (15%). University research (TU-Graz, Montanuniversitiät Leoben) and other research institutions (Joanneum Graz) are also part of the cluster (see Fig. 2).

After the Second World War an important political decision was taken, namely the nationalization and strategic promotion of basic industry, resulting

in strong growth of those industries in the period of reconstruction until the sixties. Competitive advantages were initially the proximity to mining and sources of energy; later they shifted to technological advantages, based on major innovations such as the LD (Linz-Donawitz) process of steel making in the early 1950s or the COREX process in the 1980s. In the post-war period the cluster was characterised by strong unions and direct interventions of the federal state as owner of the largest firms. The social partnership was functioning smoothly until the 1970s guaranteeing employment security and high wages for workers.

In the seventies conditions changed for the worse. Eastern European as well as newly industrializing countries represented new competitors, while total demand e.g. in the steel industry did not increase to the same extent. So there was oversupply and prices deteriorated. At first, state owned firms tried to keep up employment, but after a while such "labour hoarding" produced huge losses. Since the 1980s privatization and restructuring resulted in severe employment cuts, particularly in Upper Styria, an Objective 2 area forming the core of this cluster. Here, employment fell from 22,700 in 1986 to only 9350 in 1994, while the number of companies increased from 19 to 38 in the same period (Steiner and Hartmann 1997).

In a first phase of restructuring, state-owned firms tried - although not very successfully - to diversify into high-tech industries, some of which were unrelated to their existing business, and to build a large technology firm under central control. More recently this strategy has changed: the state firms have been split up, partly privatised and control decentralised. Their managements now focus more on their respective core activities and most of the firms have regained their competitiveness. Examples are the restructuring of Voest-Alpine AG into successful smaller units (VA Stahl AG, VA Technologie AG, VA Bergtechnik AG), as well as the change of the state owned VEW (Vereinigte Edelstahlwerke) into the private and now international Böhler-Uddeholm group. A number of spin-offs have also occurred as a consequence of the restructuring. A number of organisations of the regional innovation system (see Figure 1), have also played an active part in the renewal of the cluster, in particular the universities and research organisations (Montan Universität Leoben, TU Graz, Christian Doppler Laboratories, Joanneum Research); as well as the technology centres (e.g. in laser technology), technology transfer agencies (TTZ Leoben), and incubators.

At the Austrian level a *Metallurgie Forum* was founded, to enable co-operation between leading Austrian firms in the areas of process technology and automation (Bratl et al. 1997).

Looking at the actual innovation networks of firms in the respective sectors we find varying results. In the REGIS a firm survey showed that

innovation partners from the region were not frequent in this sector (Kaufmann and Tödtling 2000). Many firms were found to be inward looking and only a few were engaged in innovation networks. These networks were partly within the region, but more often at national and international levels. On the other hand, Steiner and Hartman (1997) in qualitative interviews with 25 key actors identify several learning networks in this cluster. Most of these were vertical (with customers and suppliers), but there were also some horizontal links and connections with knowledge suppliers. In the latter study, regional and larger scale networks were found to have about the same frequency.

Concerning the role of policy, we find that public actors have been quite important for the transformation of this cluster. In the past this occurred through the state-owned industry and the system of social partnership. At present, policy emphasis has shifted more towards encouraging innovation and technology, both at the federal and Land level, with an emphasis on infrastructural improvement. Up to now, however, only the first steps (*Sondierungsprojekt*) have been taken towards a cluster policy in materials and metal.

To sum up, materials and metals is basically an old cluster in the process of restructuring and transformation since the 1980s. An enormous loss of jobs has more recently been followed by an interesting shift towards specialty and high quality products. Examples of such are special high quality rails, high quality steel for machine tools, new compound materials, new techniques to cut or transform metal, etc. A major driving force has been organisational change, namely the privatisation and decentralisation of state-owned firms, leading to the internationalisation of the sector (passive and active) as well as to new firm formation.

Vehicles and Transport

This is currently the strongest growing cluster of the Styrian economy and it consists of a rail and an automotive segment. The former includes firms like Simmering Graz Pauker (owned by Siemens) producing locomotives and wagons, Voest-Alpine supplying special quality rails for high-speed trains (Donawitz), targets including electronic controls (Zeltweg), as well as a world market leader in machines for rail construction (Plasser & Theurer in Vienna). In the automotive cluster, on which we focus in the following, there are both endogenous firms such as Steyr Fahrzeugtechnik (now owned by Magna), AVL List and foreign firms which have been set up in the past 10 years, such as Chrysler and Magna. The IWI study (Fabris et al. 1995) counted 37 firms with 7800 employees in the cluster. It contributed 10% to Styrian industry sales and was growing fast (by +162% between 1987 and 1992). More recently (1999) the automotive cluster (AC Styria) included, according to official information, about 150 firms and 13,000 employees (see Fig. 2).

In this cluster some firms produce high-value components (such as gearboxes and 4-wheel drives manufactured by Steyer Daimler Puch in Graz), as well as other auto components (such as axles, seats, leather interior units, steel cord for tires, glass for front windows, exhaust systems, and parts for racing cars). Then there are assembly plants, such as Chrysler (Eurostar) for vans, recreational vehicles and jeeps. But there is also a world-leading research and development firm for combustion engines (AVL List) as well as related research capacity at TU Graz and Joanneum Research. AVL List has technological strength in the development of combustion engines but also in testing, measurement techniques, computer simulation and software.

The automotive cluster has developed to a considerable extent as the result of explicit policy decisions both at the federal and the Land level. At the federal level the policy since the mid-1970s was to promote Austrian subcontracting to the international car industry in order to reverse the balance of payment deficit in that industry. Now there are a few hundred firms in Austria related to the car industry. At the Land level the policy was to attract international firms (such as Chrysler, Magna) which could serve as lead firms in an emerging cluster.

In 1996 a policy initiative was launched in Styria by the Association of Industrialists together with SFG (Steirische Wirtschaftsförderung) in order to strengthen this cluster and to intensify and improve subcontracting with Styrian firms (AC Styria). Those subcontractors face the challenges of the opening of Eastern Europe (low-cost competition), of rising quality standards and of a concentration process in the subcontracting industry. In order to stay competitive Styrian firms had to improve their quality and develop towards becoming system suppliers. AC Styria is intended to link regional and international firms and knowledge suppliers. International firms are considered as flagships and providers of know-how and competence (e.g. with respect to new demands in subcontracting). Cluster activities have been undertaken in several areas:

- Awareness raising, information and communication (through platforms, workshops, events),
- Stimulation of co-operation (networking activities),
- Qualification (establishment of a new college, internet-based further training network), and
- Marketing activities to make the cluster internationally known and to attract foreign firms.

The foreign firms attracted so far have played their role as flagships for marketing the region and have also developed subcontracting relations to

Styrian SMEs, but to what extent they are also partners in learning networks has yet to be determined. The role of the foreign firms in the region is not always without conflict. A case in point is Magna, which does not want to accept the Austrian system of labour representation in the firms (shop stewards according to labour law). Its conflict with the union is now being decided in court. Conflicts like this have been rather uncommon in Austria so far, but might become more common with the recent political changes towards a center-right government in the future.

On the basis of the results so far, we conclude that the cluster has to a high degree the character of a marketing tool for the region. It also serves as tool for developing and upgrading suppliers in the region through the diffusion of best practice. It is not clear to what extent innovation and interactive learning is also involved. There is a database on the web concerning requests for co-operation, as well as some joint projects between the larger firms (e.g. a common acoustic research centre, a training network and some other activities: Steiner and Hartmann 1998), but generally this aspect seems relatively undeveloped at present. Although there has been no systematic evaluation so far, the AC Styria is regarded by many as the most successful case of cluster policy in Austria and it has been used as a marketing tool by the responsible politicians (from the conservative People's Party). This political success was regarded with envy by the junior partners in government (Socialdemocrats) which felt that they could not benefit enough from this approach. Obviously, the monopolisation of the cluster by one political group runs counter to the Austrian style of consensus- seeking and has led to political stalemate concerning future cluster projects in Styria, in particular those intended for the wood cluster. Recently the automotive cluster has been left to stand on its own two feet, i.e. it is no longer financially supported by the Styrian government but it has become self-financing. It remains to be seen to what extent firms will be willing to carry on with the cluster under these conditions.

Upper Austria – the "Smart Follower"

Upper Austria, to the north of Styria, is the second province with an active technology and cluster policy, although here the efforts are more recent than the policies in Styria. Upper Austria partly imitates the example of Styria (in particular regarding the automobile cluster), and partly follows an approach of its own. In general, there seems to be more reliance on market mechanisms and a smaller role for government, which may be due to the fact that the region had a better economic performance and fewer crisis situations in the past. The region also seeks co-operation with Styria e.g. with respect to the automobile and the materials clusters. For policy makers in both regions there are obvious benefits to be derived from interregional co-operation in these fields.

The regional innovation system of Upper Austria is in many respects "thinner" than the one in Styria: There is no technical university, no major research organisation and a rather weak system of technology transfer. Important elements include the University of Linz (in particular with respect to information technology), the research park Hagenberg (software) and the technology centre FAZAT in the old industrial town of Steyr (see Fig. 3). Also relevant are some newly established colleges and two competence centres (materials and software). TMG, a regional development agency, plays a key role with respect to location and technology policy.

Upper Austria currently has an active cluster policy with respect to automobiles and most recently also in plastics (see Fig. 4). The first has historical roots in a local truck and arms industry (Steyr Nutzfahrzeuge, Steyr Antriebstechnik). Other endogenous firms are KTM (motorbikes) and Miba (mechanical parts for cars) and BMW (engine production), an international flagship firm, attracted in the 80s. Together with the Styrian AVL there is some competence with respect to diesel engines in the region, a fact which resulted in a special focus and sub cluster in this area (CDT). The cluster policy is still at a rather early stage (about two years old) with TMG its main promoter. Due to its young age not much can be said about experiences up to now, nor to what extent relevant relationships have been developed between firms.

Some potential for a cluster seems to exist in information and communication technologies. There is leading research at the university of Linz (mathematics, informatics), there are a number of young firms, partly spin offs, in the research park Hagenberg, and in other technology centres. There are new colleges in the fields of media engineering, software engineering, and automation technology and there is a major yearly event ("Ars Electronica") serving as a cultural background for these activities. There is some networking among the above-mentioned actors in this new field, but at present it cannot be said whether this might lead to a cluster in the future.

Conclusions

Cluster approaches have been applied in Austria both at the national and regional levels, although in different forms and intensity. We can draw the following conclusions: At the national level cluster approaches have been used mainly as analytical tools to identify competitive and technological strengths of the economy. Both macro- and case study methods were applied. The results were not translated directly into an explicit cluster policy but the ideas were implicitly taken up e.g. in the technology policy concept, the location of new colleges (Fachhochschulen), and of competence- and technology centres. Thus, we could speak here of a cluster-informed policy.

At the regional level the cluster approach was taken up more explicitly by policy makers. This was most strongly the case in Styria, but other regions followed. In Styria the approach was motivated by the need to restructure the regional economy and was supported by a well-developed innovation system. The most prominent clusters have strong roots in the region (this is particularly the case for materials-metal as well as wood-paper) although this does not imply that the most important linkages are still in the region. In particular the materials-metal and the automotive cluster are strongly internationalised as far as the firms, markets, and networks involved are concerned.

The automotive cluster was the main policy focus both in Styria and Upper Austria. The most important effects so far seem to be the marketing of the region(s) as well as the upgrading of local SMEs as suppliers of larger firms (knowledge transfer). There were steps towards interactive learning and innovation but to what extent substantial innovation networks have developed still has to be investigated.

There is a potential for policy learning both in Styria and Upper Austria: Styria can build upon the experience of AC Styria in the effort to build up institutions for the wood and materials/metal cluster, although the conditions are quite different. Upper Austria took the opportunity to imitate Styria to some extent (auto-cluster), but there is also potential for interactive policy learning since it soon became obvious that the automotive cluster reaches beyond the individual regions and there is need for co-ordination and joint policy approaches.

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Figure 1. The regional innovation system in Styria

Contract research Joanneum Research	Science/ University education Technical University Graz, Karl Franzens University Graz, University Leoben	Technical colleges Technikum Joanneum
➢ Environment/energy ➢ Informatics ➢ Sensorics ➢ Materials ➢ Economy/technology	➢ Architecture, construction engineering, machinery, electrical engineering, natural sciences ➢ Law, social sciences/economics, medicine, humanities, natural sciences ➢ Mining, materials	➢ Design ➢ Automotive technologies ➢ Information management ➢ Industrial electronics ➢ Business administration
Co-operative R&D-institutions At universities	Companies Emerging cluster structures:	Vocational training WIFI, BfI, HTL
➢ 9 Christian Doppler Laboratories ➢ Competence centre for materials (Leoben)	➢ Automobiles/railway technologies ➢ Metals/materials ➢ Wood/paper ➢ Environmental technologies	➢ Very broad range of training programmes in business adminstration and technology
Technology transfer/ consultancy	Technology centres/ incubation centres	Public support/finance SFG, Innofinanz
➢ Liaison offices of the universities ➢ TTZ Leoben ➢ AGIPLAN and other consulting firms	➢ 3 Technology centres ➢ 4 Incubation centres ➢ "Wirtschaftspark Obersteiermark"	➢ Subsidies ➢ Finance ➢ Regional development policy ➢ Technology policy

Figure 2. Selected clusters in Styria

	Materials / metal	***AC Styria***
Background	strong historical roots in steel industry important role of state industry restructuring and privatisation in 1980s severe employment loss renewal: quality products, firm formation	historical roots (cars, motorbikes) some endogenous firms and competence Inflow of foreign capital since the late 80s strong growth in the 90s explicit policy support
Approx. size (late 90s) ***Products / competences***	about 150 firms; 23 000 employees high quality steel for tools, rails etc. non-ferrous metals metal processing, mech. engineering tools, machinery	about 150 firms; 13 000 employees automotive components (4 wheel drive, gearboxes, axels, exhausts, parts for racing cars, front windows, ..) development and testing of combustion engines measurement techniques, computer simulation
Key firms	remains of nationalised industries (VOEST-Alpine, Böhler Uddeholm) paternalistic SMEs new firms (spin-offs)	AVL List, Magna Chrysler, Steyr Fahrzeugtechnik Subcontractors

STYRIA (cont.)	***Materials / metal***	***AC Styria***
Challenges/ weaknesses	severe competition in low tech areas segmented structure of firms: many of them inward looking below best practice (organ., tech.)	strong competitive pressure from global industry create links between leading firms and SMEs improve subcontracting skills of SMEs move towards systems suppliers
Knowledge suppliers in the region	University of Leoben, TU Graz, Joanneum Research, Gießerei-Institut CD-Laboratories materials competence centre (to be set up)	TU Graz, University of Leoben, Joanneum Research AVL List, Steyr Fahrzeugtechnik
Other support organisations	technology centres, incubators Wirtschaftspark Obersteiermark training organisations	SFG (regional development agency) Technikum Joanneum (college) further training network
Role of policy	strong but defensive in the past (through nationalised industry) support of renewal through research infrastructure, tech.centres, incubators	very active cluster policy in the 90s attraction of foreign firms provision of specific infrastructure networking between firms

STYRIA (cont.)	***Materials / metal***	***AC Styria***
Cluster activities	first steps towards a cluster policy (Sondierungsprojekt)	• information, communication • co-operation • qualification • marketing
Networks	many firms are weak networkers examples of learning networks exist: mainly vertical; similar weight: region/beyond more links in the region: young and small firms	mainly national and international (following the markets) growing subcontracting links in the region some R&D co-operations attempts to establish a training network impact of cluster policy probably has a stimulating effect but this has still to be evaluated

Figure 3. The regional innovation system in Upper Austria

SCIENCE PARK Software Park Hagenberg	Science/ University education Johannes Kepler University Linz, University of Art and Industrial Design Linz	Technical colleges Hagenberg, Steyr, Wels
➢ Basic research in software development (mathematics) ➢ Applied (industrial) research in communication and media software ➢ Technical college ➢ Incubation centre	➢ Social sciences/economics, technology/natural sciences, law ➢ Arts, industrial design	➢ Media engineering and media design ➢ Software engineering ➢ Manufacturing and management technique ➢ Automated plant and process technology
Co-operative R&D-institutions	Companies Emerging cluster structures:	Vocational training WIFI, BfI, HTL
➢ Competence centre for light metals Ranshofen ➢ Competence centre for software Hagenberg	➢ Vehicles, engines, components ➢ Plastics ➢ Steel, aluminium, metal ➢ Machinery, environmental technologies ➢ Furniture, windows, doors ➢ Information and communication technologies	➢ Very broad range of training programmes in business administration and technology
Technology transfer/ consultancy	Technology centres/ incubation centres	Public support/finance TMG
➢ Liaison office of the university Linz ➢ CATT/IRC	➢ 2 Technology centres ➢ 4 Incubation centres	➢ Technology marketing/policy ➢ Location (investment) marketing

Figure 4. Selected clusters in Upper Austria

	Automobiles (AC) / Diesel-engines (CDT)	***Plastic (KC)***
Background	historical roots (cars, arms) endogenous firms and competence, esp. Diesel tech. Inflow of foreign capital (BMW) strong growth in the 90s explicit policy support	regional concentration of firms around Kremsmünster, Lenzing
Approx. size (late 90s)	AC: 205 firms in Upper Austria, ~55 000 employees CDT: 63 firms in Upper Austria	138 firms, ~20 329 employees
Products / competences	Diesel engines, motorbikes, trucks automotive components (transmission), development and testing of combustion engines	plastic production plastic manufacturing and application machinery for plastic industry
Key firms	AVL-Steyr, BMW Motoren, KTM, Miba Steyr Nutzfahrzeuge, Magna (Steyr Antriebstechnik)	machinery producers such as Engel, Greiner, Starlinger Maschinen

UPPER AUSTRIA (cont)	***Automobiles (AC) / Diesel-engines (CDT)***	***Plastic (KC)***
Knowledge suppliers in the region	(University of Linz) Steyr, AVL, PROFACTOR	University of Linz CD-Laboratory, PROFACTOR
Other support organisations	TMG technology centres	TMG technology centres
Role of policy	very active support, Upper Austria aims at the co-ordination with other Austrian provinces (Styria) lean organisation (CDT is part of AC)	recently started support for this cluster
Cluster activities	active cluster-policy, first targeted cluster • information and communication • qualification • co-operation • marketing, PR • internationalisation	active cluster-policy, recently initiated • information and communication • qualification • co-operation • marketing, PR • internationalisation