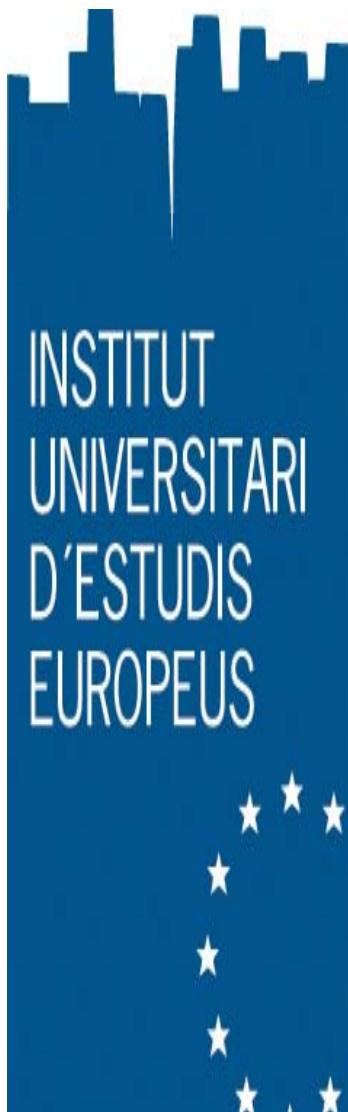


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**The Öresund region: A dynamic
region in Europe due to inter-
regional collaboration?**

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Nature of the cluster and its evolution during the last 10 years

The life science cluster Medicon Valley are located in the bi-national Øresund region which spans greater Copenhagen in Denmark and Scania in southern Sweden, including the university town Lund and Sweden's third biggest city, Malmö (see figure 1). In 2000, these two national parts were physically connected by the establishment of the 18 kilometer long Øresund fixed link (bridge and tunnel).

Figure 1. Map of Medicon Valley



In a recent study of the globalization of biotechnology and life science industry, Phil Cooke (2005) identifies a hierarchy of globally networked bioregions in terms of size and level of innovation activities. A handful of US 'megacenters' like Boston, New York and San Francisco are in the top of this chart, followed by European centres like Munich, Cambridge, Stockholm-

Uppsala and Oxford. Medicon Valley can be considered a potential megacentre if seen as one bi-national cluster (see table 1).

Table 1. Comparative Global Performance Indicators for bioregions

Location	DBFs	Life Scientists	VC	Big Pharma Funding
Boston	141	4,980	\$601.5 m.	\$800m./annum 96-01
San Francisco	152	3,090	\$1,063.5 m.	\$400m./annum 96-01
New York	127	4,790	\$1,730 m.	\$151.6m. (2000)
Munich	120	8,000	\$400.0 m.	\$54 million (2001)
Medicon Valley	104	5,950	\$ 80.0 m.	\$300 million (2002)
San Diego	94	1,430	\$432.8 m.	\$320m./annum 96-01
Stockholm-Uppsala	87	2,998	\$90.0 m.	\$250 million (2002)
Washington DC	83	6,670	\$49.5 m.	\$360m. (2000)
Toronto	73	1,149	\$120.0 m.	NA
Montreal	72	822	\$60.0 m.	NA
Zurich	70	1,236	\$57.0 m.	NA
Cambridge	54	2,650	\$250.0 m.	\$105 million (2000)
Oxford	46	3,250	\$120.0 m.	\$70 million (2000)

Source: Cooke, 2005

Since the 1970s the life science sector has been led and dominated by large pharmaceutical companies (big pharma), producing and commercializing relatively few biotechnology based drugs. In the past decade the number of possible applications of biotechnology has multiplied, and big pharma is therefore increasingly dependent on new knowledge created by dedicated biotechnology firms (DBFs). In turn, DBFs are heavily dependent on the financial resources of big pharma (and venture capital) since the large up-front costs and long development times of new drug candidates require substantial cash-flow. Another important factor is the need for close relations with universities, research hospitals and other research organisations for intellectual property and knowledge inputs as well as the recruitment of skilled research personnel.

This ‘transformation’ of biotech, with increased variety and complexity as major characteristics, has created new requirements for successful bioregions. The regions need to host a

critical mass of strong actors representing not only the pharmaceutical industry but the whole value chain, provide suitable opportunities for basic research as well as commercialization, and link up with knowledge sources in other bioregions across the globe. This paper describes the development of the Medicon Valley biotech cluster the last decade, both assessing how the cluster has adapted to these new requirements and identifying future challenges that the cluster faces.

Evolution of the cluster

The life science sector in Scania has long traditions through the presence of Astra (subsequently merged with Zeneca to become AstraZeneca) and Pharmacia (subsequently merged with Upjohn to become Pharmacia & Upjohn, and eventually acquired by Pfizer). Both these companies historically located significant research activities in Lund; AstraZeneca are still present with a major research unit employing 1 200 persons. After the Pharmacia merger the research on cancer and immunology was spun out to form the Lund based Active Biotech AB in 1997, while the rest of the company's activities disappeared from the region (the company still has a unit in Uppsala). Active Biotech AB is today, with 90 employees, the second largest and second oldest DBF in the region, after BioInvent International AB which today employs a staff of around 100 persons. BioInvent was created in 1995 by researchers at Lund University that wanted to commercialize their research. Besides these two medium-sized firms, the Swedish part of the region hosts about 35 other DBFs of varying size and age. A large share of the companies are university spin-offs (e.g. Camurus, Cellavision, Genovis and Wieslab) while others are local sub-units of global biotech companies (e.g. Acadia with headquarter in San Diego and research unit in Malmö).

Also the Danish part of the region has been a strong milieu for life science for a long time. Large anchor firms like Novo Nordisk and Lundbeck are still among the major players in the world, but local spin-off companies like Novozymes (research part of Novo Nordisk), local but world leading diagnostics companies like Dako (founded in Copenhagen 1966, today with sub-units in Colorado and California), and strongly associated pairs of complementary companies like Neurosearch (a biopharmaceuticals spin-off from Novo Nordisk) and NsGene (cell technology research spin-off from Neurosearch), have contributed to a renewal of the bioregion meeting new requirements on the global market. In total the Danish part of the region hosts about 100 DBFs.

The term Medicon Valley was first introduced in 1994 by the Øresund Committee. This is a forum of public agencies from the Danish and Swedish part of the region with the mission to stimulate binational regional development. Feeding into the existing industrial specialization of the region, it decided to focus specifically on the emerging field of biotechnology. Besides the historical localization of big pharma (in fact, 60% of Scandinavian pharmaceutical companies are located in Medicon Valley) an enormous potential for life sciences within the region was identified as it hosts 11 universities and 26 hospitals. However, the potential of becoming a global bioregion or ‘megacentre’ are conditioned by the ability to achieve integration between the two national counterparts. This was hence the main ambition with the creation of Medicon Valley.

The efforts to promote actual integration, making it justified to speak about Medicon Valley as one cross-border cluster (as opposed to two separate national clusters with less dignity on the global biomarket), took off for real with the formation of Medicon Valley Academy (MVA) in 1995 (in 1997, the organization changed its name to Medicon Valley *Alliance*). MVA was initiated by Lund and Copenhagen Universities as an EU Interreg II project. The rationale behind the initiative was to stimulate the formation of a cross-border life science region by promoting local integration and cross-fertilization between industry and academia. The MVA initiative has contributed to the development of the cluster, not the least because of its power of attraction on venture capital, research funds and human capital. This, together with the general transformation of biotechnology towards increased variety and complexity, has led to a shift in dominance from large pharmaceutical companies taking care of the entire value chain to small DBFs mainly focusing on basic research and early stages of development. Several of the large pharmaceutical companies have gradually downsized their production activities in the region, yet increasing their research facilities. At the same time there has been an impressive growth in number of DBFs. 65 new DBFs have been established since 1998, and if medical technology companies and R&D based service firms are included, the number of start-ups exceeds 100. Only in the period 2004-2005 29 new small R&D based firms were established in the region (MVA, 2006). Today there are approximately 130 DBFs of which approximately 70% are located on the Danish side of Medicon Valley. Also university research, representing the earliest stages of the biotech value chain, has increased in the region.

This shift in dominance from single actors spanning the entire value chain to actors mainly representing the early stages has also affected the integration of the cluster and the needs for linking up with other bioregions. Actors in life science are today by necessity part of global research communities rather than regional ones. Due to their extreme specialization they are forced to seek collaboration among the few potential partners available in the global arena, often only to be found in global biotech ‘megacentres’ (Moodysson, 2007; Moodysson and Jonsson, 2007). For reasons like this, the initial enthusiasm over MVA as an initiative with the aim to strengthen local and cross-border integration has partly diminished. Several of the commercial actors gradually realised that ‘network promoting’ activities without substantial output in terms of new formal collaboration were hard to justify, and academic actors felt a growing alienation against what they felt was more ‘the business of the local business’ than something for them to engage in. As a result of this, MVA has adapted its strategy to meet the requirements of its members of a more dedicated focus on promoting global visibility of world class research. In its present ‘vision and mission’ statement the focus has thus been broadened, not only to promote regional integration but also:

“initiate synergetic collaboration with other bio-regions and organizations and, together with others, promote and brand Medicon Valley, as well as the entire Øresund region, locally and globally” (MVA, 2006).

Recent examples of this strive to link up with other global biotech ‘megacentres’ is the establishment of MVA ‘embassies’ in places like Kobe, Vancouver, Seoul and Beijing, as well as the “UK-Medicon Valley Challenge Program” initiated in 2005. The aim is to develop world class biotechnology research and products by promoting research exchange and interaction between organisations in the Medicon Valley cluster and the biotech clusters in Cambridge, London, Liverpool-Manchester and Edinburgh. Examples of concrete activities within the programme are seminars, exchange of experiences between MVA board members and their UK counterparts, a joint EU 6th Framework Program including MVA and the Scottish Enterprise, and a UK-Medicon Valley Post Doc Programme (MVA, 2006). The long-term vision of this collaboration is, according to the MVA chairman Per Belfrage to create

“an air bridge from Medicon Valley to London and Cambridge, giving young scientists from Copenhagen and Lund the opportunity to experience these hot spots without having to move families and without having to worry about exorbitant housing prices”.

Major actors of the cluster

a) Firms

Firms are key actors in the cluster as main drivers for innovation and industrial dynamics. According to MVA there are in total 130 biotech companies, 70 pharma companies and 130 medtech companies located in the region. not all of these firms are engaged in or affected by research and development related to life science. When omitting those that only have sales or service departments in the region, or for other reasons cannot be classified as knowledge intensive firms, the number is reduced to approximately 150 companies. Of these 150 firms, 130 can be classified as DBFs while the remaining 20 are either large pharmaceuticals or medtech firms.. The 10 largest firms in Medicon Valley are:

	Empl.	Loc.		Empl.	Loc.
1. Novo Nordisk A/S	9000	DK	6. Unomedical A/S	1200	DK
2. H. Lundbeck A/S	2100	DK	7. AstraZeneca R/D Lund	957	SE
3. Coloplast A/S	1990	DK	8. Pfizer Health AB	850	SE
4. Novozymes A/S	1669	DK	9. Radiometer A/S	847	DK
5. Leo Pharmaceutical	1270	DK	10. Chr. Hansen A/S	725	DK

b) Universities

Universities are other important actors in Medicon Valley. Their role can be described according to three tasks. Firstly, they provide training and education to create and sustain a skilled pool of local researchers and scientists. Secondly, universities conduct publicly funded scientific research which can serve as knowledge input for DBFs. Finally, there is the so-called ‘third task’ of universities which refers to direct collaboration between university and industry in the form of contract research as well as commercializing scientific research through licenses and start-ups of knowledge-intensive firms by university researchers. The most important universities in the region have been the universities of Lund and Copenhagen due to their long history of scientific

excellence in medicine, biology and chemistry. Below we provide a general overview of the most important universities related to Medicon Valley.

Lund University was founded in 1666 and hosts eight faculties and a multitude of research centres and specialized institutes. It is today the largest unit for research and higher education in Sweden covering more or less all academic disciplines. The university has approximately 40 000 students and 6000 employees. More than 3000 post-graduates work at Lund University. Most doctorates are awarded in the medical sciences, followed closely by technology and the natural sciences. In 2006 the University had 581 professors. About half of all research at the University is externally financed.

Faculty of Medicine – In 2005 the faculty had 2500 undergraduate students, 950 postgraduate students with 130 dissertations presented annually, while staff consisted of 139 professors and 450 other teachers and researchers. The faculty collaborates intensively with the university hospitals in Lund and Malmö to create an environment with productive communication between basic research and the healthcare system. One of the results of this collaboration is the Biomedical Centre (BMC).

The formation of the Biomedical Centre (BMC) in 2001, initiated by Lund University to promote life science in the region, was underpinned by similar rationale as the MVA. The BMC assembles all the university's life science research under one roof, including the Stem Cell Centre and the Strategic Centre for Clinical Cancer Research (Create Health), located adjacent to Lund University Hospital. It is the largest single unit for teaching and research at Lund University, comprising half of the research at the Faculty of Medicine. It has a total of 700 scientists, including 50 affiliated professors, post-docs, Ph.D. students and technicians/administrative staffs working across 90 research groups. Major strongholds are today found in the fields of diabetes, immunology, neuroscience and cancer (BCG, 2002). This was primarily an attempt to rationalise the university research and strengthen the brand name of Lund University as centre of excellence in biomedical research. Hence, this initiative was mainly geared at strengthening the knowledge generation subsystem of the regional innovation system, while at the same time it contributed to promoting the integration of knowledge generation and early stages of knowledge exploitation. The concentration of related activities in one unit is completely in line with Lund University's building centres of excellence as part of a general development towards a more entrepreneurial

university. The ‘flagship’ of BMC is without doubt the Lund Strategic Research Center for Stem Cell Biology and Cell Therapy (Stem Cell Centre), established in 2003. Since the autumn 2006 BMC also houses a Bioincubator unit, which draws both on the concept of IDEON Incubation, and the services of Teknopol at (the immediately adjacent) IDEON, which was the first science park to be established in the Nordic countries in 1985, and on (the university-hospital hybrid) BMC as a source of new businesses, to extend the scope of commercialisation undertaken by the university to the active formation of biotech firms.

The University of Copenhagen was founded in 1479 and is the first university of Denmark. Spread over eight faculties from January 2007 after the integration of Danish University of Pharmaceutical Science and Royal Veterinary and Agricultural University as two new faculties, there are approximately 37000 students and more than 7000 employees. Except for management and engineering faculties, the University of Copenhagen qualifies as a broad, comprehensive university. Most relevant for Medicon Valley are the Faculties of Health Sciences (Medicine) and Science (as well as parts of the two new faculties). The University of Copenhagen has selected four Research Priority Areas for the years 2003 to 2007. The Research Priority Areas are set up to promote cross-faculty co-operation, encourage interdisciplinary research and education and strengthen the communication of research results and dialogue with society. One of these research areas is ‘Biocampus’ targeting core biotechnological research.

c) Research institutes

In addition to firms and universities, research institutes play an important role for basic research and discovery. The most important institutes in Medicon Valley are:

Carlsberg Research Center is an independent private research centre and part of Carlsberg A/S. Traditional competences are in malting, brewing and fermentation but it has become increasingly active in biotechnological production processes and biomedical sciences to target early drug discovery.

The Hagedorn Research Institute is an independent basic research component within Novo Nordisk A/S in the field of diabetes and its complications. The three main areas of

research activity are (1) stem cell research & developmental biology of the pancreas (2) immunology and genetics of Type 1 Diabetes and (3) structural and systems biology of ligands and receptors of the insulin peptide family. The institute also fulfils an educational mission by training a substantial number of masters and PhD students in collaboration with Danish universities, the Ministry of Science, Technology and Innovation (VTU) and the Medicon Valley Academy (MVA).

AstraZeneca's respiratory research unit in Lund with approximately 800 research employees, accounts for roughly two-thirds of inflammation and immunology R&D in Medicon Valley.

Health care institutions supply expert assistance and research in different aspects of drug and device development. The most important hospitals are Copenhagen Hospital Corporation, Copenhagen County Hospital, Lund University Hospital and Malmö University Hospital.

d) Network organizations

Network organizations have proven to be key venues and meeting grounds that provide the social platforms to exploit the opportunities of co-location in a cluster.

Medicon Valley Alliance (MVA): The largest and probably most important network organization for Medicon Valley with 280 members (counted January 2008). If any, MVA should be considered as *the* cluster organization. As a member financed network organization it works to promote the necessary interaction for network formation and knowledge transfer between academia, public health, and biotech related industries. Important tools in this are seminars and conferences, as well as initiating and coordinating projects associated with educational, scientific and business activities in the region. MVA also sets up and manages comprehensive knowledge databases and has initiated a range of working groups to analyze regional competences within specific subject areas. In addition, MVA contributes to the regional and international marketing of Medicon Valley by visiting and presenting the cluster at conferences and other events and, as mentioned above, by establishing 'embassies' in other important bioregions globally.

MVA is a non-profit association predominantly based on revenues generated through membership fees. In 2005, these constituted 75% (Denmark, 52% and Sweden 23%) of the total

annual turnover of approximately 1.2 million euros. 47% of the total membership fee is paid by private funds while 53% is funded publicly. The remaining 25% were accounted for by a contribution from the ØresundScience Region (13%), PhD administration (5%), sponsorships and funds (4%), a VINNOVA project (2%), and seminar fees (1%). In total, MVA has a staff of 10 people responsible for daily operations and a board of directors of 15 representing the different members of the organization. The board of directors is elected at the annual general assembly.

Øresund University: This is a consortium of fourteen universities and university colleges in the Øresund region with the objective to increases quality and efficiency among the participating institutions by opening up all courses, libraries and other facilities to all students, teachers and researchers. Of the fourteen universities, four are Swedish and ten are Danish. The number of Danish and Swedish students, however, is about the same. Øresund University is, similar to MVA, part of Øresund Science Region.

Øresund Science Region: ØSR joins the forces of six regional research and innovation platforms, Øresund University and a number of regional co-ordination bodies in an attempt to strengthen regional co-operation and integration between universities, industry and the public sector. The six ØSR platforms are: Medicom Valley Academy; Øresund IT Academy; Øresund Food Network; Øresund Environment Academy; Øresund Logistics; Øresund Design. The activities of the platforms include establishing partnerships, benchmarking, enhancing research and education, innovation, technology transfer and marketing.

Barriers to the development of the cluster

The cluster is unique in being located in a region that spans parts of two different countries. This feature can and should not be ignored as a weakness of the cluster compared to similar life science clusters in scope and size such as nearby Stockholm-Uppsala. The national border contains a liability for fragmentation of cluster activities. This paper shows that the full potential for synergy effects derived from close proximity may be hampered because of this. In other words, cross-border regional interaction is only weakly developed. In addition, extensive parts of the regulative environment (e.g. tax-rules, employment legislation) as well as research and innovation policy is shaped and implemented within a national framework which complicates cross-border cluster interaction.

Part of the explanation of cluster fragmentation, can be the imbalance between the different parts of Medicon Valley. The Danish side is strongly characterized by being the capital city region and the only major urban area in the country. More or less by default, there is a lot of business activity going on in terms of financial markets, presence of business headquarters as well as political activity. Scania, on the Swedish side, is typically a second tier region being relatively far away from the action in the capital Stockholm. In terms of inhabitants, number of firms (especially big pharma), venture capital investors there is clearly a skewed distribution in favor of the Danish part of Medicon Valley. As for university and research facilities however, the situation is more balanced.

Another potential barrier to the development of the cluster is the somewhat disappointing results in commercializing academic research especially compared to North-American life science clusters. Measured in terms of establishing start-up companies or license agreements following patent filings, the Medicon Valley universities (and university hospitals) fall behind important competitors such as Karolinska Institute in Stockholm, Oxford University and Stanford University alone. Partly, this can be explained by the fact that ‘the entrepreneurial university’ has its origin in the US while Europe in general (with the exception of the UK) is following suit. Therefore, it should be emphasized that legislation and the establishment of technology transfer offices is still in the process of catching up and considerable progress is being made. A lot of policy efforts can be expected to contribute in this. Another disadvantage, at least compared to the North American life science clusters, is the lower supply of venture capital.

The role of public policy at national, regional and local levels in promoting the cluster overcoming barriers

Both countries have thriving innovation policy environments. The main governmental innovation body in Sweden is VINNOVA (Swedish Agency for Innovation Systems) which has been established in 2001. It has an annual budget of about 110 million euro to support innovation on a national, regional and sectoral level in active collaboration with industry and academia (following the triple helix model). Life sciences are broadly covered in four so-called growth areas: ‘drugs and diagnostics’, ‘biotechnical tools’, ‘medical technology’ and ‘innovative food’. It can therefore be seen as a prioritized technological platform in Swedish innovation policy not the least because it receives approximately one tenth of the total annual budget. Moreover,

VINNOVA has committed itself to support the absorption of biotechnology in the food sector in Scania through its regional innovation systems program VINNVAÄXT. In Denmark, innovation policy is coordinated through the Ministry of Science, Technology and Innovation (VTU). Compared to Sweden, there is less explicit state support and involvement for innovation or triple helix collaboration. VTU supports however ‘innovation consortia’ to enhance cooperation between public institutions and private enterprises. An example of this is the recently established Danish Pharma Consortium under initiative of four Danish Medicon Valley universities (Copenhagen University, Danish Technical University, Danish University of Pharmaceutical Science and the Royal Veterinary and Agricultural University). Another important component of Danish innovation policy are the 15 national Business Service Centres (Erhvervsservicecentre) to provide counseling and information to SMEs at a local level. The aforementioned incubator facilities should also be mentioned as part of both countries’ innovation policy. In sum, therefore, it needs to be emphasized that the innovation policy environment for Medicon Valley is very strongly divided along national boundaries. There is no systematic collaboration or coordination between VINNOVA and VTU for Medicon Valley.

Even if Medicon Valley is not a direct result of national or regional political initiatives, it has indirectly benefited from the favourable political environment for supporting high-tech as well as cluster development. Sweden has for many years pursued an active innovation policy through the national responsible agency VINNOVA. This has been a combination of technology policies, supporting specific, strategic technologies and sectors – of which biotech was/is considered to be one of the most important, and innovation policies, promoting the formation of regional innovation systems, primarily for supporting high-tech industries. So far, out of 8 Vinnväxt projects, three belong to the biotech sector (two red bio in Gothenburg and Uppsala, and one green bio in Lund).

Denmark on the other side has a tradition of less direct public intervention, and leaves more to the market. Thus, Denmark, which in contrast to Sweden, is dominated by SMEs, is characterised by a market-driven innovation system supporting non-R&D based, incremental consumer product innovations. One of the exceptions to this is the pharmaceutical industry, which is research intensive and dominated by large companies. The support of this industry mainly takes

the form of science policies of funding basic research at universities and research institutes, even if it amounts to less than the similar funding in Sweden.

As has already been stated in the paper the establishment of Medicon Valley Academy/Alliance is a result of an Interreg project initiated by Lund and Copenhagen universities. The strategic role of universities as the key providers of new knowledge is evident with respect to promoting the formation of biotechnology and other high-tech clusters. Lund University has undergone a transition from a traditional Humboldt type university to become an entrepreneurial university taking and implementing strategic decisions (Melander, 2006). One example of such strategic decision making is the building of transdisciplinary and transfaculty research centres, such as the Biomedical and Stem cell centres mentioned earlier in the report, which is located in the so called tenth area directly under the vice-chancellor.

In Sweden, as is the case also in Finland and Norway, the universities have got a so called 'third mission' in addition to teaching and research, i.e. to cooperate with the surrounding society on everything from commercialisation of new knowledge to policy advice. Denmark on the other hand tries to achieve this by giving the universities an external majority in their boards, which elects the vice-chancellor, and by giving increased authority to appointed leaders on faculty and departments levels. Another part of this strategy is the initiative to force universities to merge with other universities and research organisations in order to get bigger and stronger universities. The merger of Copenhagen University with Danish University of Pharmaceutical Science and Royal Veterinary and Agricultural University mentioned before is one such example, becoming one of three so called 'super universities' in Denmark. This merger might have some positive effects on strengthening basic research relevant for the biotech industry, and, thus, for Medicon Valley.

Moreover, another important element of the bottom-up initiative behind the establishment and development of Medicon Valley is the efficient and well-functioning public-private partnerships with respect to research collaboration between university and both big pharma and small DBFs, venture capital raising, and general support for cluster formation. The regional level offers particular favourable conditions for such partnerships due to the presence of social capital as well as spatial and social proximity between various actors and agencies.

Future policy challenges for the cluster

Based on the above analysis, the following strengths, weaknesses, opportunities, and threats for Medicon Valley are identified (see table 2).

Table 2. SWOT analysis of Medicon Valley

<ul style="list-style-type: none"> • Local presence of big pharma • Large number of small and medium sized DBF • Strong academic research • Extensive breadth in value chain components • World leading in four therapeutic strongholds • Presence of network organization Medicon Valley Alliance • Embedded in global knowledge networks 	<ul style="list-style-type: none"> • Cluster fragmentation along national borders • Imbalance • Weak commercialization of academic research
Strengths	Weaknesses
Opportunities <ul style="list-style-type: none"> • Inter-sector collaboration (food) • Increased cross-border integration • Quality of life 	Threats <ul style="list-style-type: none"> • Dependence on big pharma

In principle Medicon valley has many essential cluster components in place in terms of key players in the drug development value chain (big pharmaceutical companies cooperating with small and medium sized DBF in new drug development), support infrastructures and presence of skilled researchers. As such, it ranks high in the hierarchy of global bioregions. However, the cluster is unique in being located in a region that spans parts of two different countries. This

feature can and should not be ignored as a future policy challenge of the cluster compared to similar life science clusters in scope and size such as nearby Stockholm-Uppsala. The national border contains a liability for fragmentation of cluster activities. The full potential for synergy effects derived from close proximity may be hampered because of this. In other words, cross-border regional interaction is only weakly developed. In addition, extensive parts of the regulative environment (e.g. tax-rules, employment legislation) as well as research and innovation policy is shaped and implemented within a national framework which complicates cross-border cluster interaction.

Diversification opportunities lie primarily in exploiting biotechnology as a generic platform technology through expanding its application into new areas of related variety, e.g. green and white biotechnology. This diversification process has already begun with the development of bio-agro research and industry connected to the VINNOVA Vinnväxt initiative 'Food innovation at interfaces', which as one of its potential growth areas focus on 'functional food'. Building on the idea of related variety will secure maximal knowledge spillover effects by combining industries with complementary and differentiated knowledge bases (Asheim et al., 2006).

The SWOT analysis emphasized furthermore the competitive advantage of having a combination of big pharma and a stock of small and medium-sized DBFs, the presence of strong academic research as well as well-developed links to the leading global nodes of the industry. These factors point at the necessity of both building-up and strengthening the endogenous knowledge infrastructure (universities and research institutes) and stimulating cooperation with national and international leading research institutions and companies. The Nordic tradition for cooperation and collaboration, also found in Medicon Valley, is according to the SWOT analysis perhaps the most important individual factor contributing to its success. Of these collaborative relationships university-industry cooperation has been by far the most important and successful, while the public sector's contribution has been of minor importance, and can partly be said to be responsible for some of the shortcomings of the cluster (e.g. the lack of harmonization in policies between the two parts of the cluster which, however, must be blamed on the two parts belonging to different national states).

The encouraging lesson to be learned from Medicon Valley is, however, how much that can be achieved and accomplished on a regional level, if the necessary and strategic resources as well as the will, capacity and ability to cooperate are present and utilized.

References:

ASHEIM, B. et al. (2006) **Constructing regional advantage: Principles, perspectives, and policies**. European Commission, DG Research Report, Brussels.

ASHEIM, B., ISAKSEN, A., NEUWELAENS, C., TÖDTLING, F. (Eds.) (2003a) **Regional innovation policy for small-medium enterprises**. Edward Elgar: Cheltenham.

BCG (2002) Commercial Attractiveness of Biomedical R&D in Medicon Valley. The Role of R&D in Attracting Regional Investments. Copenhagen: Boston Consulting Group.

COOKE, P. (2005) The Evolution of Biotechnology in Bioregions and Their Globalisation. Paper prepared for The 'Unlocking' Biotechnology' Sub-theme of the EGOS Colloquium 30 June-2 July, 2005, Berlin.

MELANDER, F. (2006) Lokal Forskningspolitik. Institutionell dynamic och organisatorisk omvandling vid Lunds universitet 1980-2005. Lund Political Studies, Department of Political Science, Lund University.

MOODYSSON, J. and JONSSON, O. (2007) Knowledge collaboration and proximity: the spatial organisation of biotech innovation projects. **European Urban and Regional Studies** 14(2).

MVA (2006) Medicon Valley Annual Report 2005. Lund and Copenhagen: Medicon Valley Academy.