

# A Comparison of High-Tech Development in Malmö, Sweden and Dublin, Ireland

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## **Introduction**

High technology development, both indigenous and foreign, promises employment and wealth. It allows regions to thrive in this new medium of a global economy despite greater relative costs of higher regulatory parameters and standards of living. Yet, how can regions achieve technology-dependent economic success? Specifically, what variables catalyze high-tech clusters and allow them to emerge as a viable host for innovative activity? This paper, through an examination of Dublin, Ireland and the Skåne region<sup>1</sup> of Southern Sweden, addresses these questions.

## **Literature Review**

The literature available on the formation of high tech clusters and the creation of economic environments conducive to high tech development generally focuses on government policy, location theory, and cluster theory. Hypotheses regarding the roots of technological innovation center on two themes: R&D activities and interactions between a firms and their surrounding networks.

Manuel Castells (1989) contributes to the debate over the changing nature of location theory as it relates to high-tech development. He posits that IT industries are unique, “deriving their specificity from the distinctiveness of their raw material (information), and from the singularity of their product (process-oriented devices with applications across the entire spectrum of human activity).”<sup>2</sup> The information requirement demands skilled labor and an “innovative milieu,” thereby promoting knowledge transfer. The process-oriented nature of the product requires that the company be close to its customers.<sup>3</sup> Because each level of industry has different labor requirements, big companies disperse their divisions, allowing regions to specialize and

draw in foreign investment. To provide access to information, regions require universities, government-sponsored R&D centers, and an overarching network of these centers. Producing necessary skilled labor necessitates educational means and a “quality of life” that draws the appropriate demographics. Finally, he argues that this “innovation milieu” will be self-continuing, with those elements constantly being produced.<sup>4</sup> This analytical framework has important implications for both foreign investment by multi-nationals and the development of new industries and technologies.

The basic theoretical conclusions on the Skåne region point to a process too early in its development to yield results. Park (2002) examines Ideon firms, concluding that the Ideon Park has contributed to regional development, rapidly growing to emerge as the “brain” for Skåne.<sup>5</sup> Jonsoon (2002) finds that most of the Ideon companies he surveys value their worldwide contacts and links more than their localized ones.<sup>6</sup> However, he rejects the theory that new IT technologies will render personal contacts obsolete, emphasizing the importance of proximity.<sup>7</sup> The Science Park model may yet show great benefits to its companies.

Beyond the microcosm of Ideon, Park and Lee (2004) analyze the factors behind the high-tech development in Sweden, examining the effects of technology and knowledge innovation. They cite four main reasons why actors within clusters cooperate: “the degree of willingness to invest, the existence of adequate access to specialized skills and proper materials, the existence of specialized customers characterized as demanding, loyal and trend-sensitive, and links to suppliers, related industries, competent industry organizations, and universities”.<sup>8</sup> Overall, Sweden has successfully created innovation clusters through networking actors, but it is still a work in progress lacking key factors; notably, its ability to raise new capital and convert

knowledge to “breakthrough” products is relatively poor.<sup>9</sup>

David Soskice's article, “Divergent Production Regimes,” compares the two production regimes in capitalism – Coordinated Market Economies (CME) which operate in Northern Europe, including Sweden; and Liberal Market Economies (LME) found in Anglo-Saxon countries and Ireland. Fundamental differences between the two include the role of the state, power and influence of unions, the financial systems, and the education systems. Despite these differences, globalization has recently caused convergence of CMEs and LMEs.

Michael Porter (1990) pioneers this concept of clustering central to our study. He expounds upon four mutually-reinforcing conditions that catalyze specific economic development in a specific location. These factors: demand conditions, industry strategy and rivalry, related and supporting industries, and factor conditions comprise Porter's competitive "diamond." The impacts of these characteristics are magnified by geographic firm concentration and the presence of domestic rivalry.<sup>10</sup>

Porter reasons that rigorous inter-firm competition is associated with the enhancement of other traits such as supporting industries, demand conditions, and factor conditions. Another important facet of Porter's diamond is demand condition; sector-specific demand promotes investment and factor creation, impelling specialization and the rise of supporting industries.<sup>11</sup>

In effect, competitive advantage for clusters arises from competition and adversity between firms. Porter's analysis and the supporting literature provide a useful foundation for our inclusion of independent variables such as education, business culture, and regional characteristics. However, as our study will indicate, government policy-making, and the level at which government policy-making is conducted, is vital to the shape and magnitude of cluster

development. Domestic competition does not seem to be as much of a factor, whether the region is seeking advantage in foreign investment or indigenous development, because of the low population of the regions and the exportable nature of their products.

### **Rationale for Case Selection**

#### *Malmö*

Malmö provides an interesting case of economic transformation; it has moved from a failed Fordist model to the sphere of high-tech development. The greater Skåne region provides a technological development center in Lund (Lund Institute of Technology) and also has several important economic connections to other countries. Skåne signifies a European success in the development of high-tech SMEs. The region has an established educational center with a highly developed business culture of networks between various actors, and a reputation for a high quality of life. Its history as a town of heavy industry makes it an ideal case as it attempts to change its economic identity by fortifying these characteristics.

#### *Dublin*

The Irish economy has experienced unusual economic growth in the past 15 years in the area of high-technology. In contrast to the Malmö case, the "Celtic Tiger"—and the technological growth associated with it—has been prompted by government policy. High-tech developments have been dramatic. Ireland is the number one location in Europe for international pharmaceutical investment and is the home of many blockbuster products. These traits make Dublin an ideal location for a comparative study.

### **Rationale for Independent Variable Selection**

Our interviews yielded several themes pertaining to the development of high-tech clusters. Four variables combine several factors outlined in Appendix E, Figure two.

Government policy includes tax structure, physical infrastructure, the extent of decentralization, agenda setting, funding (local, regional, federal or EU), the creation of organizations that facilitate high-tech development, and the magnitude of R & D investment. We differentiate between regional and national level policy mechanisms. In the education section, we discuss the extent of local universities' business orientation, the extent of synergy between local firms and universities, the general influence and prestige of local universities, and the extent to which local universities harness innovation. Regional characteristics include language, currency, age distribution, quality of life, immigration, emigration, and domestic demand. Finally, in business culture we explore worker productivity, business-higher-learning institution-government, the presence of horizontal linkages between companies, and the extent to which entrepreneurship is promoted.

### **Independent Variable #1: Education**

#### *Malmö*

Education, especially university-level training and research, is crucial to high-tech development. In Malmö and Lund, the university system focuses on preparing its graduates to be productive workers in innovative, high-tech sectors. Skåne's post graduate education rate is 20% greater than the rest of Sweden (Table 6).

Malmö and Lund universities provide the specialization necessary for high tech research and entrepreneurship. Malmö University<sup>12</sup> was established to mimic the Lund Institute of Technology's successful system of professional training in innovative technologies. A vital link between these graduates and these business sectors in Malmö and Lund are incubators. These institutions help start-up companies by offering free or low-rent office space and guidance. VentureLab, a Lund University incubator comprising of about ten companies initiated by recent

Lund University graduates, provides a useful example. Another example is the Ideon Science Park, which is closely connected with the Lund Institute of Technology. The success rate of businesses emerging from this lab is approximately 90%, indicating systemic success.<sup>13</sup>

Malmö has sought to mimic Lund's model by creating similar incubators university-business partnerships. Perhaps the most prominent is Medeon, a medical incubator. According to its website, "our goal is to be the complete resource required to realize your idea at all stages, from feasibility study to financing, patent protection, incorporation and business plans."<sup>14</sup>

### *Dublin*

Dublin's government (both regional and local) is highly focused on education. The Irish Development Agency (IDA) is a consultative, semi-autonomous agency. IDA has encouraged research through competency benchmarks, the creation of Science Foundation Ireland (SFI), and facilitating cooperation between universities and corporations. Universities often revamp or create courses simply from industry request.

Several of our interviewees felt that the connection between industry and universities must be strengthened to create more awareness of incubators. Additionally, some believe that the universities' departments are not organized to serve industry needs. Even so, Mark Keane, former Computer Science department head at the University College of Dublin, recounted companies visiting UCD and being impressed with its disciplines.<sup>15</sup>

Dublin has also turned to incubators as a means to foster indigenous corporate growth. Two city incubators provide cheap rent, networking, advice, and local talent to entrepreneurs. Most prominent is the Guinness Enterprise Center. Its website cites states: "As an Enterprise Centre, the Centre's role is to assist fledgling businesses get started, established and then to move

on after 2 - 4 years, so that vacated space can be used to assist other new start-up businesses”.<sup>16</sup> It develops small businesses, primarily in software, light high-tech prototype engineering, e-commerce and international/technological traded services, e-commerce, and mobile technology.

### *Summary*

Education in both Malmö and Dublin is a crucial factor in the development of the high-tech sectors in both regions. While both regions recognize the important connection between universities and regional development, they approach it very differently. The principal difference lies in the fact that Malmö focuses on the path from universities to incubators whereas Dublin exerts influence through funding of partially government affiliated corporations. Moreover, Dublin has a less developed network of incubators than Malmö and less multilingualism.

## **Independent Variable #2: Business Culture**

### *Malmö*

A clear indicator of business culture in Malmö is the cultural context that surrounds networking. Rather than open networks that actively facilitate fresh investment, many argue that networks in Malmö are characterized by a more exclusive attitude. According to Professor Bjorn Bjerke, networking in Malmö represents a gathering of friends—a “club”—all of whom enter with a set of preconceived expectations which are usually met.<sup>17</sup>

Entrepreneurship is another area of business culture lacking in some respects. While the number of businesses in Malmö is booming, only about 10% of them are in high-tech areas requiring entrepreneurship. Bjerke claims that the majority of businesses can be labelled as “mom and pop” businesses, such as restaurants opened by immigrants.<sup>18</sup> While these businesses help Malmö's economy, they are not knowledge-intensive. At the same time, firm-university cooperation is notable; it scores very highly in terms of firm-academia collaboration (Table 7).

*Dublin*

The business culture of Dublin appears to be less dependent upon cooperation and horizontal linkages. Any form of collaboration tends to be initiated by government agencies such as The High Level Steering Group. This organization was established in 2003 by the Department of Enterprise, Trade and Employment to “determine what the implications of the policy initiatives at European level were for Ireland and what actions Ireland needed to take.”<sup>19</sup>

Innovation and entrepreneurship are two of the weakest aspects of Ireland's recent growth. Because of Ireland's focus on acquiring FDI, indigenous businesses are few, and innovation has suffered. Most of the growth seen in Ireland over the last decade can be attributed solely to the influx of multi-national corporations. There is also a correspondingly high level of investment in R&D from these MNCs rather than from indigenous businesses. In short, “a key blockage to developing research and innovation is the national culture and approach to innovation and entrepreneurship.”<sup>20</sup> By their own admission, Ireland has “a long way to go” in the creation of an innovative and entrepreneurial society.<sup>21</sup>

*Summary*

Both cases seek to address historically weak entrepreneurial cultures. Further, high levels of business and education communication and coordination exist in both regions. Networking in Dublin and Malmö is dissimilar. While there are attempts to foster strong network connections between multiple actors in Dublin, such as government, education, and business, networks in Malmö are more pervasive and informal; individuals, leaders in government, labor, and business, encourage development of the region.

Innovation in the two regions also differs. While Malmö's innovation seems to stem from

regional diversity, innovation also occurs in areas such as VentureLab and Ideon Science Park, which are highly successful at cultivating and supporting new ideas. In comparison, Dublin lacks home-grown innovation. In publications and interviews, the outlook on the health of innovation in the region is dim. It was generally concluded to be an essential goal for continuing Dublin's development and economic growth. Dublin is attempting to encourage innovation development from the top-down, rather than creating a support network for a grassroots innovation stream as in Malmö.

### **Independent Variable #3: Government Policy**

#### *Malmö*

In Malmö, the regional government has sought to foster high-tech development. According to Malmö University Research Coordinator Peter Jonsson, the aim is to shift Malmö's development from an industrial society to a knowledge-based economy by focusing on higher education, research, and productivity.<sup>22</sup> The Malmö city planner, Christer Persson, cites similar goals when it comes to developmental policy. The driving force behind his goals is the local politicians. However, now that this development has successfully begun to occur, private investors and the state have become significantly more involved.<sup>23</sup>

More specifically, in conjunction with opening Malmö University, the city is actively developing its regional infrastructure. In 2000, a central project was the opening of a new bridge linking Malmö to Copenhagen and its international airport. This signified a major step toward increasing Malmö's accessibility and consequently, its economic viability.

Another area of government policy that can contribute greatly to local growth is tax policy. The tax system in Sweden, as a whole, is rather unfavorable to businesses. This was underscored by entrepreneurs at the VentureLab, many of whom rely on the incubator system to

develop their businesses before relocating to a country with a more favorable tax system, such as the United Kingdom.

Land use is yet another area of government policy that Malmö employs to attract new businesses. Most obvious is the regeneration of the Western Harbour. This land has been dedicated to Malmö University as well as to developing residential areas. Other construction projects include new enterprises, office buildings, and incubator facilities.

### *Dublin*

Dublin's development appears to be primarily driven by national governmental directives as well as national bodies such as Forfás (Irish: *strong growth*)<sup>24</sup>, IDA, SFI, and Enterprise Ireland. These organizations offer an integrated, coherent model for national development that supersedes the regional governmental agents such as the Dublin Chamber of Commerce and Dublin's municipal government.

Dublin's impetus for development emanates from central government policies such as Ireland's exceptional corporate tax law. Dublin has benefited from a corporate tax rate of 12.5%, the lowest in Europe. Additionally, the Irish government provides loans and subsidies to potential foreign investors.

National bodies have been crucial. Due to IDA's international offices and extensive network of lobbyists, they have succeeded in attracting the largest share of FDI of any EU country—specifically in the areas of biotechnology and information technology. SFI also serves as an important catalyst for high-tech clusters in the Dublin area. This government institution will invest \$800 million in biotechnology alone from 2000 to 2006. They also foster the development of a highly-skilled, technically-trained workforce through initiatives such as the

training of secondary school instructors and the funding of internship and graduate programs in “strategic” sectors such as biotechnology.

The most common weakness on the part of central government policymaking mentioned in our interviews concerned infrastructure. Dublin’s rapid commercial and population growth has outpaced corresponding improvements to its infrastructure. However, the central government has embarked on projects such as a new LUAS light rail service to remedy this problem.

### *Summary*

Much of the divergence evident in these cases can be attributed to their different respective policies and weights of national and regional government. While government policies for both cases strive for high-value economic development, different institutions and different subsequent policy mechanisms appear to be at play in each case. Whereas both nations are very small in terms of population, Ireland is markedly more centralized with a more cohesive policy and vision for national, as opposed to regional, development.

Divergent local and national policymaking regimes and policy strategies explain, to some extent, Dublin’s emphasis on locating large MNCs and FDI to the area and the Skåne region’s less coordinated efforts to foster smaller, often indigenous enterprises. While agencies such as the SFI and Enterprise Ireland also encourage SMEs pursuing niche markets, this is not the dominant national agenda. Conversely, while Skåne has attracted some major international biotechnology companies, a concerted effort to target major foreign players in high-value sectors, such as biotechnology and ICT, does not exist.

## **Independent Variable #4: Regional Characteristics**

### *Malmö*

Recent economic experience is one regional characteristic that has strongly influenced

development in Malmö. The city of Malmö has a history rich in industrial culture. However, between 1970 and 1995, Malmö experienced a severe recession that left its industries in decline and its population suffering. Industrial employment plummeted from 40,000 to 18,000.

Immigration also plays a central role in Malmö's development. Malmö currently has the greatest portion of immigrants in Sweden; 14% of its residents are foreign-born (Table 1). As a result, much of Malmö's population earns little income and thus has little to give back to the community in the form of taxes. Even so, the overall level of education within the immigrant population is actually quite higher than within the local population. This level of immigration has turned Malmö into a diverse city, reflected in its rich culture, especially in the dining sector.

Quality of life in Malmö has increased dramatically since the end of the city's industrial era. Athletics has played a great role in increasing Malmö's quality of life. This increase in local cultural activities has led Malmö to become an increasingly desirable place to live, particularly for those commuting to work in Copenhagen.

Age distribution is also considered a crucial aspect of development in Malmö. 34% of its residents are between the ages of 20 and 44 (Table 2, Graph 2). Specifically, the city has devoted many resources toward recruiting youth by opening Malmö University. However, the city is also currently working on several more cultural projects. One particularly striking example is the skateboard park under construction which will one day be the largest outdoor skateboard park in Europe.

The geography of Malmö also plays an integral role in its development. Malmö is ideally located in the south of Sweden in a climate more desirable than Stockholm or Gothenburg, and the opening of the new bridge linking Sweden and Denmark has facilitated cooperation with both

Lund and Copenhagen. Complementing its attractive geographic location, 81% of Swedes speak English, a characteristic essential to competition in the global marketplace (Table 7).

### *Dublin*

Dublin manifests many regional characteristics that facilitate its development as a high-tech hub. Dubliners obviously speak English as their first language. Ireland's use of the Euro makes its cities more accessible to Europe and established multi-national corporations. These two regional characteristics make Dublin a highly attractive target for high-tech FDI.

In 2000, 18.4% of the EU population was aged 10-24; the figure for Ireland was 24.3%<sup>25</sup>. IDA also spoke to the highly educated nature of the people of Dublin and emphasized the government's emphasis on education in science and technology.

Immigration is also an important component of Ireland's human capital. During the Irish Potato Famine (1845-1850), an enormous percentage of Ireland's population emigrated from the country. Within the past 20 years or so, however, many of the Irish that left have begun to return. At this same point, many non-Irish people began to enter the country both as immigrants and as people seeking political asylum.

Another crucial regional characteristic is population and geography. Interviewees noted that Ireland's small size makes it easy for policies to be quickly implemented. Moreover, Dublin's status as the country's capital city makes for close involvement with national government.

Perhaps the most significant regional characteristic for Dublin is related to its recent macroeconomic background. The impetus for the government's focus on high-tech development was the striking unemployment rates of the early 1990s. These economic conditions made the

central government and its agents keenly aware of the consequences of policies that are not focused and innovative.

### *Summary*

Both cities focus on youth recruitment, with some success. This is closely tied to education, as both cities have made great reforms within their education systems to produce a more productive population with the capacity to thrive in a high-tech society.

Language is another aspect of regional characteristics in which both Dublin and Malmö are at an advantage in the world. English is, of course, the native language of Ireland, and the majority of Malmö's population speaks English nearly as well as their native Swedish.

Geography is another aspect of regional characteristics in which Malmö and Dublin share a similar position. Malmö is strategically located as a link between continental Europe and greater Sweden. Dublin, on the other hand, has frequent flights linking Dublin with the rest of Europe, particularly London.

Currency is a regional characteristic in which Malmö and Dublin differ significantly. Unlike Malmö, Dublin uses the Euro, a clear advantage in the business world. At the same time, the cases are similar in that they have both recently begun to attract significant waves of immigration.

### **Dependent Variable: High-Tech Development Qualitative Measurements**

Measuring high-tech development in a region requires holistic and comparable observations. We use our observations from interviews and quantitative data to measure the presence of high-tech development. We define high tech development as the growth of industries and services centered on pharmaceuticals, information services, medical technologies,

information technology, software and others. Our observations have revealed that both Dublin and Malmö have significant development in these areas. However, this development has occurred in very different ways and has produced unique results.

### *The Value Chain and Breakthrough Product Development*

The changes in the independent variables in Malmö and Dublin have impacted the value chain—a way to describe the predominant production type (i.e. labor-intensive versus knowledge-based) and outputs of an economy.

Dublin continues to foster movement up the value chain by pushing for advances in innovation and entrepreneurship, setting goals for higher graduation rates, improving the social culture and most importantly, improving infrastructure. The people with whom we spoke continually emphasized the point that they are unable and unwilling to compete with Eastern European countries on low labor costs and labor-intensive production. Instead, they want to continue to create a dynamic knowledge-based economy.

Malmö, however, is struggling to advance up the value chain. Many graduates leave the region for Stockholm, and Malmö University does not have the research or incubator facilities to create a successful growth area based on a knowledge-based economy.

For Dublin, the strength of this value chain has been crucial. The city and its area boast the presence of some of the world's largest companies and the development of pharmaceutical products such as Viagra, Lipitor and Botox. Although Malmö and its region is the home of the cell phone, it has a weaker focus on product development and large corporations focused on research.

### *External Perceptions*

External perceptions reveal whether a region has successfully portrayed itself to the rest of the world as an innovative region. This contributes to the self-replicating nature of high-tech development and innovation by convincing workers and companies to work and build in the region, contributing further to the image, and so on.

Dublin, because of its international publicity efforts, has come to be seen as a region with a booming economy, and is one of the areas first considered by companies when opening up new European enterprises. The national agenda and agencies such as IDA have allowed Ireland to present a message of economic prosperity, and an image of an economic milieu attractive to companies. Skåne is known for the Øresund Bridge, not for the indigenous development in Lund. But, that bridge has drawn attention to Malmö, raising its international profile. It has gained attention as a city on the rise, as seen by its immigration and international media attention. The profile gained by such projects as the Calatrava Tower, can also bring attention to high-tech development.

### *Cluster Geometry*

Generally speaking, whereas Dublin has primarily attracted clusters of massive MNCs, Malmö and Lund have spawned smaller, often indigenous high-technology firms. The direction of cluster development in Dublin is clear: its biotechnology and ICT clusters are comprised of global powerhouses such as IBM and Merk. These corporations, many of them American, use Ireland as a foothold for research and development and sales in Europe, but do not cooperate or compete at the domestic level. The Dublin Chamber of Commerce noted that while these firms sit on local development boards, these forums are neither sector-specific nor related to actual product innovation or sale.

On the other hand, the shape of high tech clusters in Malmö and Lund more neatly align with Porter's "diamond." While these firms might not rely upon domestic demand, the nature of their density and horizontal networks is essential. No high tech firm employs over 1,000 workers in all of Skåne. It remains to be seen whether the horizontally-linked SMEs of Malmö prove more viable and stable than the investments of high-tech giants in the Dublin area.

## **Quantitative Measurements**

### *Foundation*

Although qualitative observations on our cases are very informative in terms of measuring high tech development, quantitative data is equally revealing. Ideal data would be a set of comparable measurements for both the City of Dublin and the region containing Malmö and Lund. However, we were forced to use national data (see Appendix D).

### *Findings*

An important measure of high-tech development is the presence of innovative industries and a country's ability to innovate. These are the cornerstones of such development and ensure its sustainability. One way to measure this is the Summary Innovation Index (SII), as developed by the European Commission. This places the dominant European countries on a four quadrant graph to estimate whether each is moving ahead, losing momentum, catching up or falling behind in terms of innovation. Sweden scores the highest in this index with a 6.5 while Ireland gets a 1.2 (Graphs four and five in Appendix G). However, Ireland is classified as "moving ahead" whereas Sweden is neither moving ahead nor falling behind.

A number of other important statistics speak to the same strength of Sweden. In 1999, for example, 8.3% of Swedes were employed in high tech manufacturing compared to 7.3% of the Irish. Sweden has the same slight edge when it comes to percent employed in high tech services.

Sweden has a dramatic advantage in business expenditures on research and development as a percent of GDP, the number of high tech applications controlling for population and percentage of venture capital from the GDP with 2%, twice that of Ireland (Table, 7). Ireland, on the other hand has a slight advantage in terms of percentage of new capital from the GDP, percentage of new-to-market products, and percent of high tech value added products. The only measured area in which Ireland has a dramatic advantage is with SMEs innovating in-house, where Ireland has 62.2% and Sweden has 44.8%. Graphs six through ten in Appendix G and tables seven and ten in Appendix F give the details of these indicators.

The aforementioned measures suggest that Sweden and Ireland are very close when quantitatively measuring their high tech development, although some data suggests that Ireland is moving ahead faster than Sweden.

## **Conclusion**

Effective government, at whichever level it originates, is necessary for high-tech success. As seen in Dublin, highly centralized decision-making can draw in foreign multi-nationals. Setting the value chain agenda and ensuring an attractive long term government policy allows companies to enter a predictable, profitable environment. This can be achieved through tax policy, adjusted rent for businesses, the creation of incubators, or other government services and incentives. Government-sponsored organizations such as IDA and SFI allow experts to present Ireland to firms and foster indigenous innovation. Important contributions can also derive from decentralized authority. Ideon, founded by a local initiative of the governor, effectively fosters indigenous SMEs. Likewise, in Ireland, it is precisely the decentralization of power that has allowed IDA and its partners to function effectively.

Business-oriented education systems also enable success, attracting foreign investment and the development of indigenous industries. In Dublin, contact between MNCs and Irish universities has structured curricula that prepare graduates to be productive in high-tech sectors. In Lund, the chain from university to incubator to science park creates indigenous companies, and is now being mimicked in Malmö.

Regional characteristics were also shown to be critical factors in both cases. While Sweden has its own national language, its use of English in the business world has allowed its workers to compete in the global economy. One factor that has encouraged MNCs to come to Ireland has been its membership in the Euro-zone, easing transaction costs for doing business with the rest of Europe. Age distribution, in both cases, was a very significant factor in the high-tech development. The surplus of young people has attracted large companies, and led to those people creating their own industries.

Finally, business culture signifies an important factor. Interviewees in both Skåne and Dublin discussed how an advantage of their respective regions is their characteristic productivity, entrepreneurship, and drive for innovation. These characteristics are reinforced by tendencies toward networking and cooperation in Malmö, but not necessarily Dublin.

Skåne and Dublin have seen success in similar characteristics of education, business, and the regions themselves. Orienting students towards certain jobs, establishing networks, and having useful languages, currencies, age distributions, etc. are factors that are shown to be successful in one or both cases.<sup>26</sup>

The critical differences are in the government policy variable. Ireland's focused national policy has resulted in many foreign multi-nationals locating operations in Dublin, but the country

has not seen much indigenous development. Skåne, through policies originating from the local and regional level, has had great success in creating innovative SMEs, but has not seen nearly the level of foreign investment experience by Dublin.

However, both types of development are beneficial to a region and both have significant drawbacks. Foreign MNCs have raised employment and GDP in Ireland at an incredible rate, but there is no guarantee that Ireland's American economic model will keep moving up the value chain and retain these companies (Table 9). Sweden leads Ireland in many significant indicators of high-tech development and those companies are likely to remain in Sweden, but Skåne still has lower employment and lower average GDP than the rest of Sweden (Tables 3, 4, 7, and 8; Graph 3).

Therefore, to promote high tech development that will benefit a region, a government should both set a national agenda and devolve authority to allow regions or semi-autonomous governmental organizations to make decisions. Beyond the patterns seen in Dublin, there are also cross-benefits possible. National progressive tax policy would benefit SMEs as well as MNCs, and, as Castells argues, a region can make itself unique to appeal to specific multi-national industries. The government, as a whole, can work to draw in foreign investment, but regional authorities are best equipped focus policies to foster indigenous development.

Government policy can influence education characteristics and business culture. It seems as if that is the factor missing from Porter's diamond. Also, a mixed policy can protect against the weaknesses of the LME style economy, because SMEs will stay in the country. Producing both types of development can result in a healthy economy adaptable to the requirements of the new global economy.

## **Appendix A: Methodology**

The first phase of our methodology was establishing high quality, diverse contacts. This involved sending out an initial email to approximately 80 candidates for interviews or presentations. Our initial email not only requested an interview, but also worked to establish a contact tree so as to maximize the type of contacts. We submitted concise emails that provided supplemental and detailed information on our project and the program. This technique proved successful; we consistently found ourselves channeled to a contact who suited our research needs. In both Malmö and Dublin, our contacts were diverse, experienced and very informative.

We prepared for our interviews by establishing goals for what types of topics we were interested in exploring. Since much of the direction of our research was contingent upon what we would find once in the region, these target topics started out very general but became more focused, particularly once we arrived in Dublin. The initial set of topics included exploration of the city's relationship with the region and whether that regional is characterized by cooperation, competition, both or neither; the presence and role of prominent universities; the extent of local, regional, national and EU funding; exploration of the major protagonists, if any, of the region's development and whether this development was coordinated; information on the presence of appropriate and diversified infrastructure for development including roads, public transportation, broadband access, sanitation, etc; and the role of a culture that facilitates development through high morale, a young population and an attractive living place.

The six of us traveled to Malmö, Sweden from Tuesday 6 May through Friday 9 May, 2005. During this time, we spoke with seven contacts whom we established after extensive email and telephone communications. The first of these was Anna-Lena Bengmark, a very resourceful

librarian from Malmö University. She was able to give us network space and access to the University's database, which led to several informative articles. On the same day, we interviewed Bjorn Bjerke, a professor of entrepreneurship, who was able to give us a more cynical introduction to Malmö and several resources on the area's development. Professor Bjerke also introduced us to his colleague, Daniel Hjorth, another professor of entrepreneurship. Professor Hjorth gave us our first cohesive conceptual model for the area's development.

Our itinerary next took us to Peter Jonsson, the research coordinator for Malmö University. Mr. Jonsson was also very useful in providing reinforcement on the story that we heard from the previous two interviews. We learned that in many ways, the development in Malmö is coincidental – the proper alignment of actors at the right time with the right preconditions has allowed for stunning growth in high technology. What has been happening in the region, it seems, is not a coordinated effort by the government or any single actor. Rather, it appears that an organic set of conditions has fostered the area's development. Mr. Jonsson was able to confirm this.

The next day, on the seventh, we introduced our class to Sven Thore-Holm, an associate professor at Lund University, former director of strategic development for the City of Malmö and current Verkställande Direktör of Teknikbrostiftelsen. His presentation and question responses were extremely informative, as they explained the foundation for the technological incubators that seem to make the area distinct. Mr. Thore-Holm himself was involved in the creation of the world's most renowned science parks -- Ideon. We came to learn of the distinctive grass-roots development that occurs in the Skåne region.

Later that day our class met with the Planner for the City of Malmö, who gave us very

useful background on Malmö's development and its connections to the surrounding region. He informed us of the city's ambitious plans and finally put a face on the seemingly coincidental development that was happening in the area. We learned of how the city government planned on positioning itself during these times. This proved to be very useful in contextualizing what we had learned from the professors of Malmö and Lund.

On Friday the ninth, we had our final meeting with Therese Kropp, a representative from the Department of Trade and Industry for the Skåne region. Her presentation was extremely helpful for giving us background on what efforts were happening on the regional level. We learned about funding methods, organizations, the area's strongest sectors and future goals for the region. Ms. Kropp has also been essential in establishing contacts through facilitating meetings and helping us find high quality interviewees.

The six of us also traveled to Dublin, Ireland from Friday 13 May to Tuesday 17 May 2005. During this time, we spoke with seven contacts that we culled in a way similar to those in Malmö. The first of these was Sinead Cullinan, a representative from IDA Ireland, a government agency responsible for securing new investment from overseas and encouraging current investors to expand and develop their businesses. This decisive and fast-moving organization proved to be one of the biggest protagonists of the area's development. Ms. Cullinan was able to give us very detailed statistics on the development that has occurred as a response to IDA's efforts. The focus of IDA is foreign direct investment through established contacts, large corporations and extensive marketing. We next heard from two representatives from Forfás, the national board responsible for providing policy advice to the Government on enterprise, trade, science, technology, and innovation in Ireland. This is another agency that is very aggressive and familiar

with how to sell Ireland's economy. The first representative, Garrett Murray, is a policy analyst who provided extremely informative details on the methods Forfás uses to attract companies and also quantitative measures of the organization's success. The second speaker was Eimear Scully, another policy analyst, gave us the details of a "Gateways Study" the organization performed to explore the effects of geographic clustering in Ireland.

On Monday 16 May, we met with Cian Connaughton, the Policy and Communications Manager for the Dublin Chamber of Commerce. Mr. Connaughton was especially useful in clarifying the differences between national and city efforts to cultivate high-tech development. Talking with him gave the impression that the stunning high-tech development in the region was more motivated by the national government than city policies. On the same token, he emphasized that the size of Ireland meant that many national policies were directed toward Dublin in particular. In any case, his interview was informative because he was able to describe many of the incubators that the Dublin area facilitates.

We next spoke with Mark Keane, the ICT Directorate for Science Foundation Ireland (SFI). This Organization is one of the four that the national government established to facilitate high-tech development. Mr. Keane and his organization is responsible for selecting research projects that will be especially promising for the regions development. He analogized what they do to the National Science Foundation and was proud of the extensive funding that they provide. His interview was poignant because he spoke of the growing emphasis the organization places on research causes that are connected to industry. Mr. Keane was also a Computer Science department head at the University College of Dublin, where he would often speak with companies interested in investing in the area. He told us of the key factors they seek.

The final interviewee for this day was David Pierce, the former president of the Dublin Chamber of Commerce and current director of corporate banking for Ulster Bank Group. Mr. Pierce reiterated several themes heard throughout our interviews, such as creating Ireland as a gateway to Europe, the low corporate taxes, and the importance of education. He also stated that the Irish “play hard, but work hard” which focuses on the sustainability of the Irish economy and their desire to maintain and support the growth they have experienced over the past decade.

Lastly, on Tuesday 17 May, Dave and Benjamin spoke with David Duffy, a research analyst at the Economic and Social Research Institute. This organization gives concrete recommendations on the direction of Ireland's economy and acts as an objective informative body on policy-making. Specifically, Mr. Duffy spoke about the national trends being reflected in Dublin specifically, which allowed us to study Dublin and Ireland interchangeably. While he, like our other interviewees, was impressed with the growth, it is his opinion that Dublin is unable on an infrastructural level to accommodate another MNC investment in the Dublin area. Last, he stated that Ireland can't compete on low labor costs, and instead should compete on productivity.

## **Appendix B: Study Critique**

While we are proud of our final product, our paper is by no means a flawless study. The first aspect of our study that we would change would be the schedule. Because of the national holiday in Sweden that took place during our visit, it was difficult to schedule meetings. This not only hurt our personal research, but also put the class at a disadvantage. Nevertheless, we believe that the meetings we were able to schedule were extremely informative.

Another way in which our study could be improved would be to have scheduled more parallel meetings between Malmö and Dublin. In Malmö many of our meetings were with academics whom offered a great deal of criticism that we would never had heard from city officials or those attempting to “sell” the area. In Dublin, however, we had originally planned several meetings at Trinity College that we were forced to cancel because of the research week schedule. We were unable to reschedule these meetings because the next day exams began. This also meant that we were unable to use the library facilities at Trinity as we did in Malmö. Rather than focusing on academics, therefore, in Dublin we spoke primarily with businessmen and city officials. While everyone with whom we spoke offered tremendously useful information, we heard very little criticism. Further, because we were based in the capital, the majority of what we heard focused on Ireland at the national level.

This national versus local focus was another problematic aspect of our study. Because Malmö is so distant from Sweden’s capital, Stockholm, much of the policy-making comes directly from local and regional officials. Ireland, on the other hand, is much more centralized. This is primarily a geographic phenomenon that is also compounded by the density of Ireland’s population in Dublin County. In fact, over 50% of Ireland’s population lives in Dublin County.

While the difference in policymaking that results is a central part of our study, the comparison was still difficult.

Another problematic aspect of our study was the lack of quantitative data available, particularly concerning Dublin. This is the case because, as a result of Ireland's small size and density in Dublin County, the majority of data is only available at the national level. This made direct quantitative comparisons difficult.

### Appendix C: Suggestions for Future Study

As evidenced by our conclusion, this comparative study yields several important findings with respect to the conditions necessary for high-tech development. At the same time, the pursuit of a broader area of study could be fruitful. Rather than choosing two largely successful cases, we could have analyzed a case with less success. Expanding our study to include such a developmental “loser” might help to establish a clearer causal link between our independent variables and our quantitative and qualitative measurements of successful development.

In addition, selecting an alternate case in each country could help to eliminate potential national intervening variables characteristic of Ireland and Sweden. Future study could include a major secondary city in Ireland, such as Cork, as well as Stockholm, the capital of Sweden. This would control for the different positions of Malmö and Dublin in their national economies.

While the dependent variables we chose to represent cluster development appear comprehensive, a broadening of this study could include more general indicators of economic success. Measurements of changing levels of unemployment, GNP per capita, or average household income would measure the actual macroeconomic implications of development. This may answer more clearly whether high tech developments in both of our cases correspond with improvements beyond specific sectors such as information technology. While this moves beyond the central question of our study, its implications are clearly significant.

### **Appendix D: Rationale for use of National Statistics**

Ideal data would be a set of comparable measurements for both the City of Dublin and the region containing Malmö and Lund. Unfortunately, we feel confident that indicators that exactly meet these conditions either do not exist or are prohibitively difficult to locate. Even so, we felt strongly that our research should include a quantitative component, even if its measurements did not exactly fit our needs and could only be used for suggestive purposes.

We therefore decided to use national indicators on Ireland and Sweden. We feel confident that, in the case of Dublin, national data still proves relevant. According to the Economic and Social Research Institute of Dublin, given Ireland's small population size and land area and highly centralized government, national data extends to the regional level. While the national government does attempt to foster regionally-specific development in underdeveloped areas such as central Ireland, Dublin is representative of Ireland.

In the case of Sweden, statistics concerning the Skåne Region (which contains Malmö and Lund) were available. We decided not to use them because the area technically designated as Skåne contains a comparatively large section of Sweden that has a number of disproportionately large cities. Thus, using these statistics would be deceptive and could not be used for meaningful comparisons.

Appendix E: Figures

Figure 1: Interaction between the Independent Variables

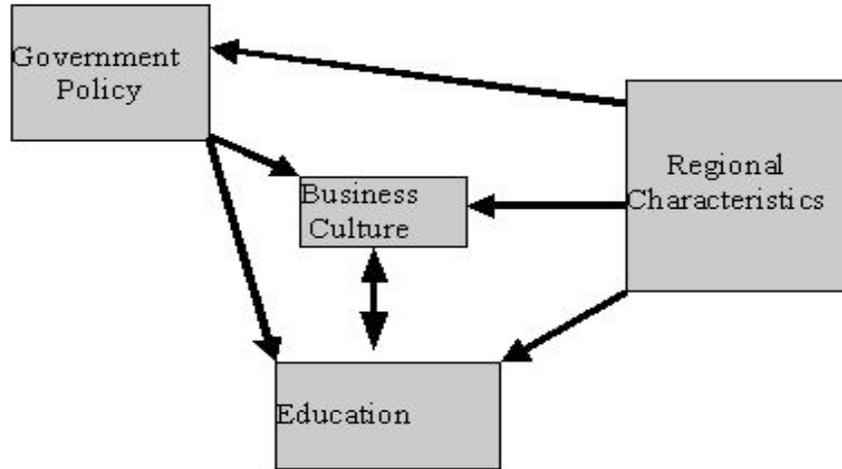
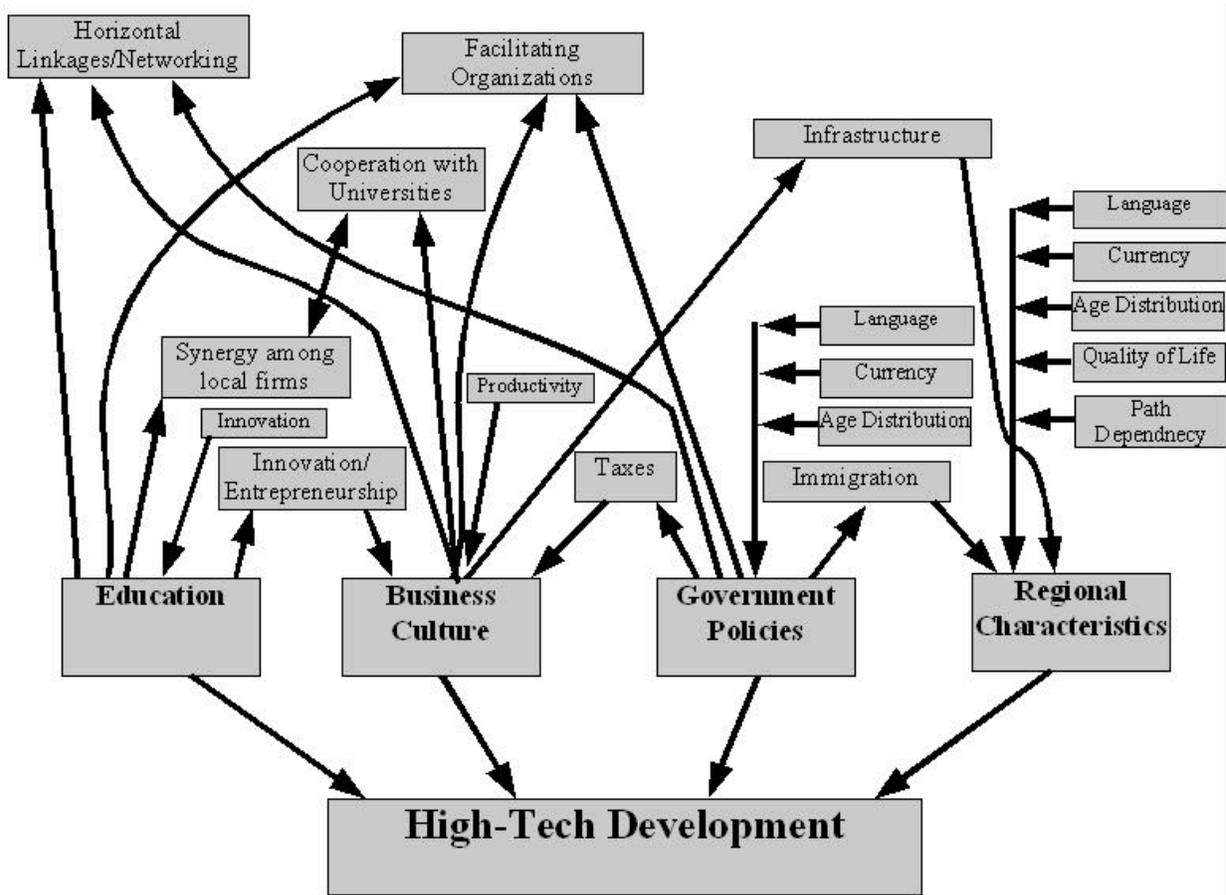


Figure 2: Intermediary Variables



## Appendix F: Tables

*Table 1: Skåne population and age distribution 2003<sup>27</sup>*

Age	Population	% Born Abroad	Age Distribution	Age Distribution Sweden
0-6	84112	3	7.3	7.3
7-15	133745	8	11.6	11.8
16-19	55216	15	4.8	4.8
20-44	381562	19	33.1	32.8
45-64	295990	16	25.7	26
65-84	173440	12	15	14.8
85+	28632	5	2.5	2.4
Total	1152697	14	100	100

*Table 2: Skåne population changes<sup>28</sup>*

Years	Population Increase by Year	% Annual Increase	% Annual Increase Sweden
1983-1987	2983	0.29	0.21
1988-1992	9428	0.91	0.66
1993-1997	5983	0.55	0.36
1998-2002	5697	0.51	0.21
2003	7607	0.66	0.39

*Table 3: Proportion of the population between the ages of 20 and 64 who are employed<sup>29</sup>*

	1998	1999	2000	2001	2002
Skåne	69.9	70.4	71.7	72.1	71.9
Sweden	73.3	73.9	75.2	75.7	75.9

*Table 4: Average income 2002 (people aged 20 and over)<sup>30</sup>*

	Total	Women	Men
Skåne	191838	157006	229125
Sweden	203257	167346	240863

*Table 5: Universities and Colleges in Skåne 2003 – Registered Students<sup>31</sup>*

	Total	Women	Men
Kristianstad College	7005	4935	2070
Lund University	32360	17140	15220
Malmö University	14426	9634	4792
Swedish Univ. of Agri. Sci	1003	587	416

*Table 6: Educational level of the population (aged 25-64) in Skåne and Sweden 2003<sup>32</sup>*

	Skåne	Sweden
Compulsory Education	8.6	8
Compulsory Education (9 yr)	10.8	10.6
High School (max 2 yr)	29.2	30.9
High School (3 yr)	16.8	16.7
Post High School (<3 yr)	13.9	14.2
Post High School (3 yr. or more)	17.8	17.4
Post Graduate	1.2	1
N/A	1.6	1.2

*Table 7: High tech statistical comparison Sweden-Ireland<sup>33</sup>*

	Sweden	Ireland
New S&E Grads (% of 20-29 years old)	9	15
Population with Advanced Skills (%)	29	22
English Skills (% of population)	81	Native Language
Multilinguality (% of population)	82	28
Home Internet Access (% of households)	54	36
EPO High-Tech Patent Applications (per million inhabitants)	22	13
Manufacturing SMEs Involved in Innovation Cooperation (%)	27	23
Innovation Expenditures (% of all turnover in manufacturing)	7	3
Scientific Publications (per million inhabitants)	1431	N/A
Investments in Knowledge as % of GDP	6	N/A
EU Commission Innovation Scoreboard Summary	6	1
Collaboration Between Industry and Academia (Score)	5	N/A
USPTO High-Tech Patents (per million inhabitants)	29	3
Business Expenditure on R&D (% of GDP)	2	1
Corporate Income Tax (%)	28	16
Economic Growth Potential (Score)	363	N/A

*Table 8: Measures of performance of the science base<sup>34</sup>*

	Ireland	Sweden
Scientific Pub. (per million) 2002	647	1598
Eur. Patent Apps (per million) 2000	61.6	248.2
US Patents Granted (per million) 2002	32.1	187
Researchers (per 1000 employed) 2001	5	10.1

*Table 9: Ireland economic statistics*<sup>35</sup>

	1993	2003
Unemployment %	15.7	4.7
Govt. Debt as % of GDP	93	34
Corporation Tax % (low/high)	10/40	12.5/25
Personal Tax % (low/high)	27/48	20/42
Irish GDP/capita (% of EU 15 Avg.)	69	125
Irish GNP/capita (% of EU 15 Avg.)	75	101

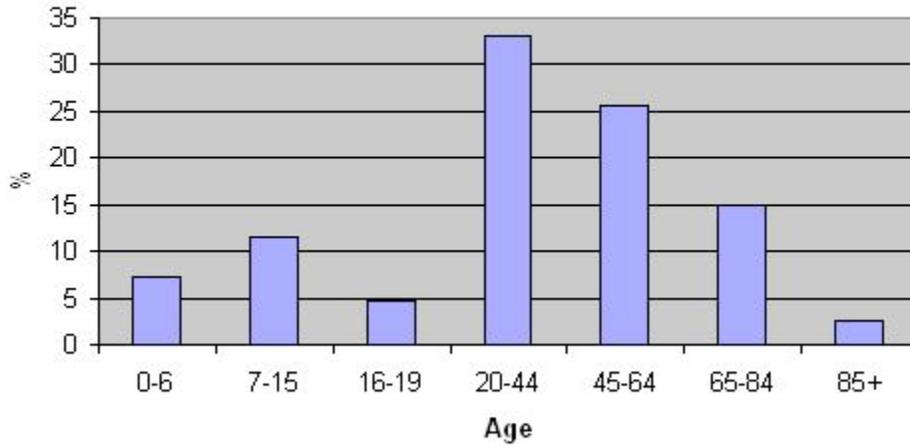
*Table 10: Dependent Variable Statistics*<sup>36</sup>

	<i>Sweden</i>	<i>Ireland</i>
% Employment in high-tech manufacturing	8.3	7.3
% Employment in high-tech services	4.8	4.0
Public expenditures on research and development / GDP	0.86	0.35
EPO high-tech applications/pop	22.9	13.3
% SMEs innovating in-house	44.8	62.2
% venture capital / GDP	2.04	0.65
% new-to-market products	6.9	8.4

Appendix G: Graphs

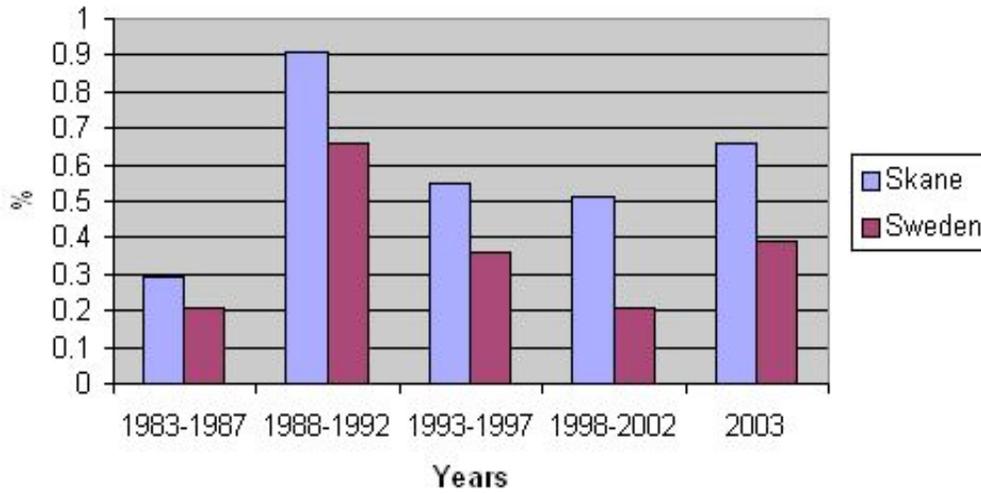
*Graph 1<sup>37</sup>*

**Skane Age Distribution 2003**

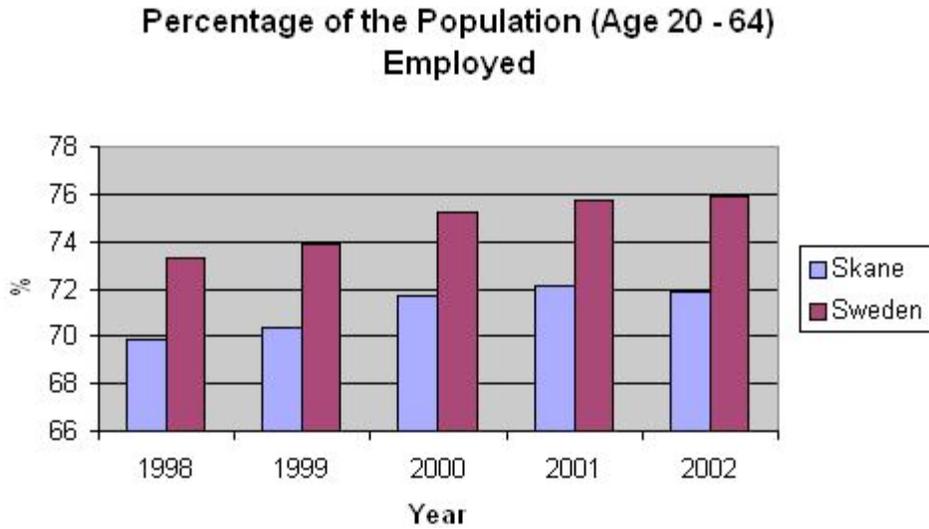


*Graph 2<sup>38</sup>*

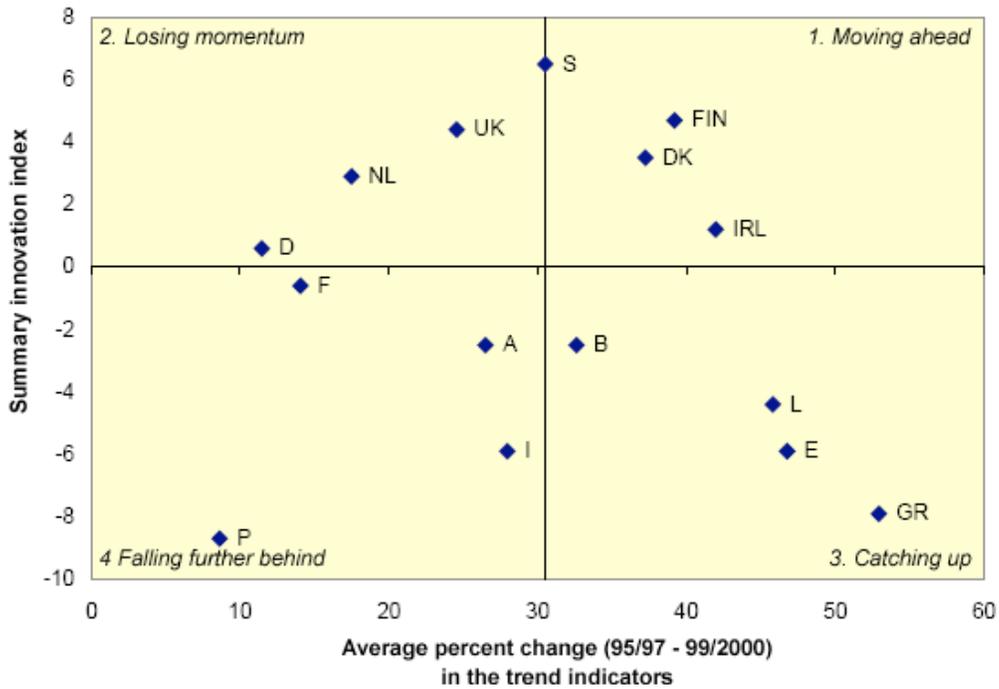
**Percentage Annual Population Increase**



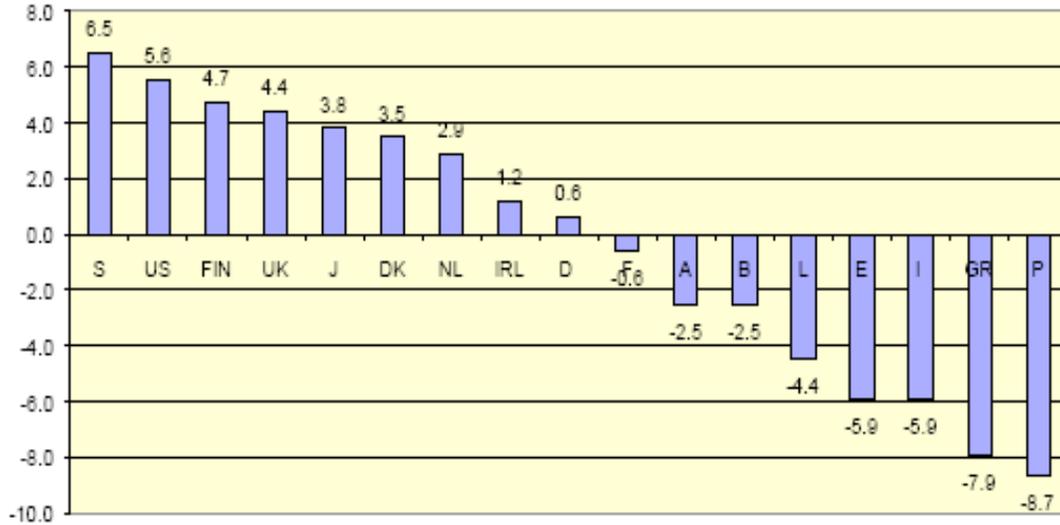
Graph 3<sup>39</sup>



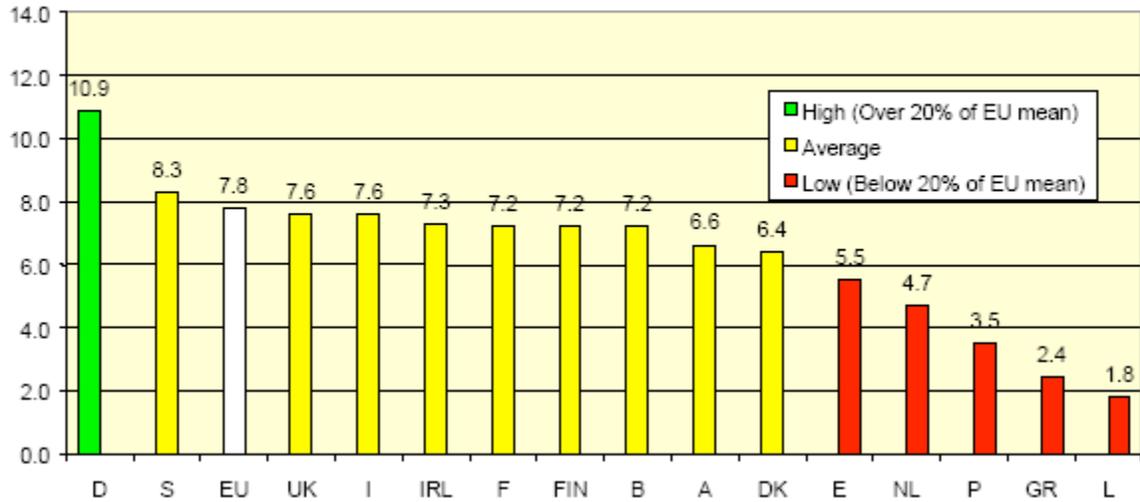
Graph 4: Overall country trends by innovation index<sup>40</sup>



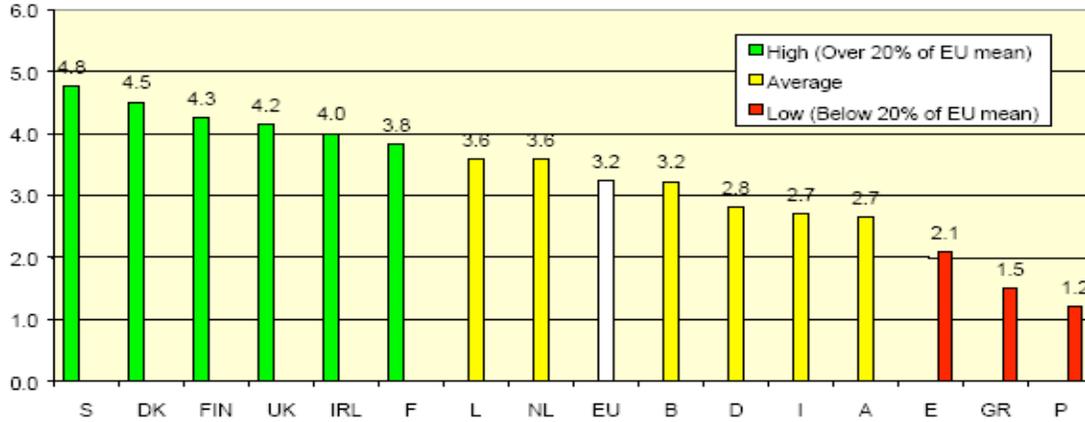
Graph 5: Tentative Summary Innovation Index<sup>41</sup>



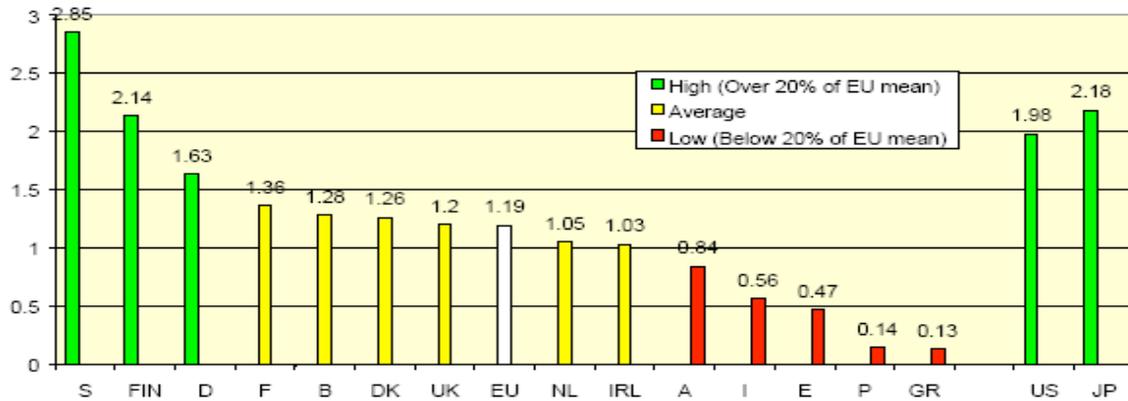
Graph 6: Employment in med-high and high-tech manufacturing (% of total workforce)<sup>42</sup>



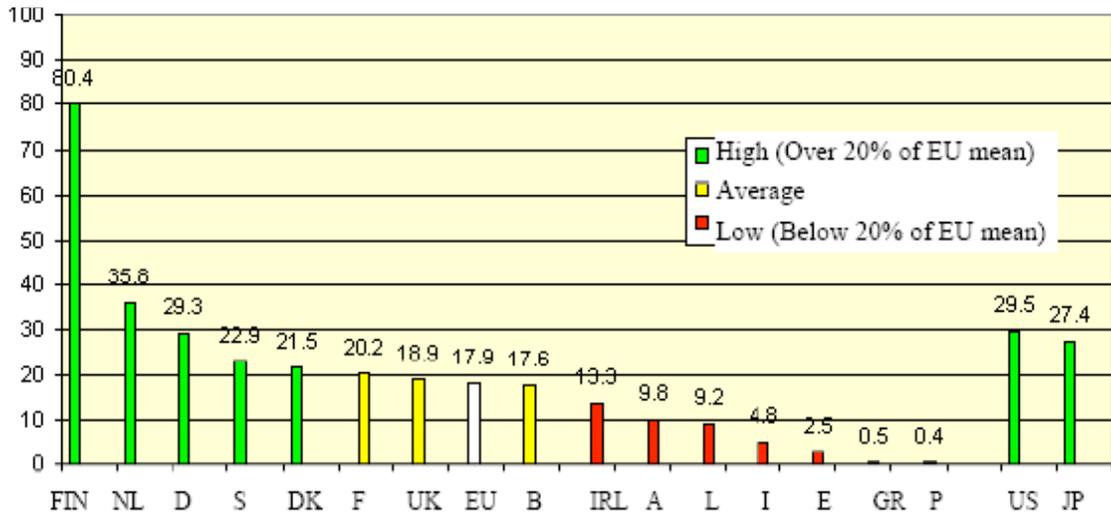
Graph 7: Employment in high-tech services (% of total workforce)<sup>43</sup>



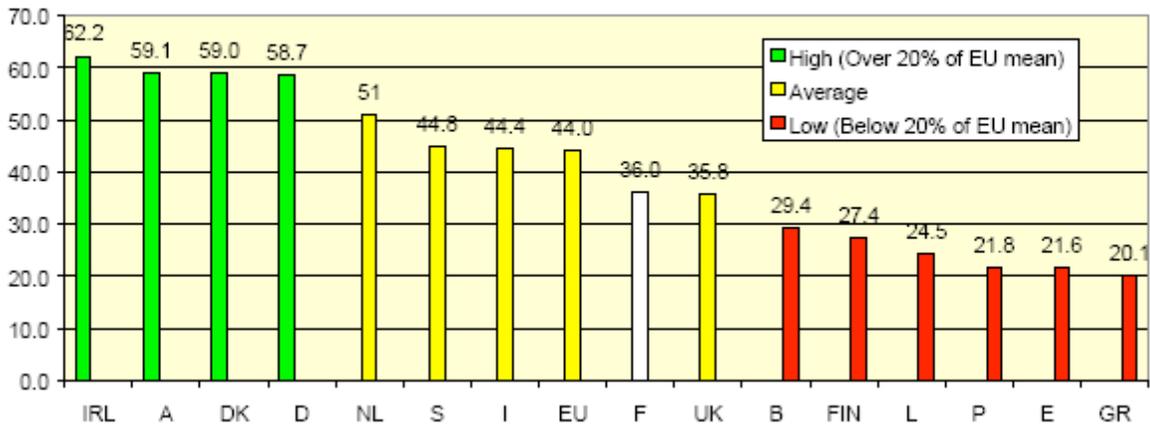
Graph 8: Business expenditure on R&D as a percentage of GDP<sup>44</sup>



Graph 9: EPO high-tech patent applications (per million population)<sup>45</sup>



Graph 10: SMEs innovating in-house (% of manufacturing SMEs)<sup>46</sup>



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