제 2주제

Swedish Technology Management

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박 상 철

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Swedish Technology Management

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Introduction

- A New Economic Order based on Globalization and Localization
- The Role of Nation-State, Industry, and University
- National Innovation System
- Regional Innovation System: Key Factor for National Competitiveness and Sustainable Development

Theoretical Background

- Traditional Innovation Theory: Linear Model, Chain-Linked Model
- Modern Innovation Theory: Innovation as Technical and Social Process, Learning Economy, Cluster as Systemic Innovation, Innovative Milieu

National Innovation System

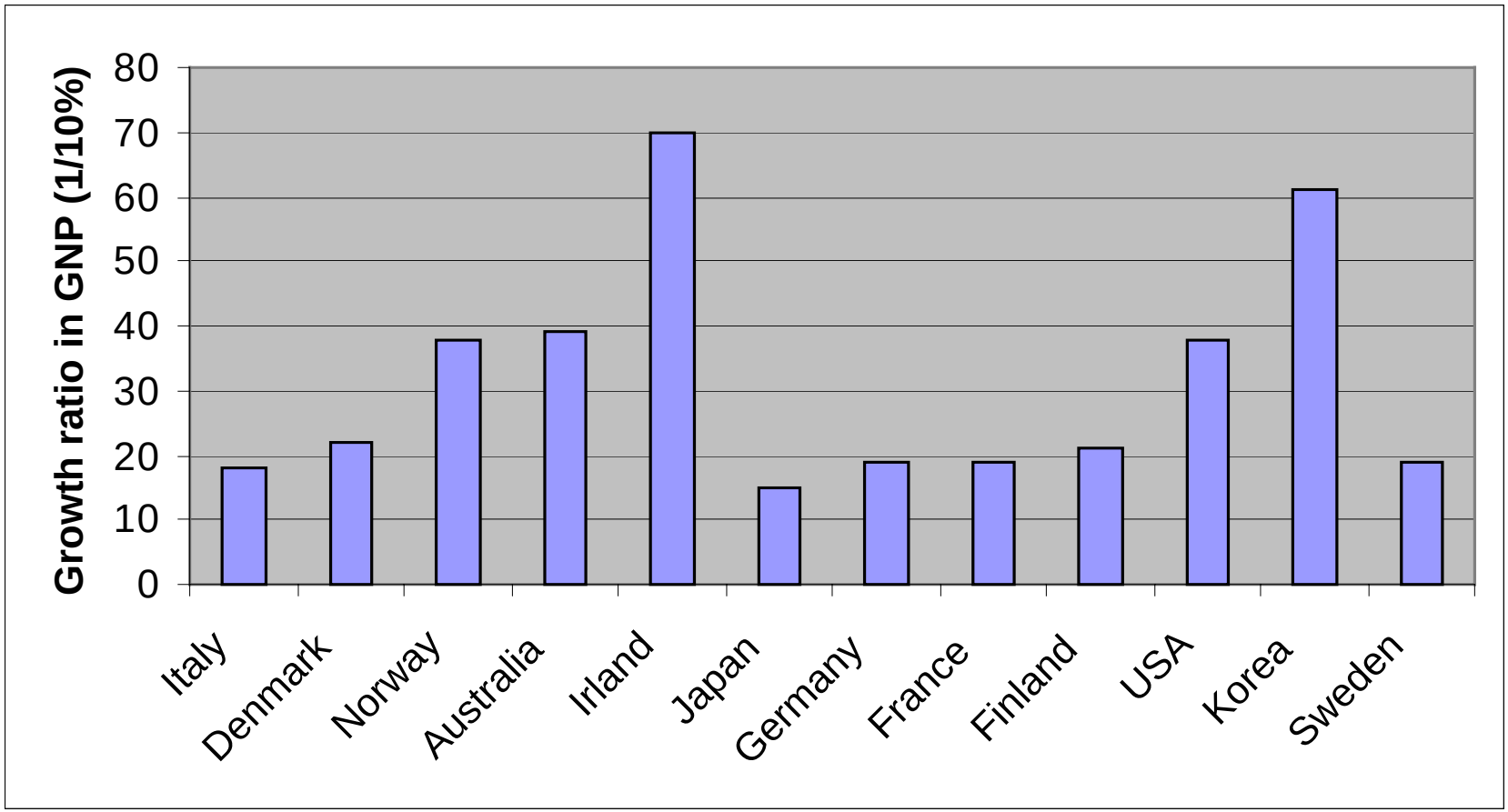
- The Agency for Innovation System (VINNOVA)
- Major Tasks: Initiatives of R & D Activities, Financial Support, Analysis of Innovation System, International Cooperation for R & D Activities
- 25 R & D Programs, over 1,700 Projects Carried out until 2003
- Main Actors and Co-operative System: Universities and Research Institutes, Firms, Government
- Results: Strong National Competitiveness (Table 1 & 2), High Investment of R & D Activities, Low Contribution to Economic Growth (Fig.1 & 2)

Table 1: World Growth Competitiveness (2003-2004)
Table 2: World Business Competitiveness (2003-2004)

Country	Growth Competitive-ness 2003	Growth Competitive-ness 2002
Finland	1	1
USA	2	2
Sweden	**3**	**3**
Denmark	4	4
Taiwan	5	6
Singapore	6	7
Switzer-land	7	5
Iceland	8	12
Norway	9	8
Australia	10	10

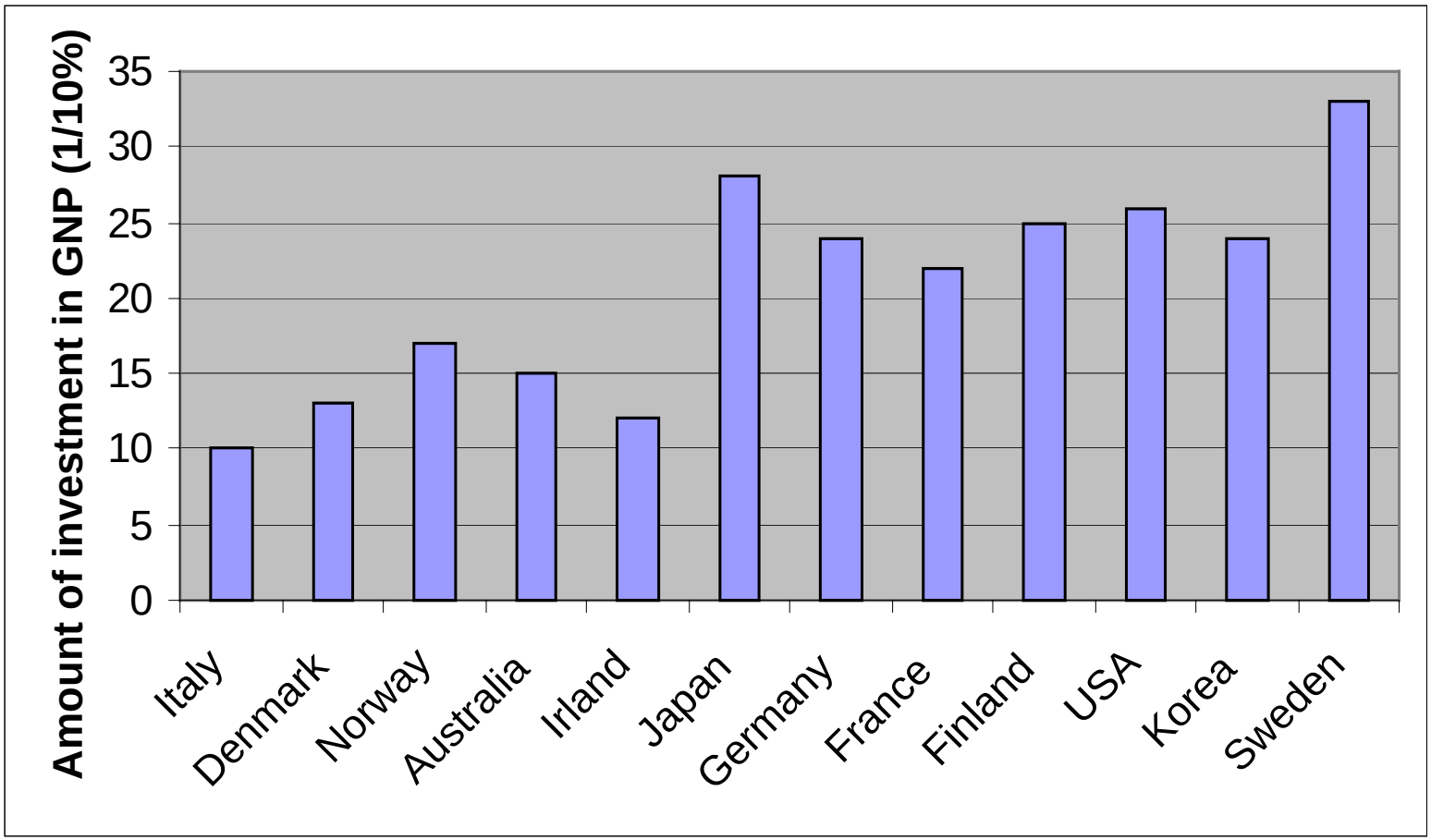
Country	Business Competitive-ness 2003	Business Competitive-ness 2002
Finland	1	2
USA	2	1
Sweden	**3**	**6**
Denmark	4	8
Germany	5	4
UK	6	3
Switzerland	7	5
Singapore	8	9
Netherlands	9	7
France	10	15

Figure 1: Average Growth Rate of GNP in Major Nations (1990 – 1999)



Source: OECD, Science and Technology Index Scoreboard, 2001

Figure 2: Average Investment of R & D in Relation to GNP (1990 – 1999)



Source: OECD, Science and Technology Index Scoreboard, 2001

Regional Innovation System in Sweden

- Developed mainly in Innovative Clusters
- Cluster Policy Conducted with Competitive Policy, Tax Policy, Education Policy etc.
- Innovative Cluster: A Process –Oriented Way of Working for National and Regional Development
- Eight National and Nine Regional Clusters in 2001, and 18 national and 14 regional clusters in 2005 (planning) (Table 3)

Table 3: National and Regional Clusters in Sweden

	National Clusters	Regional Clusters
Existing	IT/ Telecom IT/ Mobile Internet Paper and pulp industry Steel/ raw materials industry Health and medical care industries Trucks and busses Biotech Technical aids	**Furniture design industry (Småland)** Industrial automation (Mälardalen) Medical technology (Eastern central Sweden) Packaging (Skåne) Aerospace (Östergötland) Power industry (Eastern central Sweden) Cutting technology (Småland) **LCD technology (Dalarna)** **Automotive test industry (Norrbotten**)
Potential	Geriatric care Children's play, learning and environment Interactive learning Bio informatics Environmental management Music industry Green energy Smart homes Vehicle safety Specialized textile and clothing industry	Audiovisual (Fyrbodal) Functional Food (Skåne) Satellites and communication (Kiruna) Woodworking business (Västerbotten) Creative and experience industries (Mälardalen)

Source: The County Administrative Board of Södermanland, Charting Södermanland's Cluster, 1999

Regional Cluster Strategies and Policies

- Regional Clusters Regarded as Strategic Initiatives
- Requirement of Strong Support in Public Sectors: Promoting a growth policy, maximizing the use of research contributions, monitoring the market functions
- Policies: a systematic cluster analysis, striving for interplaying between actors, coordinating resources, assuring synergy effects

Geographical Patterns of Clusters and Policy Measures

A. Geographical patterns

- *Geographical specialization*: low movement of people, little income differences, medium growth
- *Geographical concentration*: high movement of people little income differences, high growth
- *Geographical polarization*: low movement of people, high income differences, high growth

B. Policy measures

- Education for labor force
- Regulation of local tax system
- Labor market
- Income flexibility
- Welfare system for unemployment

Regional Clusters

- *Successful factors of regional clusters*
- See fig.1

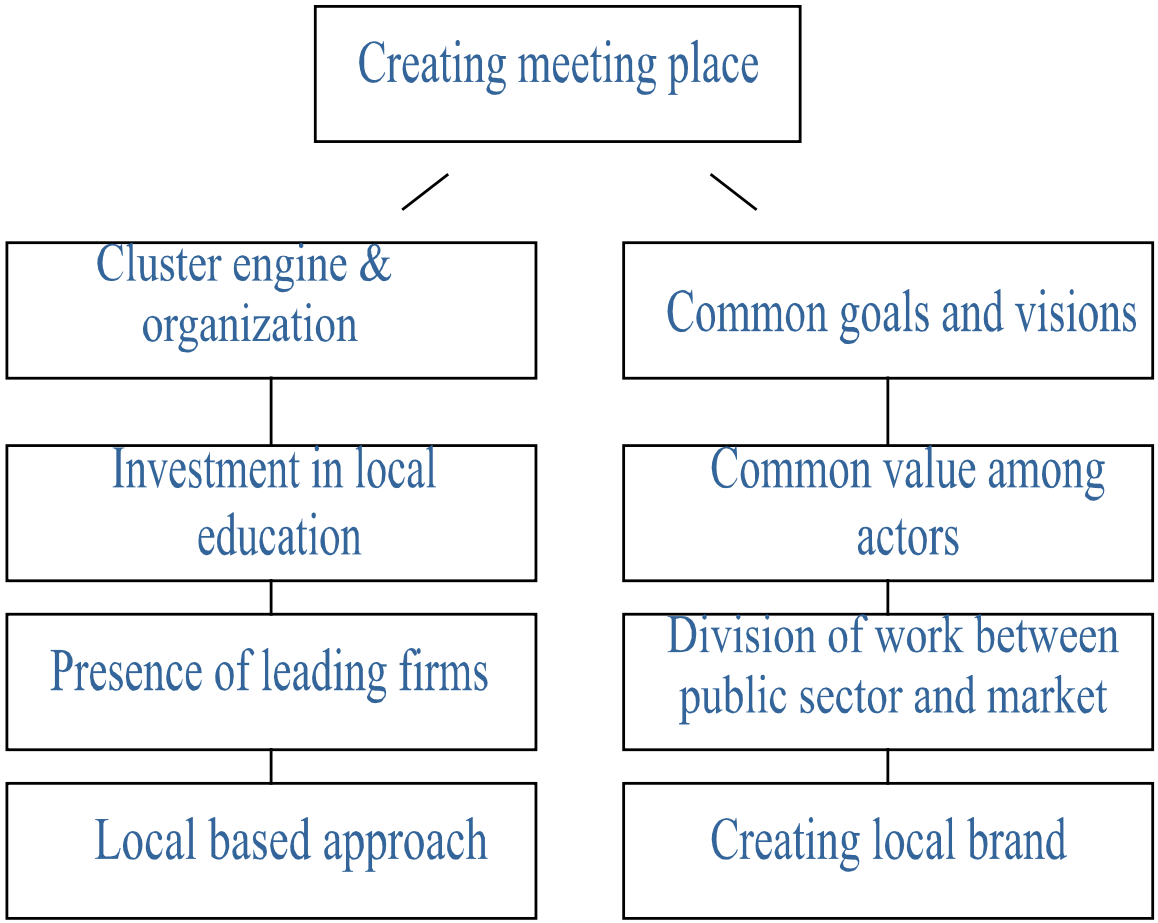
B. Needs for cluster locomotive

- Coordination based on dialogue among actors
- Integration focused on horizontal structure: hierarchical order regarded as immature in a network society
- Entrepreneurs as grass-root leaders and local leaders

C. Roles of cluster locomotive

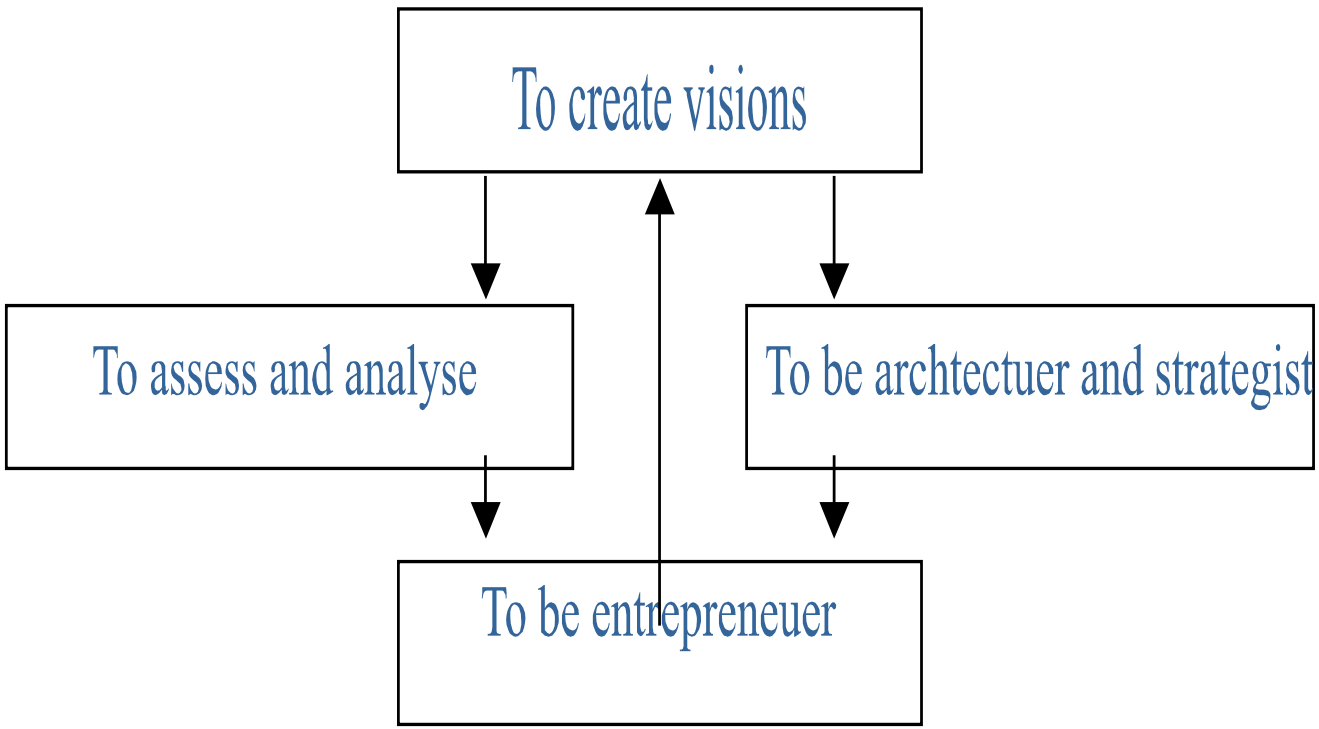
- See fig.2

Figure 1: Successful factors in regional clusters



Source: Author's own adaptation

Figure 2: Roles of cluster engine



Source: Author's own adaptation

Analysis on Clusters and Innovation System

- An analysis of linkages, specialized skills and products and strategies (a macro level) (See table 4, 5)

- An analysis of Swedish innovation system based on the 2003 innovation scoreboard in the EU (See table 6, Fig. 3)

Table 4: Analysis on Clusters on Detailed Levels

Level	Direction	Contents
Macro	Linkages between businesses	Economic structure Specialized pattern
Meso	Linkages within and between businesses	Analysis on strength, weakness, and possibility Benchmarking on business level
Micro	Linkages between suppliers around core companies	Company development Management of process chains Technological system

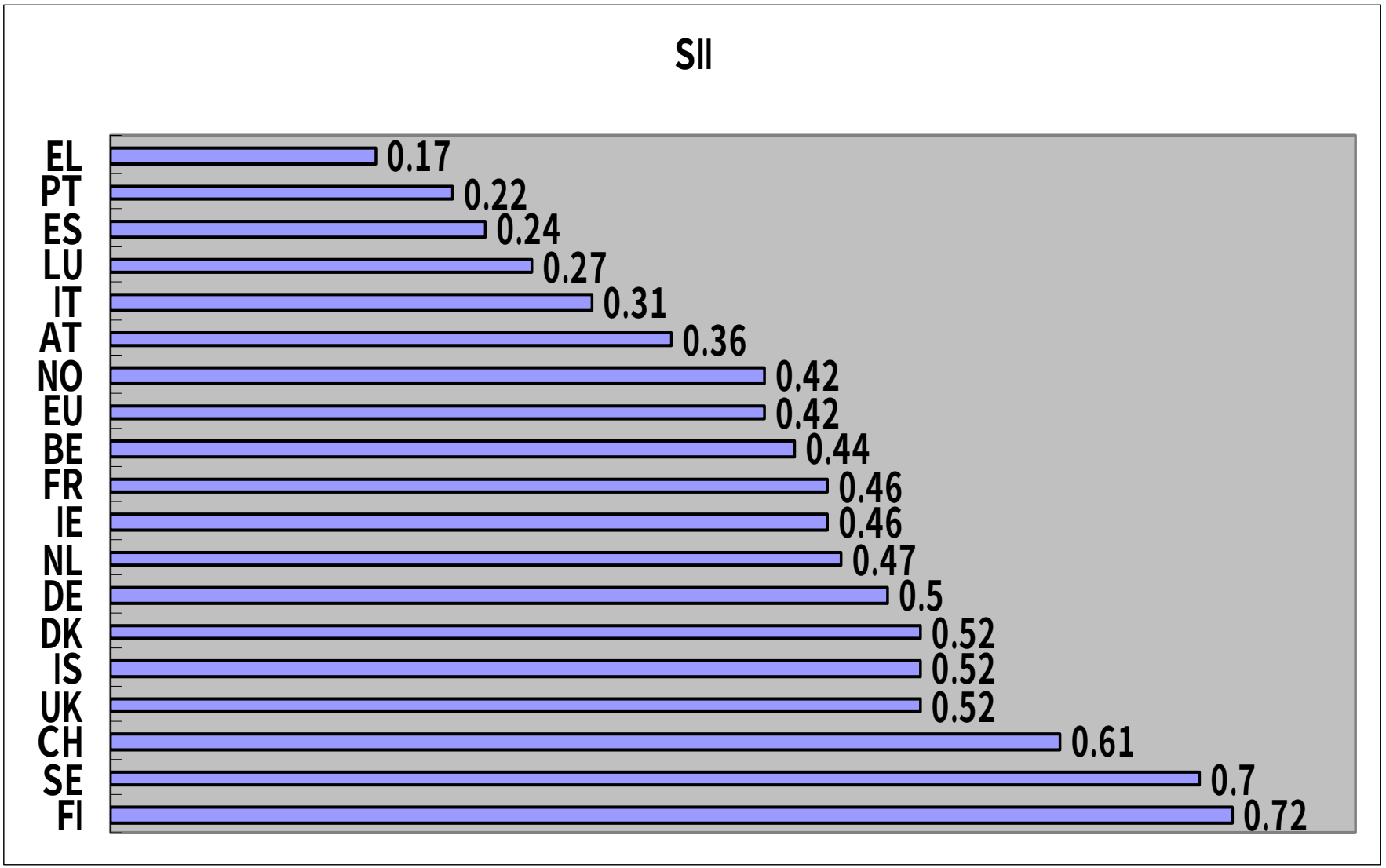
Name	Location	Core Products	Strategies	Pattern of Cluster Organization
Automotive testing cluster	Norrbotten	Offering infrastructure for testing of automotive and related components	Promoting and spreading knowledge about automobiles and components as well as developing the automotive testing industry	Cooperation between cluster organization and a non-profit association, the Swedish Proving Ground Association
Biotech cluster	Umeå	Biotech/ medicine, laboratory instruments	Close contacts with university research environments	No formal cluster organization, dense networks between Umeå University and a number of research centres
Woodworking cluster	Västerbotten	Woodworking products	Developing an effective wood industry	Cluster organization
Crystal Valley	Dalarna/ Borlänge	LCD-related products	Strengthening the Crystal Valley brand and becoming a global centre in display research	Cooperation of the Swedish LCD Centre and industry research institute
TIME	Stockholm	Telecom, IT, Media and Entertainment	Strengthening the TIME brand	Cluster organization
IDEA Plant	Sörmland/ Eskilstuna	Design, arts	Achieving global recognition for creativity in information design	Cluster organization

Rock city	Hultsfred	Music related activities and digital media	Developing a national knowledge node in areas of music and digital media	No formal cluster organization, cluster centred around IUC Hultsfred and companies of the Rock city initiative
Audiovisual cluster	Västra Götaland	Audiovisual and video businesses	Strengthening the Fyrbodal brand and becoming more competitive by attracting businesses and activities	Cluster organization (Film in West)
Cutting Technology Centre	Gnosjö region	Plastics, polymers, products in cutting processes	Becoming a national centre of polymers and cutting technology, raising the level of specialized skills and expertise	Cluster organization
The Kingdom of aluminium	Småland/ Blekinge	Aluminium	Strengthening a regional brand of the Kingdom of aluminium, improving specialized skills and expertise related to aluminium	Cluster organization based on memberships
Telecom City	Karlskrona	IT and telecom	Becoming a leading development environment focused on telecommunications	Cluster organization based on memberships
Medicon Valley	The Öresund region	Pharmaceuticals and medical technology	Making an attractive international brand	Cluster organization, Medicon Valley Academy financed by association

Indicator	EU leaders			USA	Japan
S & E graduates/ 20-29 years	21.7(IE)	19.6(FR)	19.5(UK)	10.2	N.A.
Population with tertiary education	32.4(FI)	29.4(UK)	28.1(BE)	37.2	33.8
Population in lifelong learning	22.3(UK)	18.9(FI)	18.4(DK)	N.A.	N.A.
Employment in med/high-tech manufacturing	11.36(DE)	7.39(FI)	7.37(IT)	N.A.	N.A.
Employment in high-tech services	5.23(SE)	4.74(DK)	4.74(FI)	N.A.	N.A.
Public R & D/ GDP	1.02(FI)	0.96(SE)	0.82(NL)	0.76	0.81
Business R & D/ GDP	3.31(SE)	2.47(FI)	1.76(DE)	2.04	2.28
High-tech EPO patents/ population	136.1(FI)	100.9(SE)	68.8(NL)	57.0	44.9
High-tech USPTO patents/ population	47.3(SE)	41.6(FI)	22.7(DK)	91.9	80.0
EPO patents/ population	366.6(SE)	337.8(FI)	309.9(DK)	169.8	174.7
USPTO patents/ population	213.7(SE)	156.1(FI)	147.4(DE)	322.5	265.2
SMEs innovating in-house-manufacturing	55.1(DE)	46.2(BE)	42.5(NL)	N.A.	N.A.
SMEs innovating in-house-services	43.9(DE)	39.6(LU)	37.6(PT)	N.A.	N.A.
Innovation cooperation-manufacturing SMEs	22.0(FI)	18.9(DK)	14.1(SE)	N.A.	N.A.
Innovation cooperation-services SMEs	18.3(FI)	12.8(SE)	12.7(DK)	N.A.	N.A.

Innovation expenditures-manufacturing	6.42(SE)	4.92(BE)	4.71(DE)	N.A.	N.A.
Innovation expenditures-services	19.11(SE)	2.66(PT)	1.64(DE)	N.A.	N.A.
High-tech venture capital share	71.2(IT)	70.7(FR)	57.5(FI)	N.A.	N.A.
Early stage venture capital/ GDP	0.098(SE)	0.087(FI)	0.080(DK)	0.218	N.A.
Sales new to market products-manufacturing	27.2(FI)	18.7(IT)	16.0(PT)	N.A.	N.A.
Sales new to market products-services	17.9(EL)	13.7(ES)	12.2(FI)	N.A.	N.A.
Sales new to firm products-manufacturing	40.3(DE)	32.1(SE)	31.1(FI)	N.A.	N.A.
Sales new to firm products-services	37.1(EL)	26.4(ES)	23.7(SE)	N.A.	N.A.
Internet access/ use	0.97(SE)	0.93(DK)	0.76(FI)	0.73	0.88
ICT expenditures/ GDP	9.8(SE)	8.6(UK)	8.3(NL)	8.2	9.0
High-tech manufacturing value-added share	30.6(IE)	24.9(FI)	18.8(UK)	23.0	18.7
Volatility rates-manufacturing	16.0(UK)	14.2(ES)	13.3(PT)	N.A.	N.A.
Volatility rates-services	20.4(DK)	20.2(UK)	18.5(NL)	N.A.	N.A.

Figure 3: Overall Innovation Capability by Summary Innovation Index (SII)
Source: Commission of the European Communities, 2003



Conclusions

- A national competitiveness based on the national innovation system
- National and regional clusters closely related with industrial development (Fig. 4)
- Regional clusters and national innovation system strengthening each other in a dynamic interplay
- Improving the efficiency of R & D investment as the highest priority of government's task (Fig. 5)

Figure 4: Regional disparities in GDP per capita in 25 OECD nations
Source: OECD's Territorial Development Policy Committee, Geographic concentration and territorial disparity in OECD countries, 2002

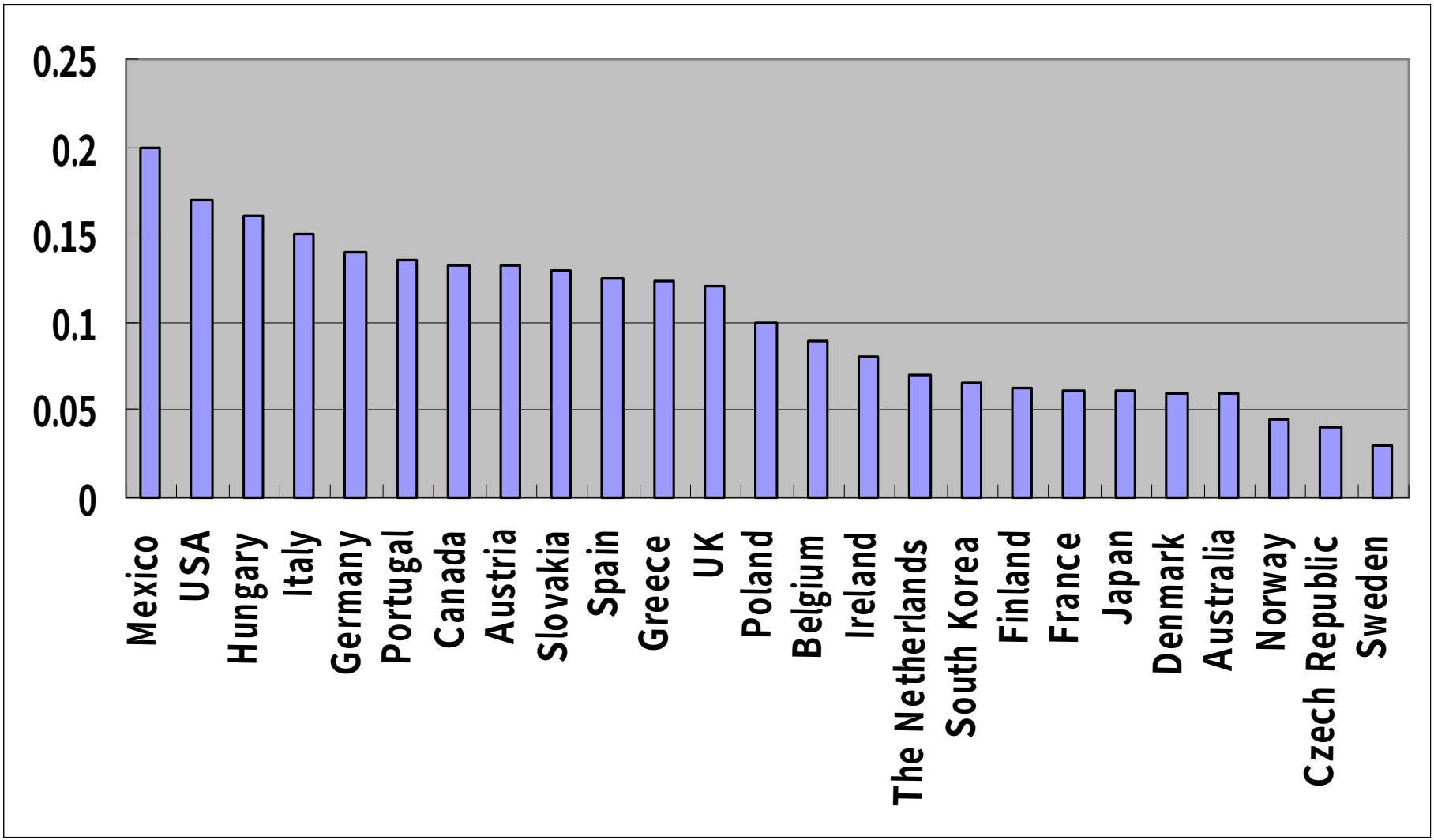


Figure 5: Response time of markets to innovative products

Source: Tellis, G. J., Stremersch, S, Yin, E. (2003) The international take-off of new products: the role of economics, culture and country innovativeness, Marketing Science 22: 188-208