# Transformation of Innovation system in a Small Country – elements of Success in Finland

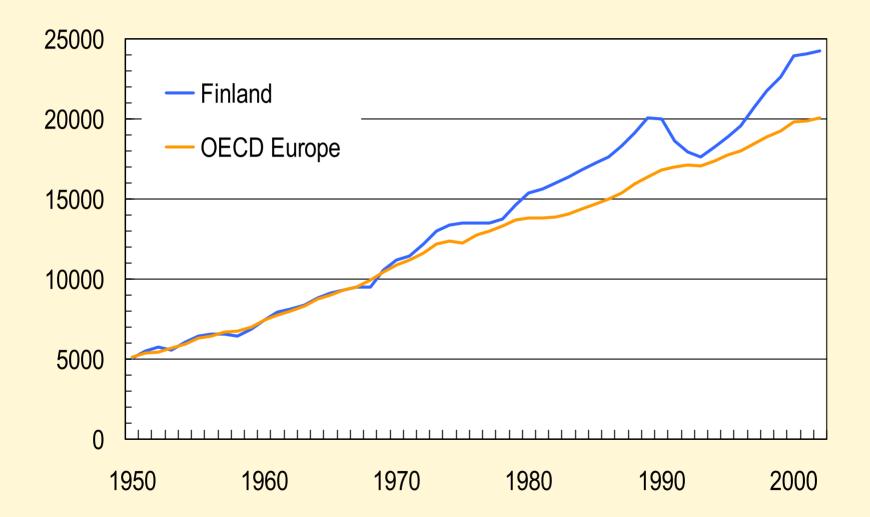
Pekka Ylä-Anttila ETLA – The Research Institute of the Finnish Economy AND Tarmo Lemola Ministry of Trade and Industry & Advansis Ltd/Oy

The First Globelics Conference, 3-6 November Rio de Janeiro

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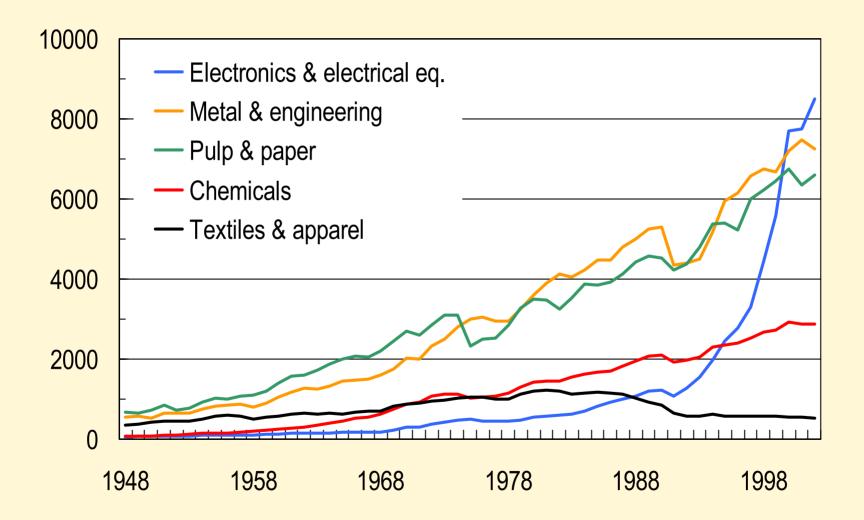
- Growth performance
  - Long term view
  - The most competitive country in the world?
- Crisis and structural change of the1990s
- Finnish miracle/Finnish model of the information society
  - The most ICT specialized country
  - Nokia A big company in a small country
- Role of science and technology policies
  - Phases of development
    - Building the basic structures 1960s and 1970s
    - Technology orientation phase 1980s
    - Era of building the knowledge-based economy and NSI 1990s
  - How do we explain the Finnish miracle?
    - Creative destruction
  - Lessons to be learned?

#### GDP/capita in Finland and OECD Europe (at 2002 prices – PPP)

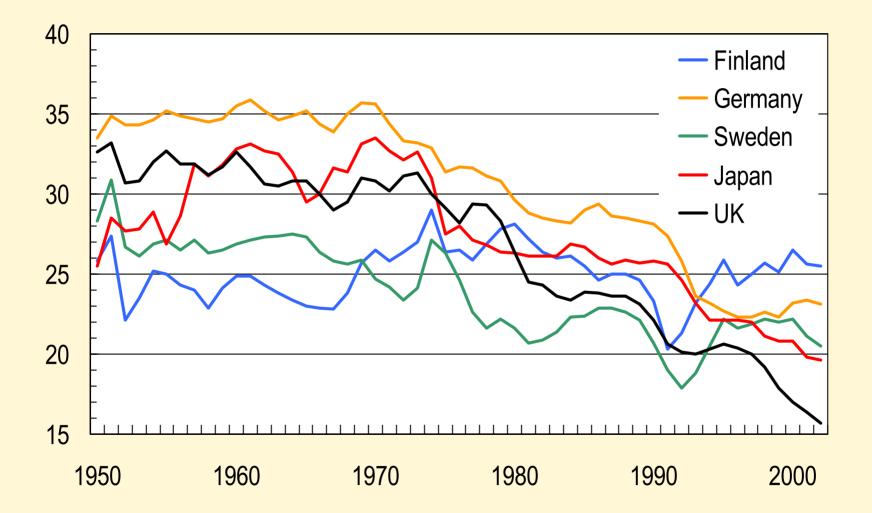


Sources: OECD, Penn World Tables.

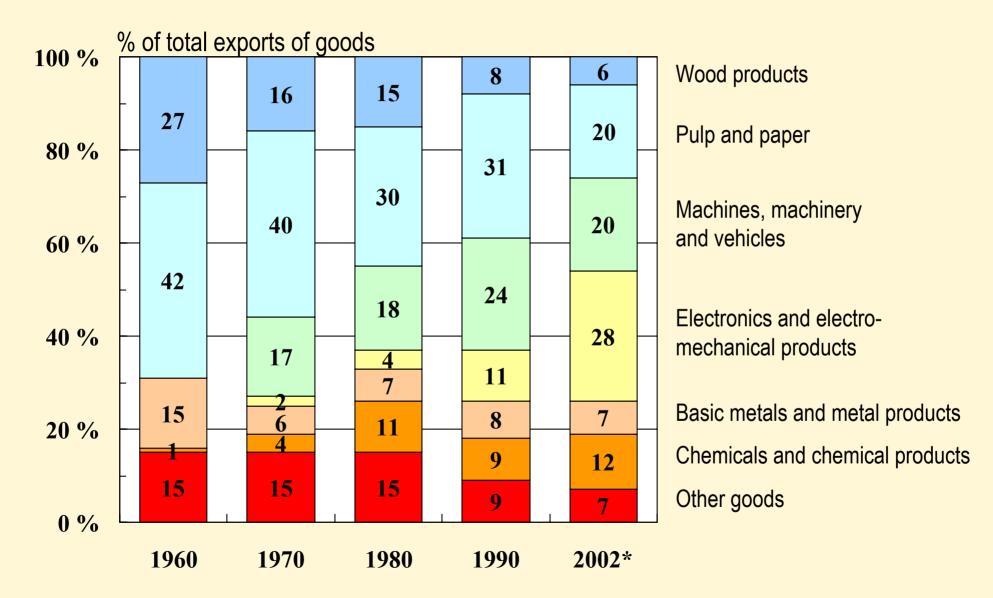
#### Manufacturing output in Finland by industries (at 2002 prices)



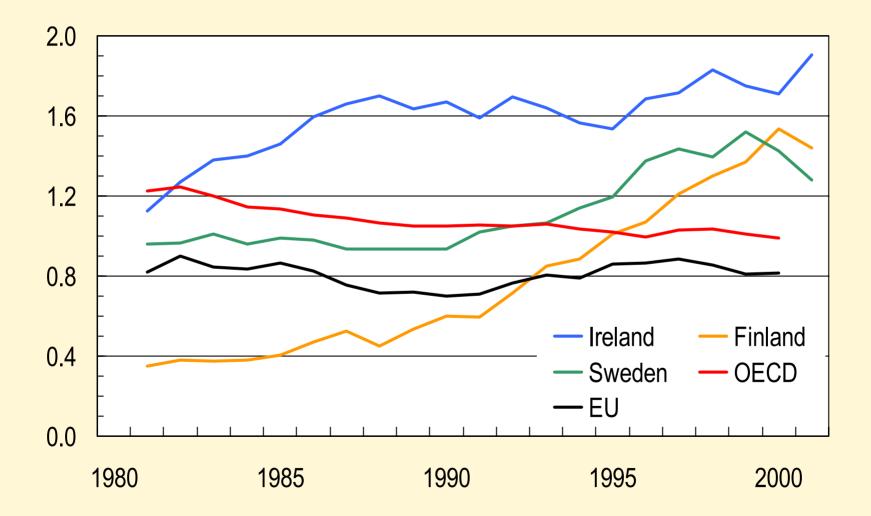
#### Share of manufacturing in GDP (%)



#### Finnish exports of goods by industry 1960-2002 (%)



#### Export/import ratio of high-tech products



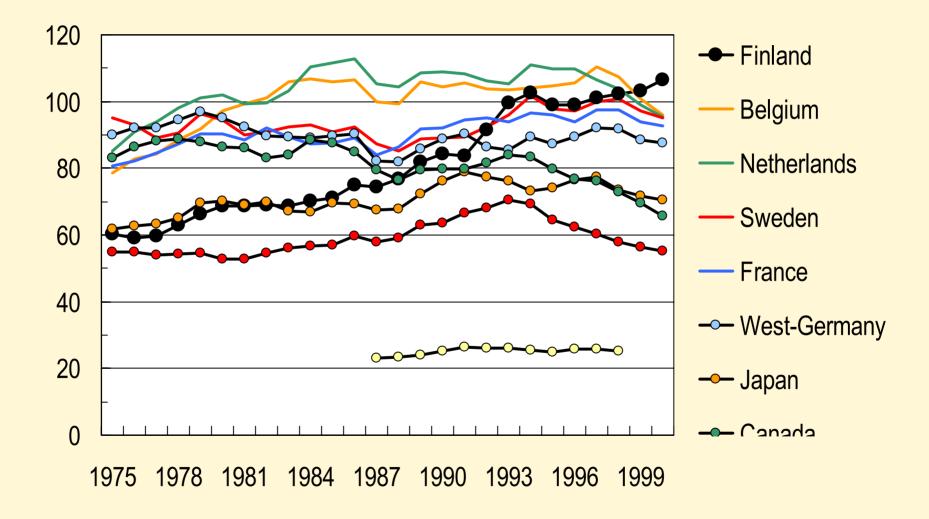
#### ICT sector's share in value added, employment and R&D

#### ICT value added **ICT** employment **R&D** in ICT (% of business sector tot., 2000) (% of business sector tot., 2000) (Selected ICT ind., % of GDP, 2000) Finland Finland Ireland Finland Sweden Korea Korea Canada Sweden USA Japan Japan New Zealand **ÚSA** UK Sweden Netherlands Canada Hungary Belgium Ireland ŪŃ France Netherlands Netherlands Norway Germany Belgium Denmark France Japan Austria Belgium Czech Rep. USA UK Norway Korea Denmark Canada Italv Norway Denmark Australia Italy France Czech Rep. Australia Portugal Spain Spain Mexico Czech Rep. Austria Australia Germany Poland Spain Portugal Italy Germany Mexico Slovak Rep. Greece . . . . . . . . . . . . 1 1 1 1 0 8 12 16 0 2 6 8 10 0 4 4 Total Communic. & other eq. Manufacturing Communic. & other eq. Computer & office eq. Services (for those avail.) Computer & office eq. Services Services

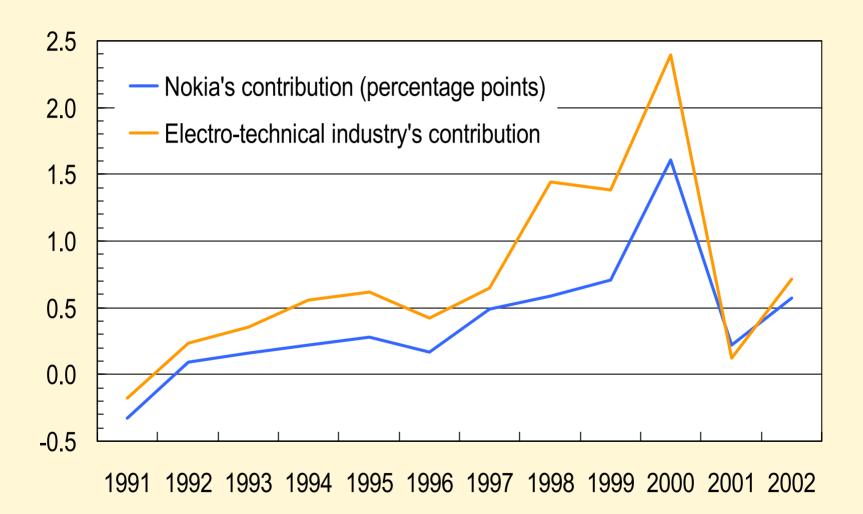
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#### Manufacturing productivity in selected countries (USA = 100)



#### Nokia's contribution to GDP growth in Finland



#### NOKIA - a big company in a small country

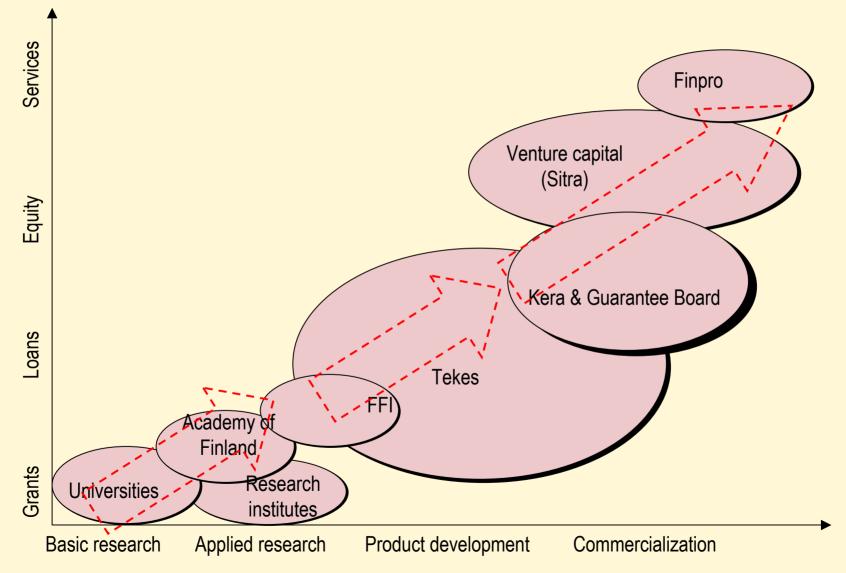
#### Nokia's share (2002) in:

GDP	2.7 %
Contribution to GDP growth	0.57 %
R&D expenditure	40 %
Exports	21 %
Total employment	1 %
Manufacturing employment	5 %
Market value of Helsinki Stock Exchange	60 %

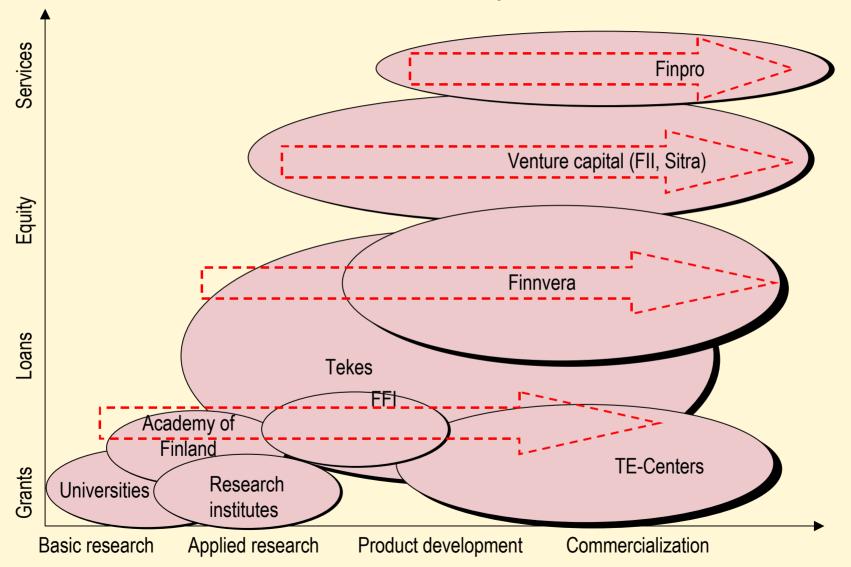
### S&T Policies – Phases of development

- No "Master Plan" in the 1990s
  - roots in the 1970s and 1980s designing of policie and creating competitive advantages take time
  - complementarities between policies, financial market liberalization, and institutional changes
- Phases of development
  - The building phase of the 1960s and 1970s
    - imitating, learning from others
    - building institutions & organizations
  - Technology phase 1980s
    - technology policy more target-oriented National Technology Agency (Tekes) established
    - commercialization of technologies
  - Era of national innovation system 1990s
    - Finland the first country to adopt the concept
    - collaboration nationally and internationally, including industry/university collaboration
    - Interplay between education, science, technology, and commercialization
    - concrete target: increase in R&D expenditure

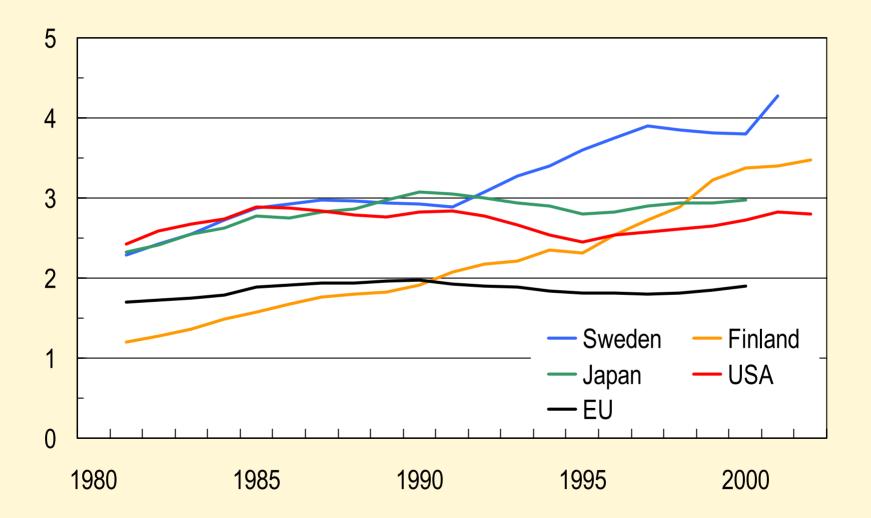
#### Innovation supporting organizations The system in the 1980s



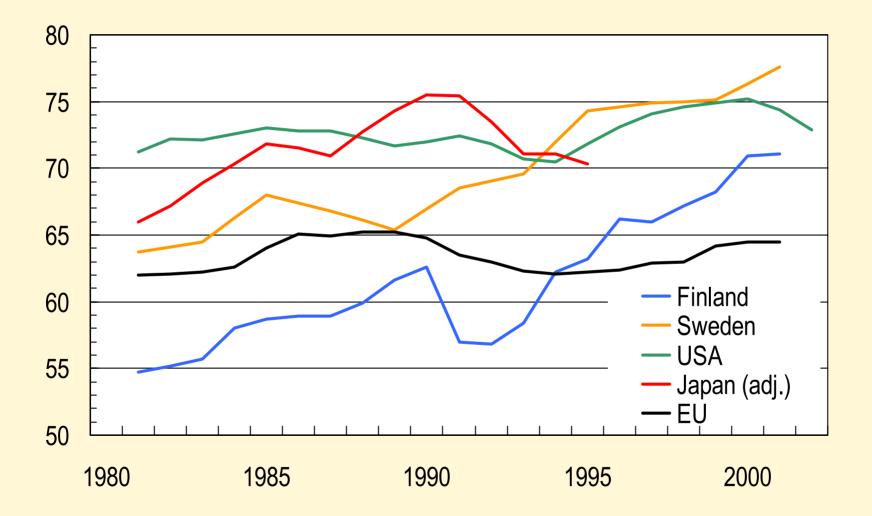
#### Innovation supporting organizations The current system



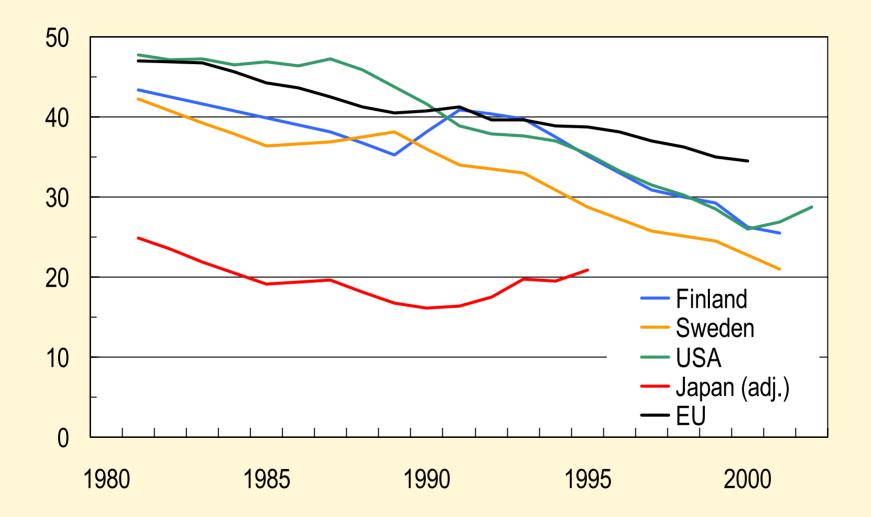
#### **R&D** expenditure, % of GDP



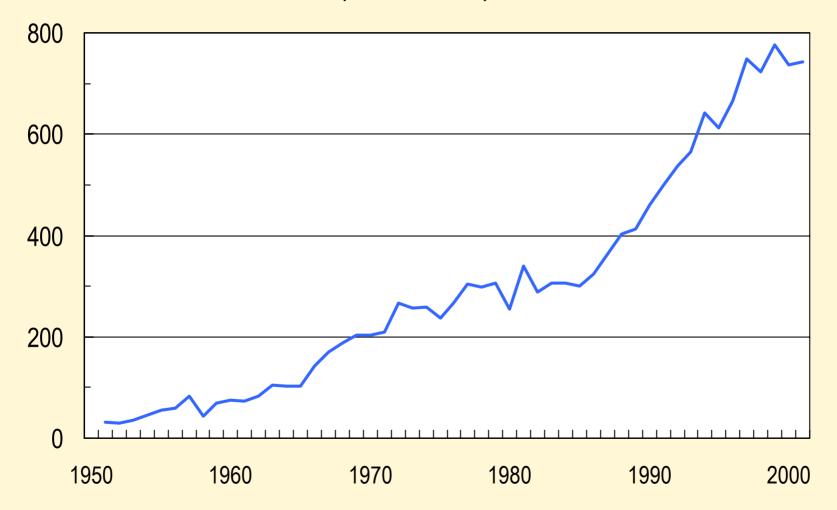
#### Share of GERD performed by the business sector (%)



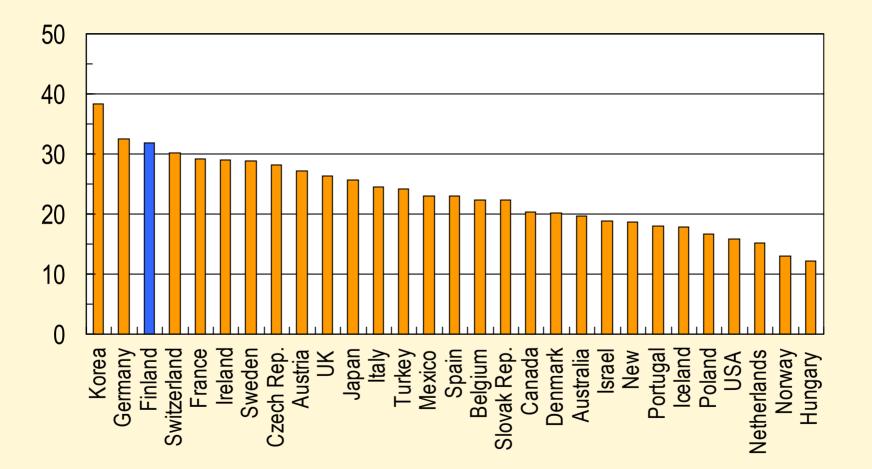
#### Share of GERD financed by government (%)



#### Post-graduate degrees granted in natural sciences and engineering (1951-2001)



# Share of tertiary type of graduates in engineering, natural sciences, mathematics and statistics, and computing, % of all graduates



# Lessons to be learned?

- Finnish miracle?
  - policies played a role, but it is not the whole story
  - business driven process
- Models come and go
  - Japan ranked the most competitive country in 1993(!) by IMD
- Small country advantage?
- Institutions matter
  - Openness to the external world has to be combined with dense interaction (collaboration & networking) internally
- Consistency of policies & long-term view
  - Stability in the rules of the game