Technology Production vs. Technology Diffusion

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Lisbon Agenda & Technology Diffusion

"not the creation of technological leadership in itself that affords a nation its competitive advantage, but the rate and level of diffusion of the technology into economic use"

Rothwell/Zegfeld 1985

Examples: Location of invention & profit from invention

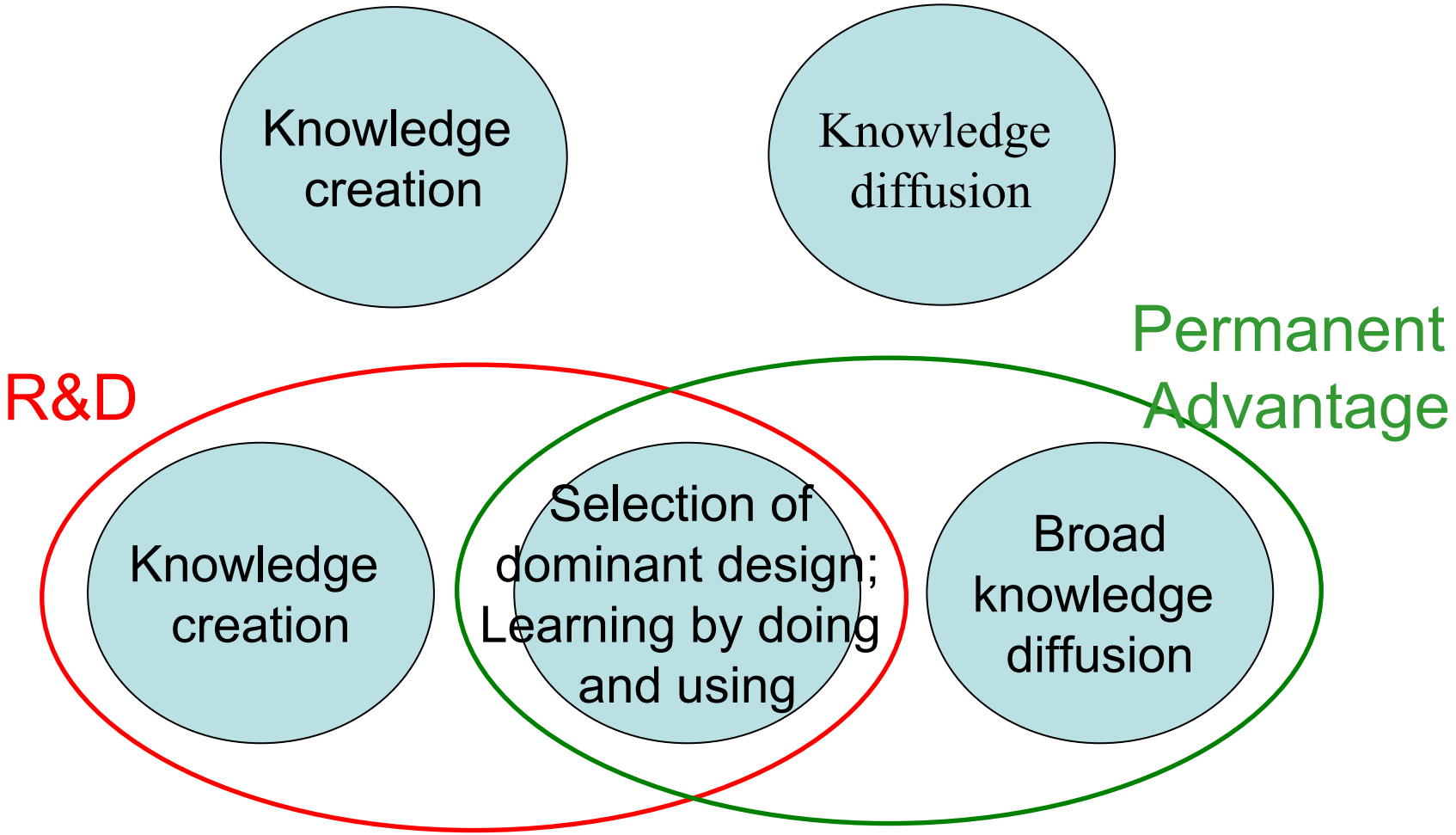
- Fax
  - First technical realisation by Bell 1921
  - Several configuration („innovation“) introduced in US & Germany (failed)
  - Telex technology more advanced („dominating technology“)
  - Massive investment by Japanese Firms to improve the technology („picture based content“)
  - Early adoption – permanent advantage of early adopters (5 year lead)
- Mobil phone
  - Basic principle developed by Bell 1940; addition coinventions need
  - Analog mobil phone (AMPS Standard) in mid 1970ies by ATT
  - First market introduction in Japan late 1970ies
  - Standardisation activities in EU (GSM) in 80; leading UK, DE, F
  - E.g. Market introduction in Germany fail („niche market“)
  - Rapid diffusion start, however, in Finland/Sweden early nineties
- Wind energy (GroWiAn vs. Denmark, .. GE R&D in DE), Solar energy (early production facilities vs. mass production

Perfect Diffusion

- Benchmark case
- Perfect flow of technological information: Location of production of knowledge and technology use independent

- But perfect diffusion is rare
  - Costly adoption / absorptive capacity / complementary assets
  - Technology production is not a one-shot game (competition of laggards force addition innovation; selection of dominant design and dynamic externalities)
  - Protection of inventors as incentive to invent
  - Nature of knowledge (tacit , localised spillovers)

Diffusion & Creation Interaction



Role of competition, non-innovation policies like health care pricing etc.

Factors Facilitating Lead Markets

- Early Demand
  (infrastructure, complementary assets)
- Price / Cost / Market structure (Competition)
- Local advantage – export – cumulative advantages
  (Producer – User – Interaction)
- Transfering innovation to new / different applications
  (Adoption risk; absorptive capacity, ..)

Internal capabilities

External capabilities

Strategic capabilities

Internal Capabilities

Manage tangible technology base
- Product development assistance
- R&D tax breaks
- State-subsidised R&D programmes
- Manufacturing consultancy

Develop and manage appropriate intangible resources
- Quality programmes
- Placements of qualified personnel, eg engineering graduates
- Loans of research personnel
- Training needs analysis and training programmes

Create needed organisation
- Technology management courses

Access external knowledge (Networking)

Access to external knowledge („technological infrastructure“)
- „Innovation vouchers“ etc.
- Science parks & Technology centres & applied PROs
- Technology development networks & Technology transfer programmes
- University liaison officers & faculty industrial placements
- Subsidy to university/industry links
- Technology information services

Manage producer/user relations
- Procurement programmes

Access partners with needed complementary assets
- Partner-search programmes
- Inter-company network programmes

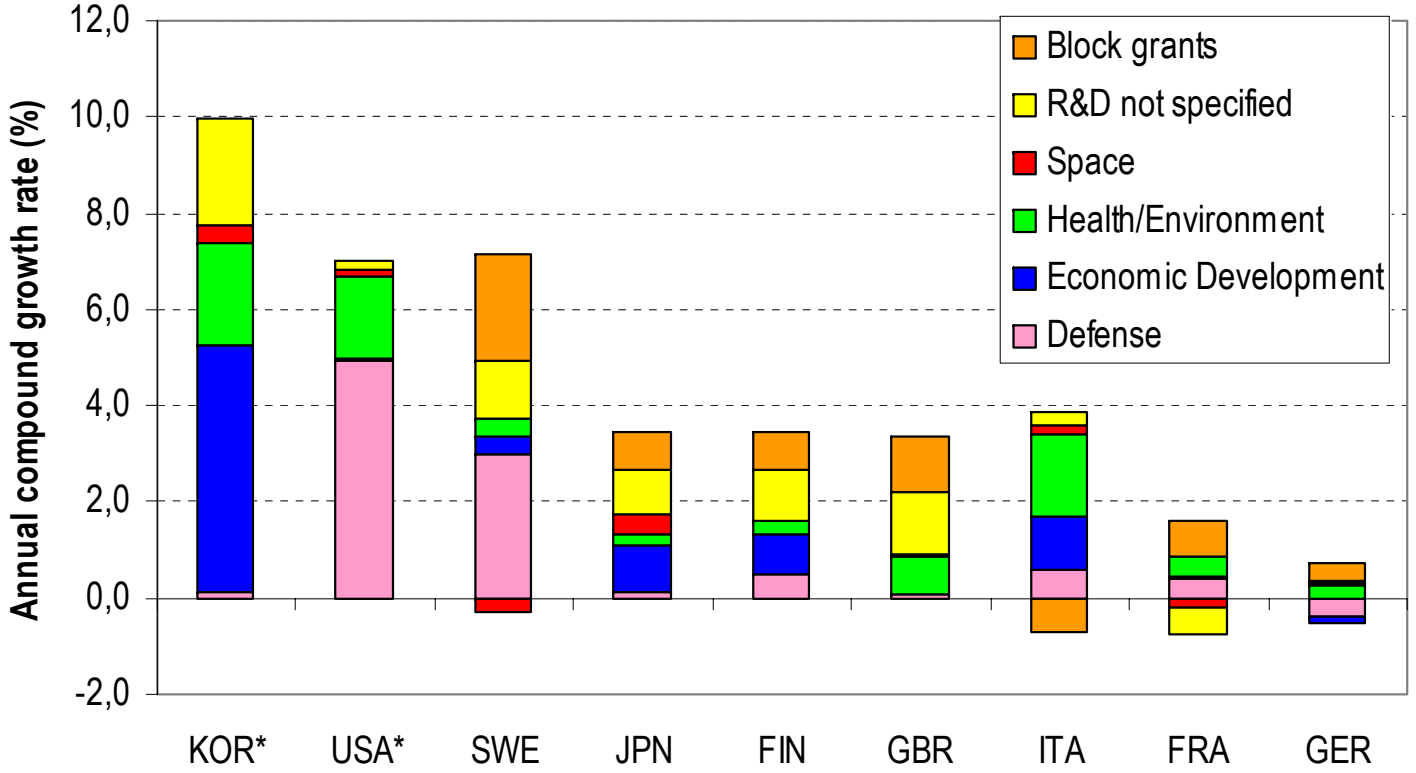
Strategic Capabilities

- Business capability development, especially marketing
- Business and technology audits; mentoring
- Awareness programmes, including visits and comparisons
- Feasibility assessments
- Financing / Smart money (early stages of diffusion)

Diffusion Policies

- All countries support technology diffusion
- Wide variety of measures
  - Enhancing absorptive capacities (esp. In SMEs)
  - Provision of information (awareness, demonstration centres, technological information centres, consultancy services, technological assistance)
  - Training programmes
  - Financial support (e.g. loans for investment in new machinery)
  - Collaborative research involving early adopters

Growth of government spendings on R&D 2000-2005 by type of spending



* Not data available for block grants to university & non-university research
Budget costs of tax credits not included here

R&D spending by type of R&D 2004 (%)

	Country/Region	Basic research	Applied research	Development
TOTAL	OECD19	18,2	23,6	57,0
Universities	OECD19	74,8	21,7	3,5
RPO	OECD19	28,4	34,7	36,3
Private sector	OECD19	5,3	21,2	73,5
Private sector	OECD23	5,2	25,0	69,8
	GER	4,5	51,8	43,8
	USA	4,2	18,7	77,1
	JPN	6,0	19,3	74,5
	GBR	14,1	25,5	60,3
	FRA	5,0	41,2	53,7
	ITA	4,6	50,9	44,5

US does not contain block grants to university & non-university research
Budget costs of tax credits not included

Does EU lags in Technology Diffusion?

- Not in general
- Sectors/Technologies where diffusion is less wide spread or slower
  - IT
- Sectors/Technologies with faster diffusion and larger rates of adoption
  - Mobile phones

Topics

- Reviewing the elements of the lead markets initiative: Regulatory/legal framework, … , *Competition, Diversity*
- Investment in complementary assets for diffusion and adoption (e.g. education, complementary products)
- Absorptive capacities (of SMEs; „R&D in SMEs“) & technological infrastructure (diffusion oriented infrastructure)
- Role of young firms as early users/producers
- (Linking technical & social change: Technology awareness / resistance)

Areas for consideration

- Absorptive capacities of SMEs („R&D in SMEs“)
- Organisational change
- Investment in complementary assets (for diffusion) (e.g. education)
- Technology awareness / resistance?
- International diffusion of new technologies / knowledge via FDI/R&D centres of foreign MNEs
- Role of intellectual property rights / spillovers
- Demand side („Lead markets“)