Challenges Due to Changes in the Industrial Structure / Challenges and Countermeasures Arising from Technology Transfer – Case of Taiwan

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Challenges due to changes in the industrial structure

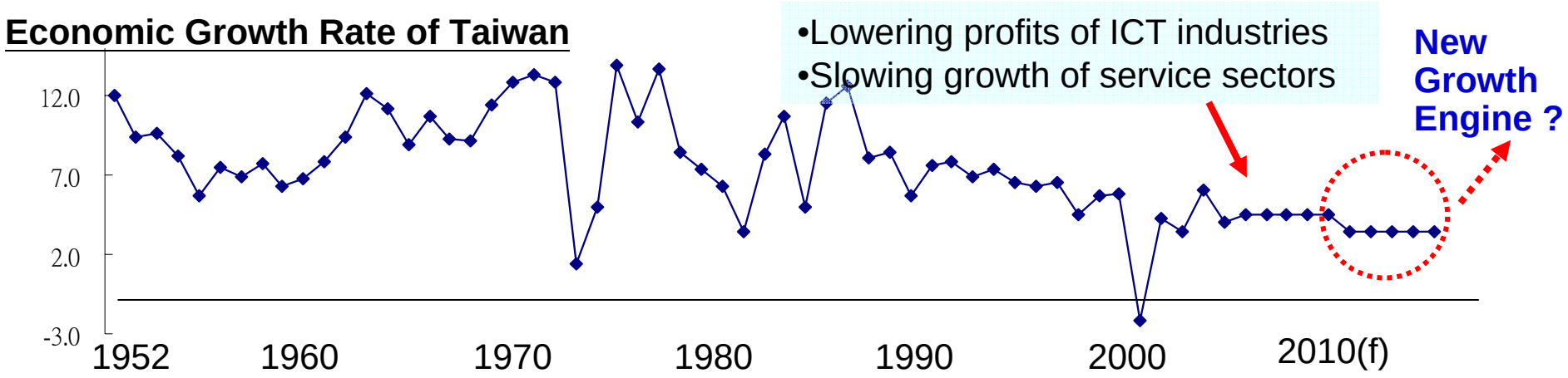
Overview-Paradigm Shift of Taiwan's Economic Development

	1960s	1970s	1980s	1990s	2000s~
Driving Force	**Factor driven** →		**Investment driven** →		**Innovation driven**
Development Phase	**Stage 2 (1953-1960)** Development of light industries for import substitution	**Stage 3 (1961-1980)** Development of export-oriented industries & heavy industries	**Stage 4 (1981-1990)** Development of 'high-tech' industries, export-oriented industries & the expansion of services	**Stage 5 (1991-)** Export expansion of 'high-tech' industries & the expansion of knowledge-intensive service industries	
Policy Trends	•Encouragement of FDI •Export Encouragement	•Development of industrial technology •Development of industrial zones •Infrastructural development	•Economic liberalization, introduce market mechanisms •Investment Promotion •Environmental protection strengthened	•Investment promotion •R&D promotion •Building information infrastructural •Development of Knowledge-Intensive manufacturing & service industries	
Focal Industry	**•Light Industry**	**•Light industry** **•Petroleum & chemical industry**	**•Strategic high-tech industry**	**Knowledge-intensive manufacturing & service industries**	

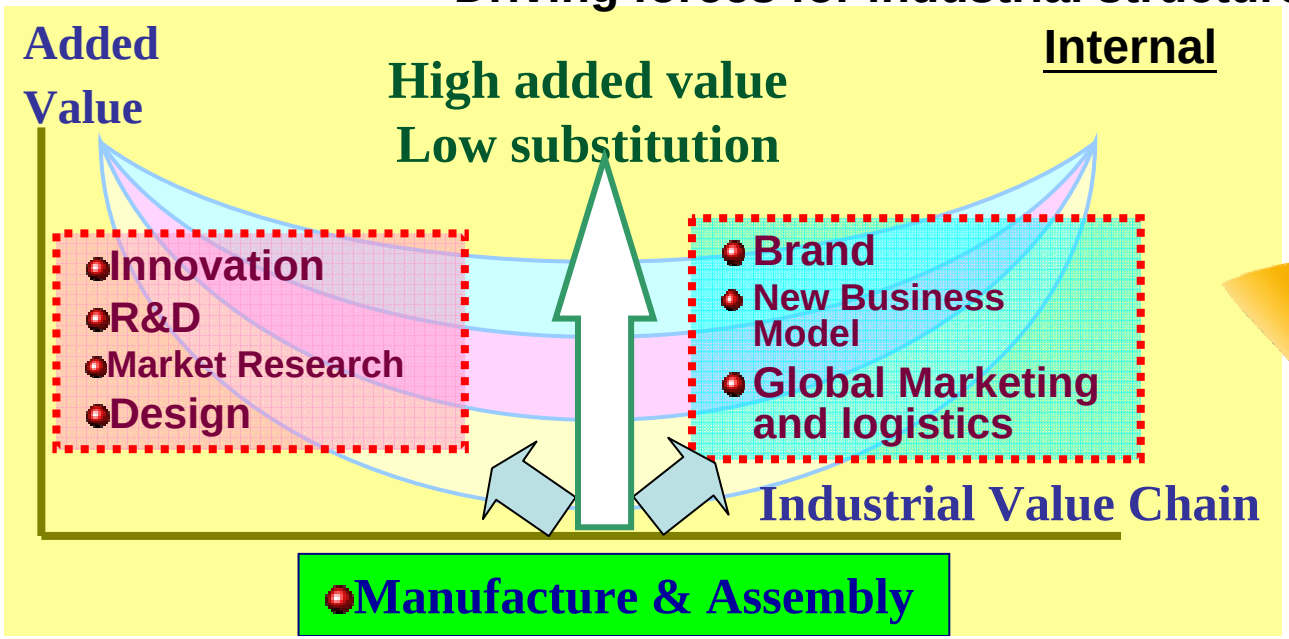
The Challenges Faced Economic Development & Structural Change

Factor Driven Phase → **Investment Driven Phase** → **Innovation Driven Phase**

Economic Growth Rate of Taiwan



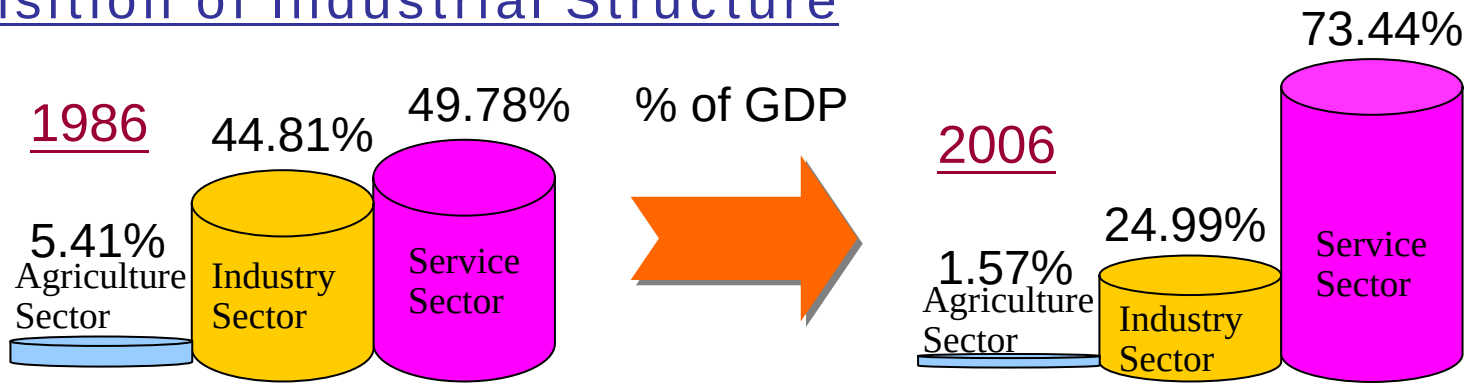
Driving forces for industrial structure changes



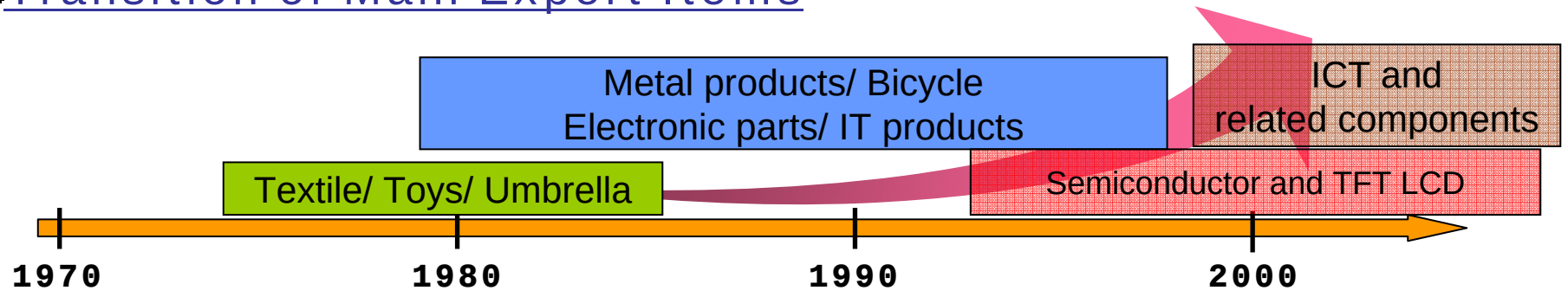
- Globalization
- Knowledge-based economy
- Demographic Structure Change
- Sustainable Development

Economic Transition of Taiwan

Transition of Industrial Structure



Transition of Main Export Items



Transition of Growth Driving Force

Long Term Industrial Structure Adjustment Issues (1/2)

➲pressure in industrial structure change

Manufacturing industry

- ⊙Outward reallocation of industrial chain.
- ⊙Catching up of technology capability from emerging economies.
- ⊙Thin profit margin in ICT industries due to OEM model.

- ⊙Cheap factor prices in developing countries.
- ⊙Industrial agglomeration in emerging economies.

Service industries

⊙Lack of growth momentum in service industry becomes major drag for overall economic performance.

➲labor market adjustment

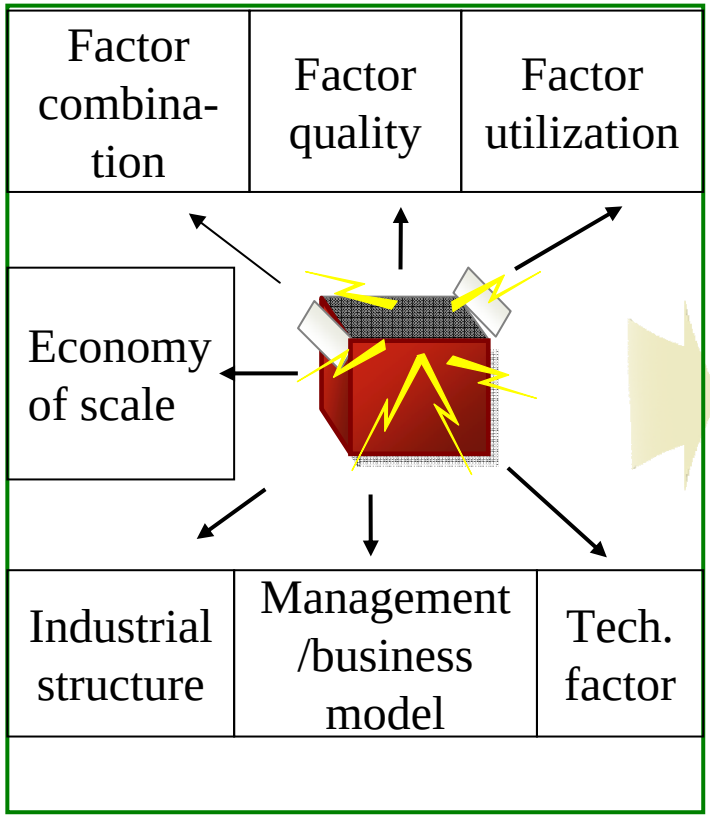
cause

- ⊙Industries facing adjustment towards knowledge based economy, structural unemployment intensified.
- ⊙Insufficient job creation from high-tech industries.

Long Term Industrial Structure Adjustment Issues (2/2)

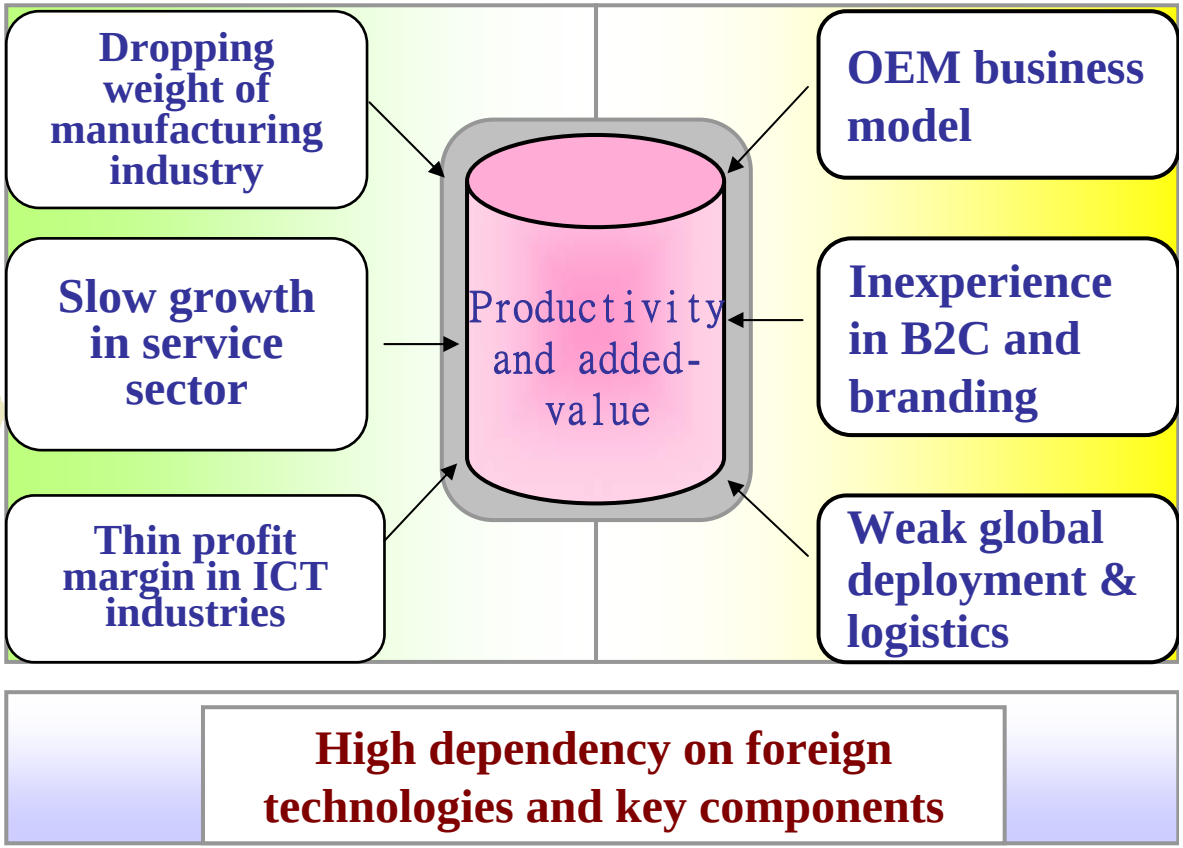
Reasons behind insufficient value creation

Factor inputs and Multi-factor productivity issues



Structure adjustment issues

Business model issues



High dependency on foreign technologies and key components

Challenges Due to Industrial Structure Change

Restructure in global industrial value chain and labor division

Societal and environment challenges

Social Equity & Environment

- Income distribution, forming of ‘M-type’ society.
- Demographic changes fuel the problem of aging society and deteriorating labor force.
- Environment protection and CO2 emission reduction, uprising in energy price and, increased demand in renewable energy.

Industrial development challenges

Innovation & value creation

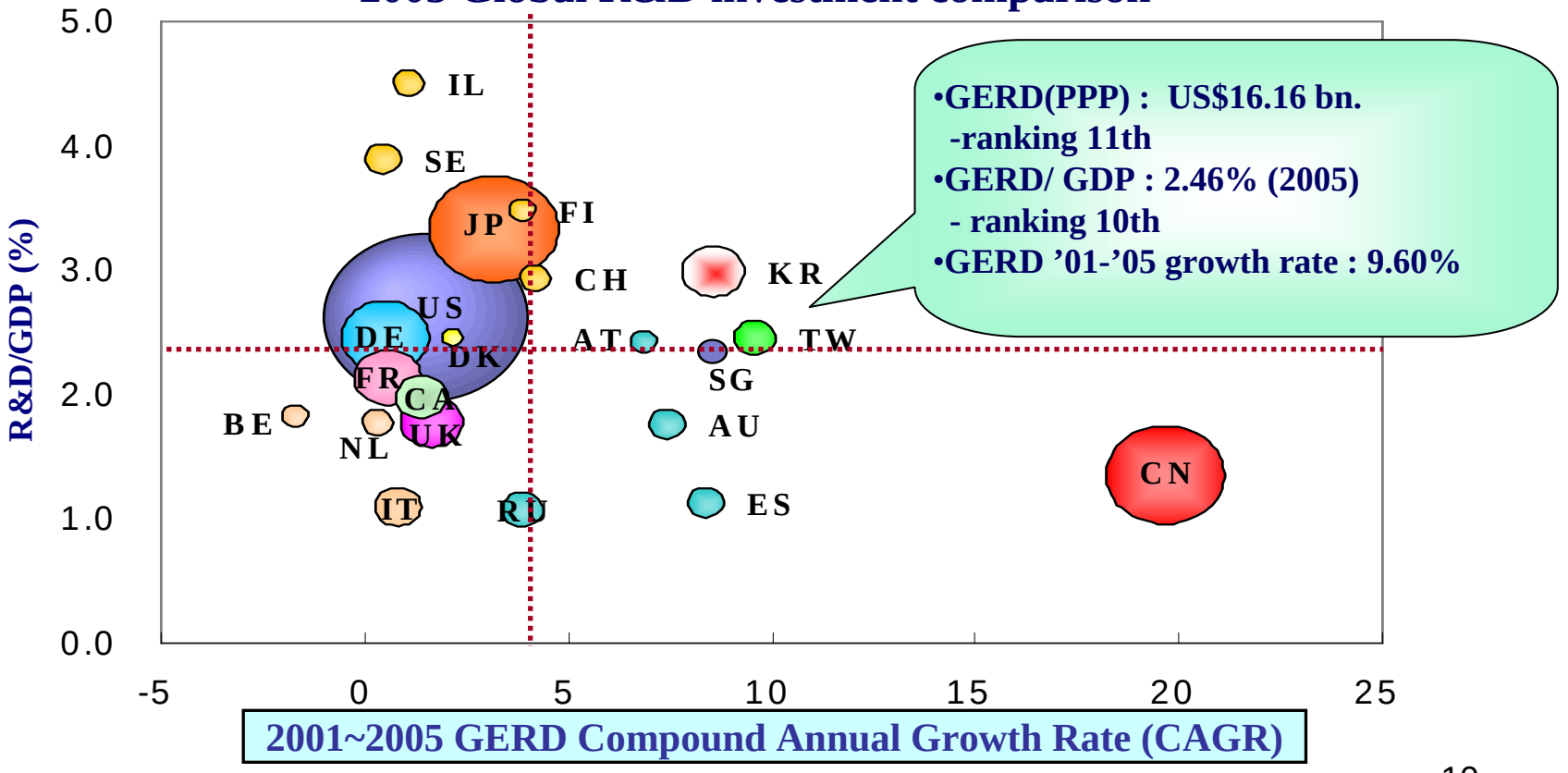
1. Needs of infrastructure that facilitates innovation
2. Balanced investment between knowledge intensive manufacturing industries and service industries.
3. Continuous improvement on industrial technology level, and building non-technology competence such as branding strategies and global logistic.
4. Attracting global talents.

Challenges and Countermeasures Arising from Technology Transfer

Overview-Taiwan's RD Expenditure & Growth Rate

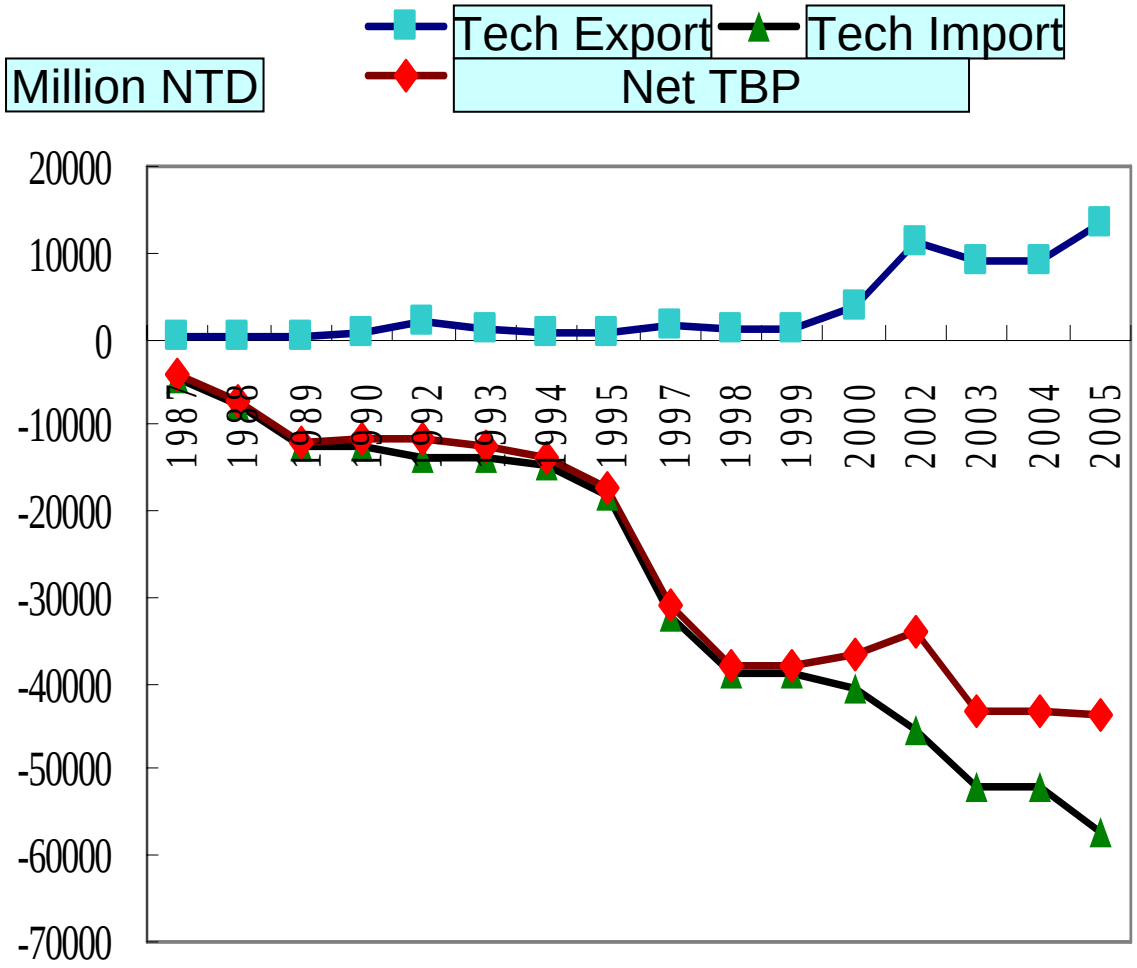
- Taiwan's overall RD investment is positioned in 'high speed and high intensity' category
- It demonstrates Taiwan's intention to catch up with the leading countries in science and technology research capability.

2005 Global R&D investment comparison



Data Source: OECD, MSTI 2007/1, May 2007

Widening Gap of Technology Balance of Payment

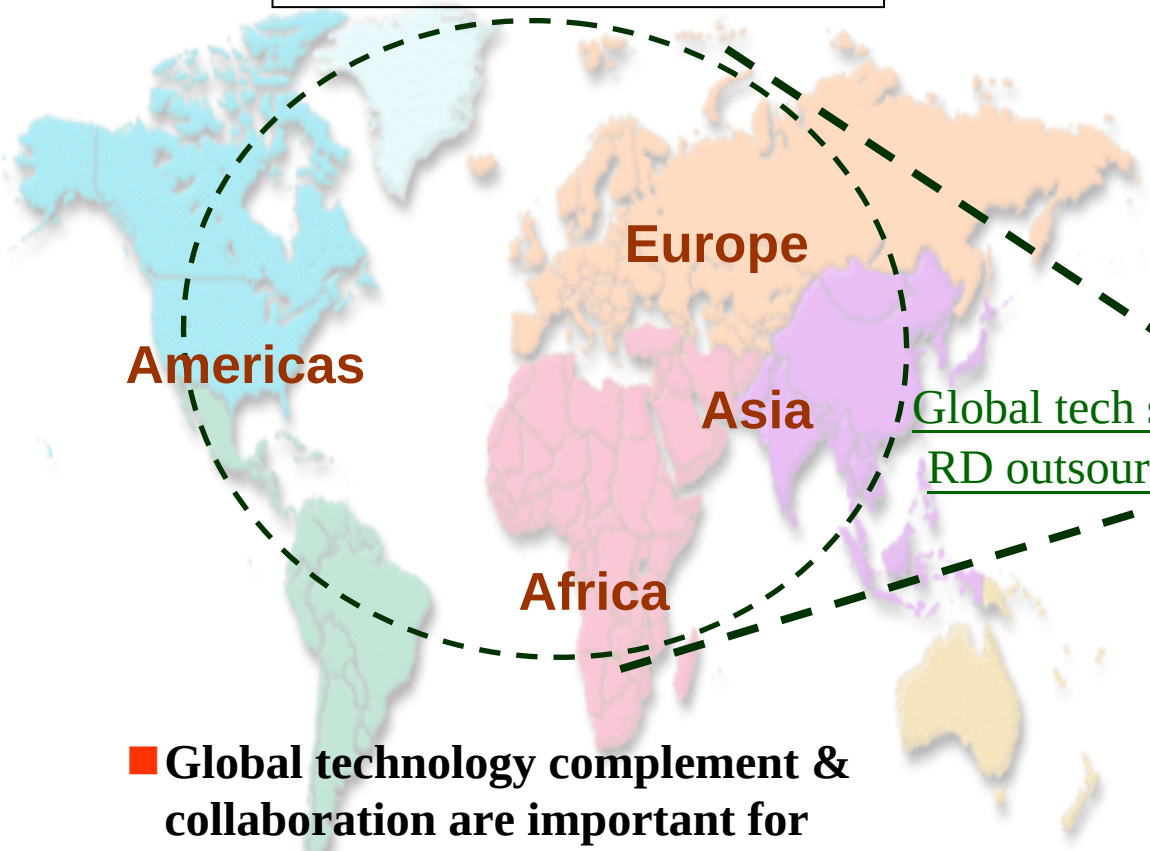


Data Source：Industrial Statistics Survey 1997-2006, Ministry of Economic Affairs, Taiwan

- Technology Balance of Payment (TBP) deficit widened since 1995.
- TBP deficit indicates high dependency of foreign technologies.
- Main inward technology transfer sources are U.S.A. and Japan, totaled 50% and 32.6% (2006) respectively.
- Main outward technology transfer is China, totaled 49.10% (2006).
- Under OEM/ODM model, industries overly relied on technology importation, building and investment in own technology base were less emphasized in the past.

Challenges in Technology Transfer – an Innovation System Point of View

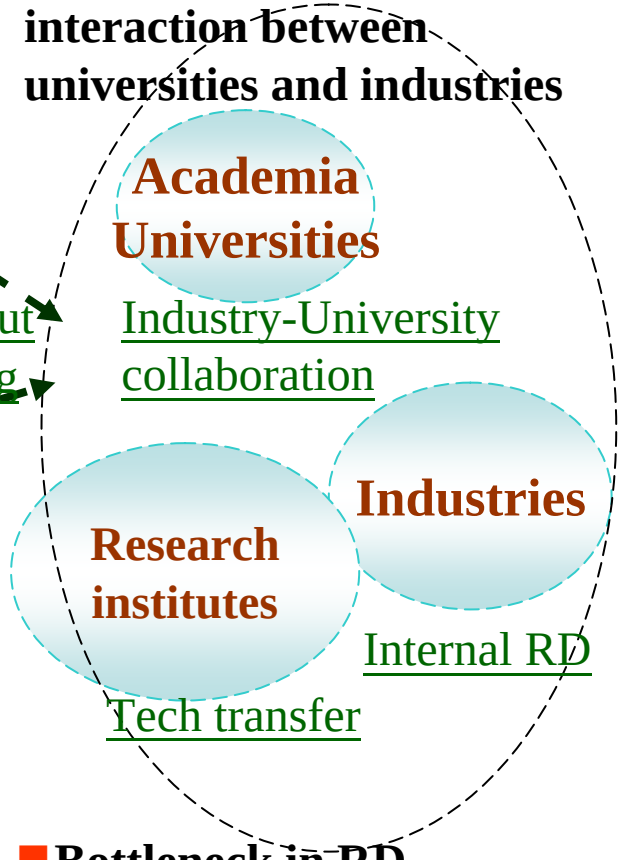
Global innovation networks



- **Global technology complement & collaboration are important for technology transfer consideration. How does Taiwan tap into global innovation networks is the key concern.**

Taiwan's innovation system

- **Not enough linkage and interaction between universities and industries**



Global tech scout
RD outsourcing

- **Bottleneck in RD institutes and spin-offs**

Bottleneck in RD institutes and Spin-offs

Research Institutes are main platform for technology transfer

- In 2005, Industrial Technology Research Institute has 663 technology transfer cases to 581 companies, it also bring about 272 investment plans in the industries.
- Many important spin-offs in Taiwan were originated from ITRI, in terms of technologies and staffs.
  - United Micro Electronics (1980)、Taiwan Semiconductor Manufacturing Co.(1987)、Taiwan Mask Corp. (1988)、Vanguard International Semiconductor Corp. (1994) …
- Spin-offs that originate from Taiwan's Technology Development Plan since 2003 were 179 cases, however, the momentum is slowing down since 2000.
  - 80% of spin-offs were originated from Technology Development Plan (TDP) conducted by ITRI

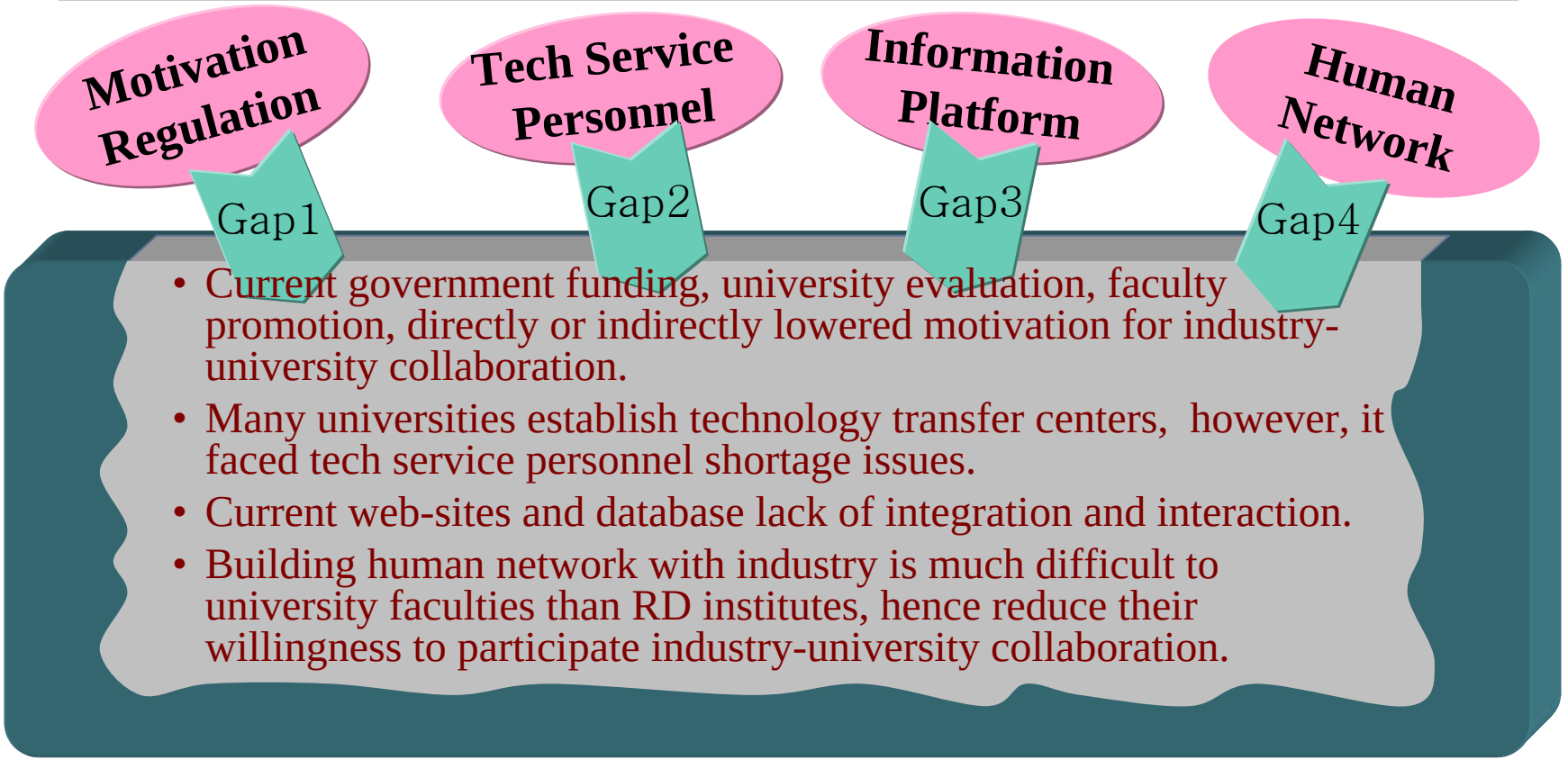
Possible cause

Bottleneck in RD institutes and spin-offs

- Insufficient front-end research and linkage to global innovation hot-spots.
- Shift in TDP fields. Emerging technology fields have not accumulated enough capability for possible spin-off.
- Brain drain - shrinking in population of study abroad technology talents & 'work in china' issue.

Gaps in Industry-university Linkage and Collaboration

- In 2004, the percentage of HERD (Higher Education Expenditure on R&D) by industry in Taiwan was about 5.78%, which was lower than the OECD average.
- Higher education IPR revenue was only 0.51% to government direct funding.
- 1997~2006 university incubation centers housed 334 start-ups, among those, 76 received technology transfer.



Key Challenges Arising from Technology Transfer

- Strengthen industry-university linkage & collaboration
  - Close the gaps between industry-university collaboration.
  - Strengthen the link between fundamental research, applied research and commercialization
  - Specialization and accumulation of capabilities innovation

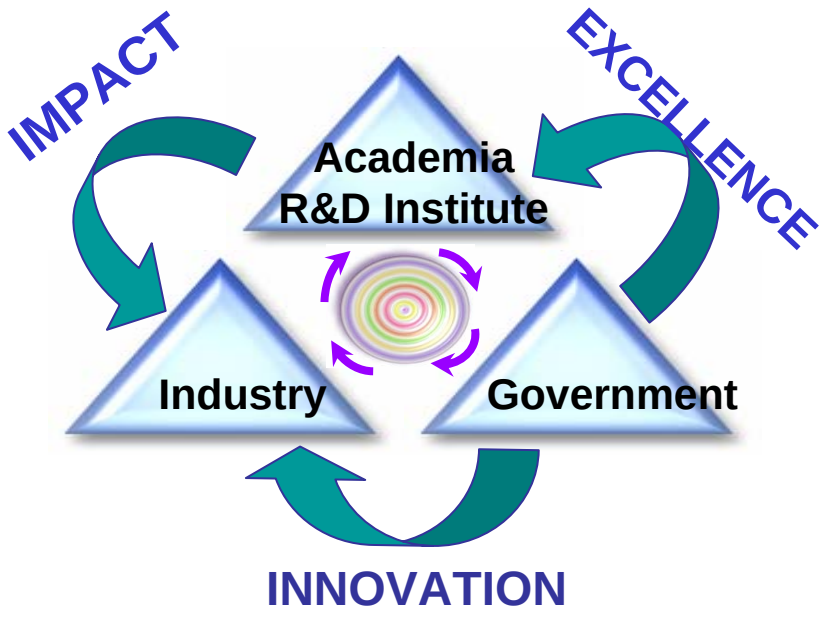
- Migrate from close innovation towards open innovation
  - Facilitate linkage between global innovation network and Taiwan's innovation system.
  - RD collaboration & tech transfer are both necessary
  - Strengthen global presence for research institutes and universities

- Balance technology-push and demand driven research
  - Push forward in emerging technology fields
  - Match mutual interests from global players
  - Supply chain extension and enhancement
  - Building complementary assets for innovation in terms of innovation ecosystem

Counter Measures for Industrial Structural Adjustment and Technology Transfer

1.Correct institution & innovation system failure.
2.Revise motivation mechanisms and regulations to enhancing linkage between actors in the innovation system
3.Encourage active participation in international collaboration of RD & innovation to address open innovation trend.
4.Business and Technology HR recruitment and incubation

5.Extending activities in value chain
6.Strengthen RD & innovation in service industries
7.Strenthen competence in both forefront and base technologies
8.Establish non-technological competence such as branding and logistic



9.Rationalize innovation policy
10.Reduce uncertainties for market and technology development
11.Better respond to globalization and resource competition
12.Creating friendly environment and infrastructure for business and technology development

End

Thank you for your attention!!