The 26th STAG Board Meeting

「Strengthening Professional Manpower Resources to Ensure Industrial S/T Competitiveness」

The Strategy to Cultivate Human Capital for Knowledge-based Innovation in Taiwan

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Content

Ⅰ. Taiwan's Structural Weaknesses in Knowledge-based Innovation and Demand for High-caliber Human Capital

A. Essential Issues underlying Taiwan's Industrial Development

- Taiwan's Structural Bottlenecks of Industrial Development
  - The high-tech industry on a trend of "razor-thin profit", slowing-down in value added growth and developmental momentum
  - Calling for a need to stimulate industrial innovation and value creation
- The Changing International landscape
  - Outreach of MNCs involved not only the production function but increasingly also the high-end segments of the value chains
  - A rising trend of R&D offshoring and the international relocation of MNCs' R&D facilitiesto East Asia
  - An increasing emphasis on R&D and innovation among countries

⇒ The far-reaching changes in the international innovation landscape and the domestic economy will bring challenges to Taiwan, not least concerning the demand and supply of the high-caliber human capital.

B. Taiwan's structural weaknesses in knowledge-based innovation

- Branding
  - The escalating pressure of "razor-thin profit" for the IT industry giving rise to the importance of branding
  - The policy at table addressing this issue tends to focus mainly on the managerial and marketing side and ignore its aspect of technological innovation.
- Forward-looking Innovation and the Development of the Next-generation Industries
  - Industrial innovation in Taiwan is arguably biased, to quite an extent, towards incremental innovation, which may result in a risk of eventually losing momentum for industrial migration and upgrading and value creation.

B. Taiwan's structural weaknesses in knowledge-based innovation (cont'd)

- Cultivation of "Basic Technologies"
  - Many of the manufacturing sectors in Taiwan vulnerable to price competition, attributable to a lack of capabilities to engage in product differentiation by means of technological innovation
  - Basic technologies relevant to many applications of high benefit across a number of sectors and capable of making step-change improvements in product and process applications

- Design and Creativity
  - Important elements to value creation, and related strongly to branding and innovations in services
  - Influential design and creativity may involve a combination of science base, intangible assets, market demand and new business models.

C. Knowledge-based Innovation and Demand for High-caliber Human Capital

- Each kind of the knowledge-based innovation has own distinct features hence may require different means to cultivate the human capital needed.

	Branding	Forward-looking Innovation	Basic Technologies	Design & Creativity
Codification of knowledge	W	M	W	M
Path-dependence	M	M	S	W
Milieu-related	W	S	S	S
Context-related	W	W	W	S

Note: W: weak; M: medium; S: strong

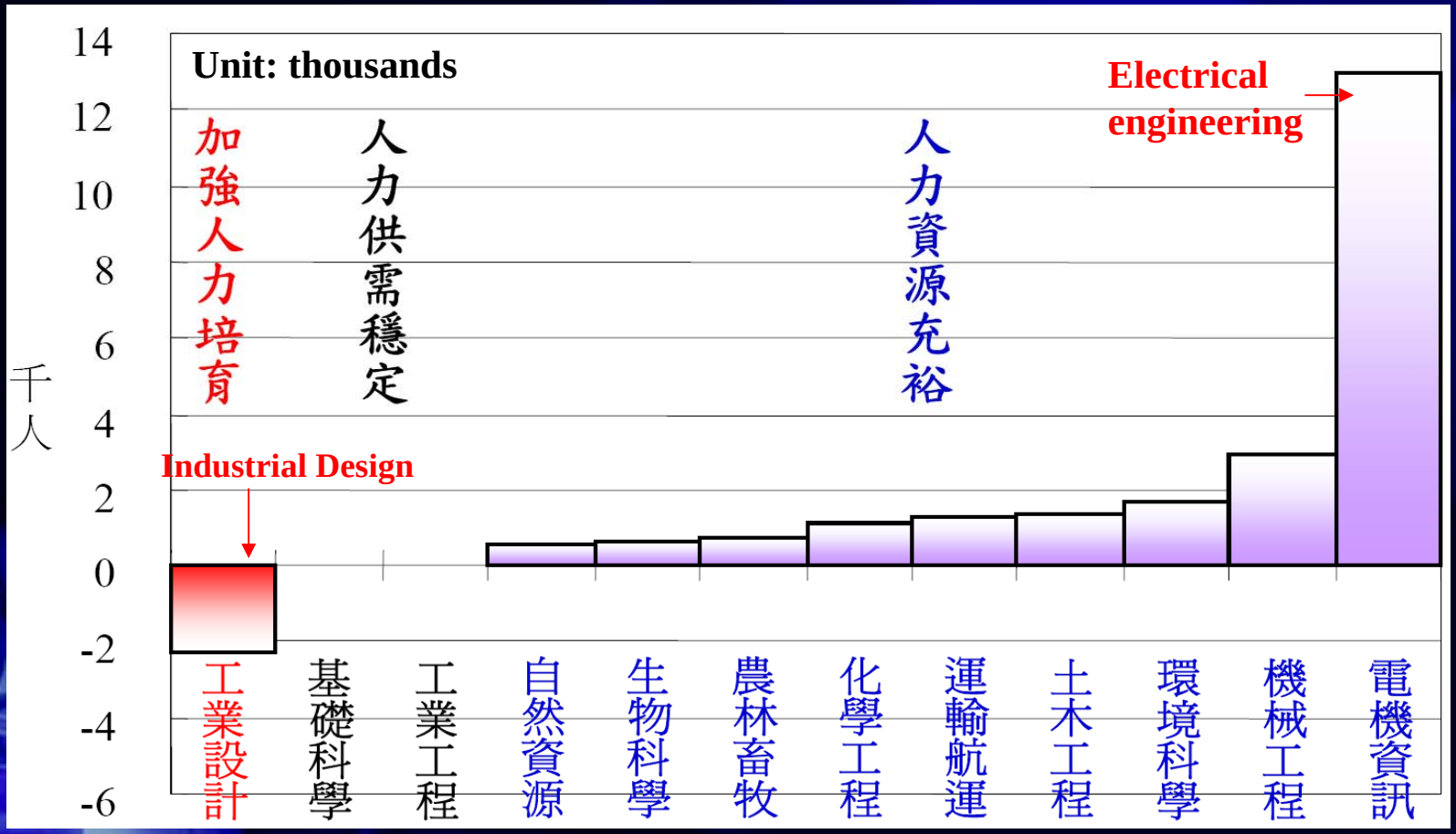
D. Main Policies to Cultivate the High-caliber Human Capital Needed

	Branding	Forward-looking Innovation	Basic Technologies	Design & Creativity
Return of migrants		●		
Recruitment of international migrants	●	●	●	●
Resourcing expatriates	●	●		
Reinforcing through environment development		●	●	●

Ⅱ. The Structural Change in Demand and Supply of Human Capital in Taiwan

A. Forecast of the Long-term Demand & Supply of Human Capital in Taiwan

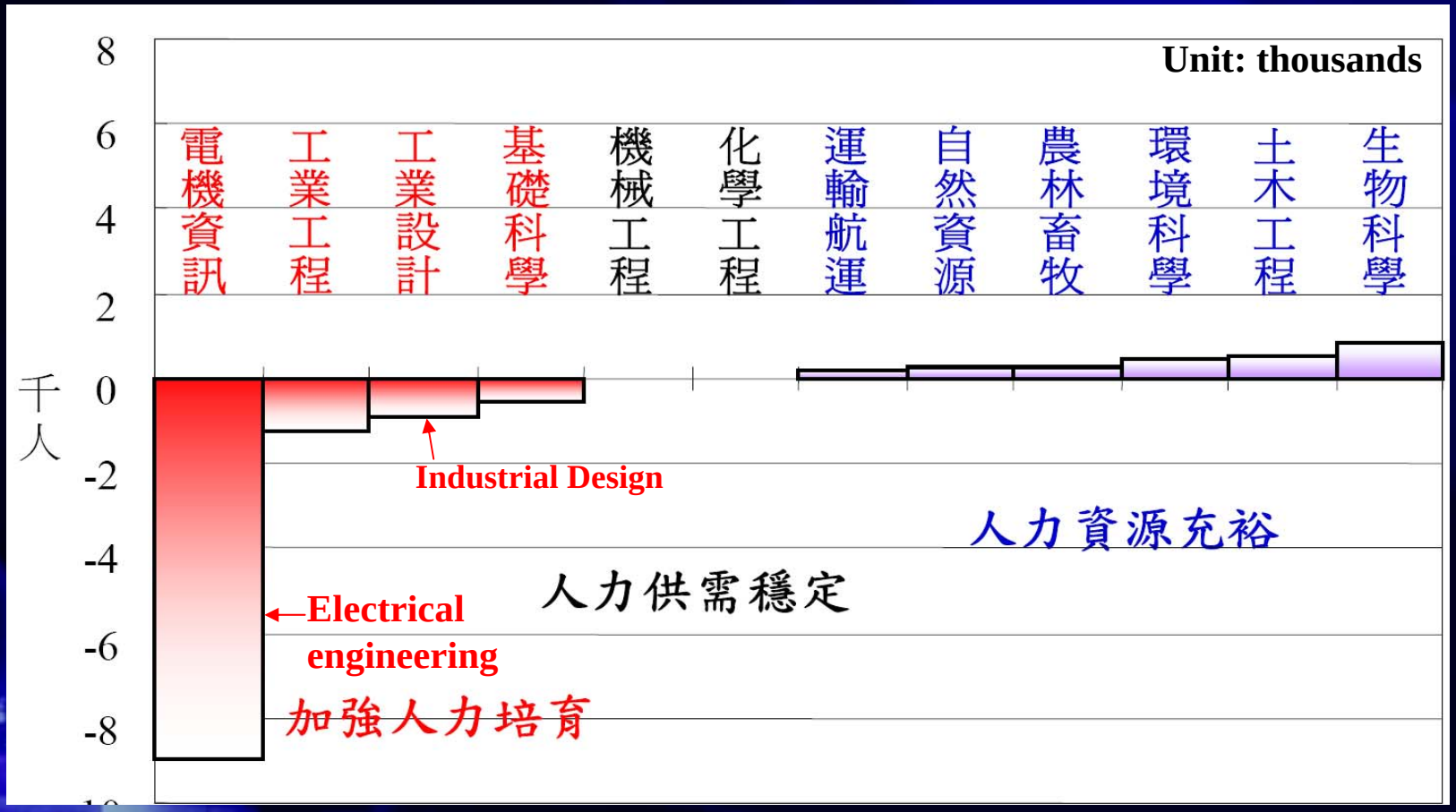
- Bachelor Degree（2005-2015）



Source: CEPD (2005)

A. Forecast of the Long-term Demand & Supply of Human Capital in Taiwan（cont' d）

- Master Degree & Above（2005-2015）



Source: CEPD (2005)

A. Forecast of the Long-term Demand & Supply of Human Capital in Taiwan（cont' d）

- Electrical engineering ：Over-supply at the entry level but over-demand at the advanced level
  - Structural shift in employment
  - Knowledge intensification of human capital needed
- Industrial Design：Over-demand at both the entry and advanced levels
  - Strengthening of university & industry collaboration for the cultivation of human capital needed
- The other fields: An abundant supply of human capital, which, however, may imply a potential problem of oversupply
  - Cross-disciplinary cultivation of human capital and adjustments of curricula needed

B. Taiwan's International Network of Human Capital

- The Number of Foreign White-collar Workers in Taiwan (1990-2004)

Origin	90	01	02	03	04	GR
Japan	3,041	3,001	3,967	3,402	3,843	7.4%
America	2,675	2,767	3,274	3,035	3,305	5.8%
Canada	1,092	1,262	1,908	1,881	2,198	20.5%
Korea	798	846	833	704	517	-9.4%
Malaysia	788	847	888	974	1,016	6.6%
U.K.	664	762	1,005	959	1,018	12.1%
Philippines	478	623	808	698	702	11.7%
India	318	337	372	372	349	2.5%
Australia	276	288	395	357	418	12.2%
Germany	248	258	362	265	226	0.7%
France	235	262	298	251	258	3.1%
Total	12,301	13,173	16,786	15,462	16,550	8.4%

- Not many of them are categorized as professional workers in the high-tech fields.

B. Taiwan's International Network of Human Capital（cont' d）

- A Closer look at the Foreign White-collar Workers in Taiwan
  - The current patterns of foreign white-collar workers in Taiwan may not fit Taiwan's needs for knowledge-based innovation
    - 10.8% : the category of "professional, science and technical services";
    - A quarter : working for language schools
    - 6.6% : with a master (& above) degree
  - Indian white-collar workers in Taiwan generally do not regard Taiwan as the most preferred destination.
- Singapore and Hong Kong as the most preferred destinations in Asia

B. Taiwan's International Network of Human Capital（cont' d）

- Expatriate Scholars in the US & Country of Origin

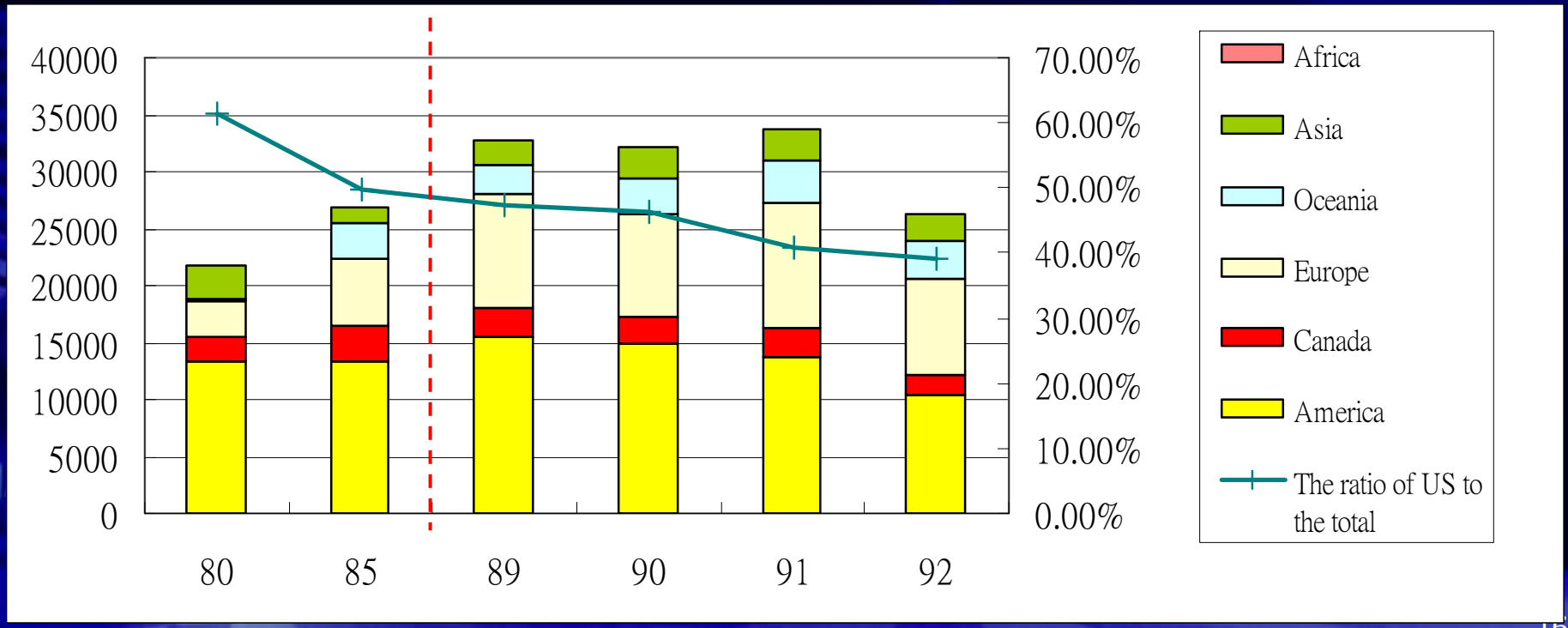
	Country	2001	2002	Country	2003	Ratio (%)
Ranking	Total	79,651	86,015	Total	84,281	-
1	China	14,722	15,624	China	15,206	18.0
2	Korea	5,830	7,143	Korea	7,286	8.6
3	India	5,456	6,249	India	6,565	7.8
4	Japan	5,905	5,736	Japan	5,706	6.8
5	Germany	5,221	5,028	Germany	4,648	5.5
6	Canada	3,735	3,905	Canada	4,222	5.0
7	U.K.	3,352	3,314	U.K.	3,113	3.7
8	Russia	3,253	3,123	Russia	2,814	3.3
9	France	3,154	2,985	France	2,789	3.3
10	Italy	2,226	2,257	Italy	2,242	2.7
11	Span	1,706	1,822	Span	1,717	2.0
12	Brazil	1,315	1,493	Brazil	1,458	1.7
13	Australia	1,212	1,316	Israel	1,290	1.5
14	Taiwan	1,196	1,294	Taiwan	1,241	1.5
15	Israel	1,205	1,270	Mexico	1,185	1.4

B. Taiwan's International Network of Human Capital（cont' d）

- A Trend of Geographical Diversification in terms of Taiwanese Studying Abroad

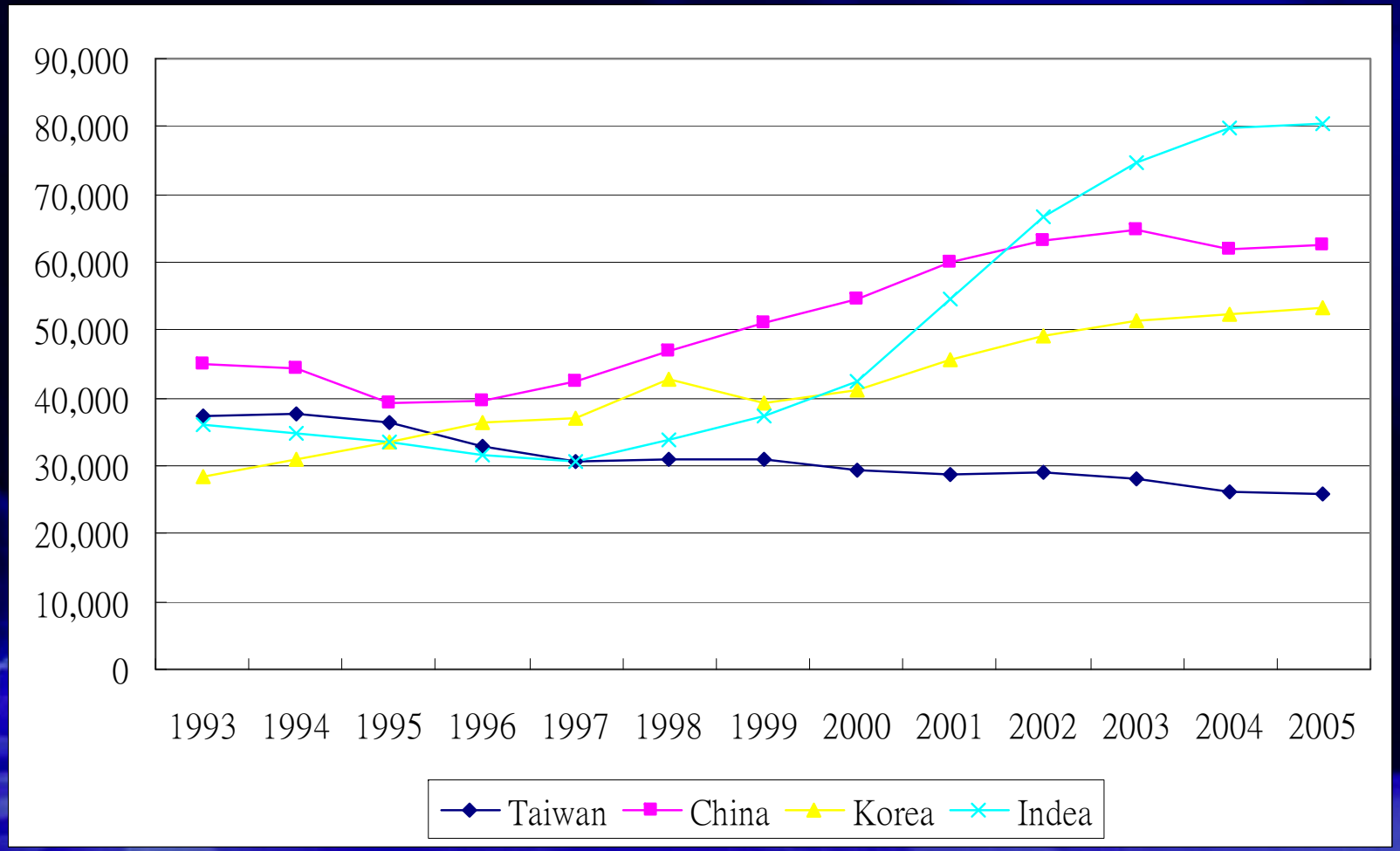
Destinations of Studying Abroad in terms of the Visas Issued

Unit：No.



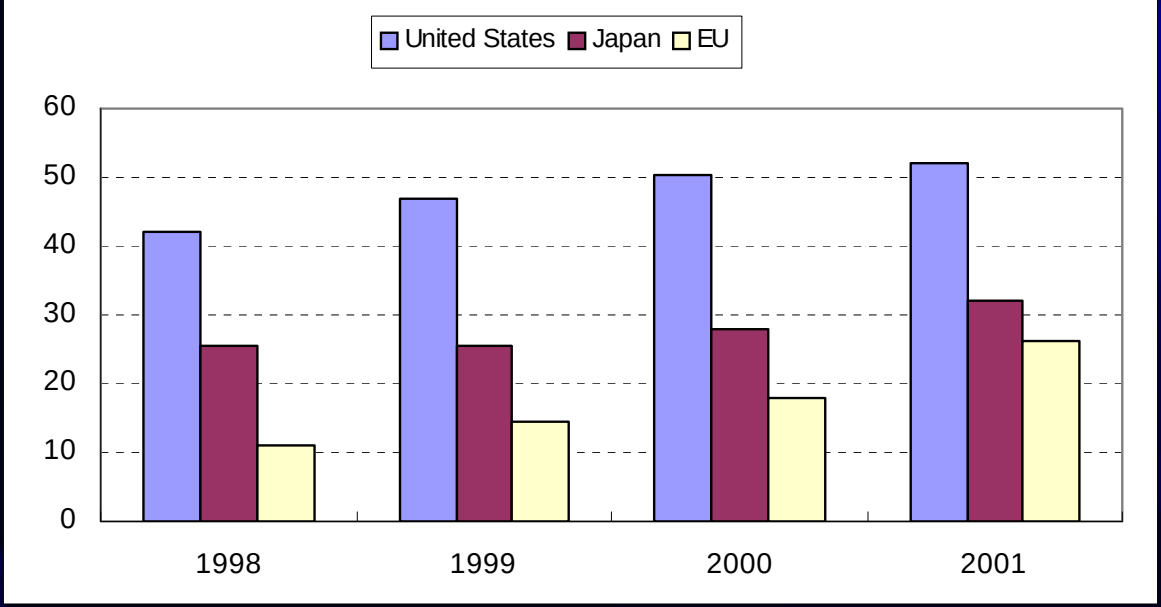
B. Taiwan's International Network of Human Capital（cont' d）

- Foreign Students in the US from Taiwan, China, Korea, India



B. Taiwan's International Network of Human Capital（cont' d）

- Foreign Students from China in the US, EU and Japan

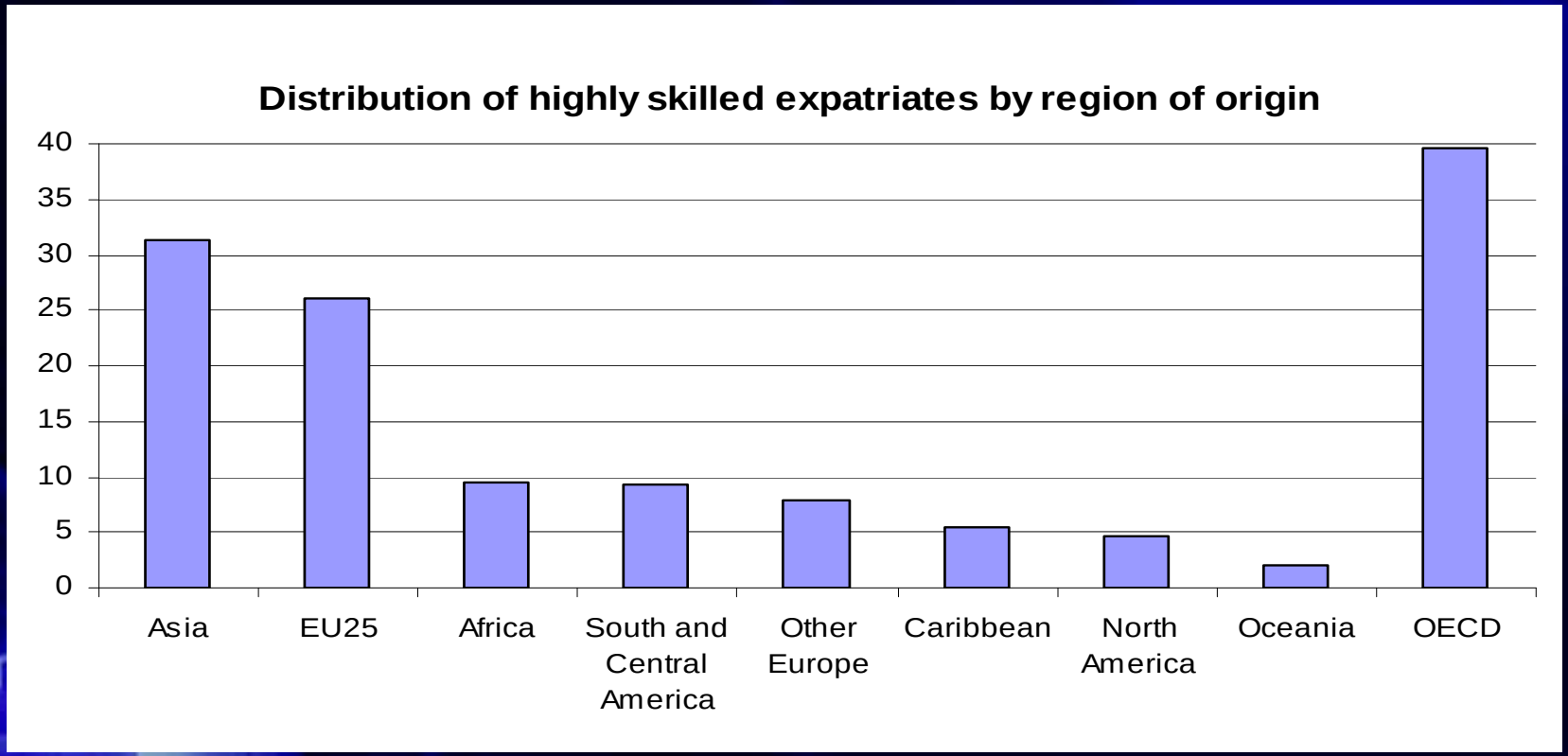


- China and India as the major Sources of Foreign Students in the US, while Taiwan on a Decreasing Trend
  - Attributable in part to the expansion of the domestic higher-education system and the declining birth rate
  - Taiwan's knowledge linkages with the US (esp. Silicon Valley) seem to be in the process of weakening.

Ⅲ. The Structural Change in Demand and Supply of Human Capital around the Globe

A. International Mobility of Human Capital around the Globe

- Asia, China and India in particular, has become the major source of foreigner high-tech workers around the globe.



Source： OECD

B. International Expansion & Relocation of R&D and Demand for Human Capital

- A Worldwide Trend to Raise R&D Intensity
  - To meet the Lisbon Goal (3% by 2010), the EU alone will need additional 0.5-0.7 million researchers.
- Due in part to the aging population, Japan is actively attracting foreign skilled workers, those from China and India in particular.
  - Relaxation of Immigration regulations on foreign IT professionals and researchers.
  - Through the Japan Society for the Promotion of Science （JSPS）to promote post-doctoral studies in Japan of foreigners (up from 537 in 1996 to 1,225 in 2000)
  - Some 169,000 foreign skilled workers in Japan in 2001 (up from 85,000 in 1992); half of them from China

B. Int'l Expansion & Relocation of R&D and Demand for Human Capital（cont'd）

- A Trend of shifting towards East Asia in terms of MNCs' R&D offshoring, offshore R&D and high-end segments of the value chain
  - India well-known for software
  - China more than a powerhouse in manufacturing

- UNCTAD：China and India as high-profile host countries for MNCs' offshore R&D facilities
  - Ranking for 2004：China (3rd), India (6th)
  - Ranking for 2005-2009：China (1st), India (3rd)；Singapore (11th), Taiwan (12th), Malaysia (15th), Korea (16th), Thailand (17th)
    - East Asia as a whole as an emerging focal location of knowledge-based jobs

B. Int'l Expansion & Relocation of R&D and Demand for Human Capital（cont'd）

- Despite a large population, shortage of human capital in India may become possible and forthcoming.
  - KPMG: a serious shortage of human capital in the IT area by 2009
    - Infosys, Tata, and Wipro outreach to China
  - Cost advantages of China currently as the main driver
    - The possibility of India and China working together to redefine the tech world order
  - Expatriates return to India: some thirty thousand in 18 months

B. Int'l Expansion & Relocation of R&D and Demand for Human Capital（cont' d）

- China's rapid expansion of the high-tech industry leads to an escalating pressure on human capital.
  - China as the largest IT manufacturer in the world
  - A policy to increase R&D intensity (1% in 2000；1.44 ％in 2004; 2% by 2010)
  - A policy to Recruit Foreign Knowledge Workers by Providing a Variety of Incentives
    - an annual target of forty thousand foreign knowledge workers set for the period 2006-2010 (the Eleventh Five-Year Developmental Plan)

Ⅳ. The Policy Trend of the Cultivation of Human Capital among Major Countries

A. General Policy Framework for the Cultivation of Human Capital by OECD Countries

- Internal Part
  - Supply-side
    - Increasing interest in S&T
    - Outreach to Women
    - Reforming curricula and training
    - Financial support for S&T studies
  - Demand-side
    - Human Resource Incubating Centers
    - National Centre for Contact with Business community
- External Part
  - Reforming immigrations
  - Recruiting foreign students and researchers
  - Attracting expatriate researchers

B. Main Employment-related Immigration Policies in OECD Countries

- A Summary of the Main Policies Adopted
  - Adapting selective migration policies (Canada, Australia)
  - Introducing or reviewing specific migration programs (Germany, UK, USA, Norway)
  - Creating labor shortage occupation lists (UK, Australia, Ireland)
  - Easing labour recruitment and changes of status (France, Japan, Korea)
  - Creating special incentive for recruiting highly skilled workers
- Problems with the Main Policies Adopted
  - How to identify, select and access appropriate talents needed
  - How to strike a balance between the foreign and domestic knowledge workers in terms of employment
  - External constraints

C. Policies towards Foreign Knowledge Workers in East Asia

- The Incentives Provided by Countries in East Asia
  - Korea：Tax-free for salary
  - Japan：Easing regulations on visa issuance and immigration control
  - Hong Kong：Easing regulations on work permits and application for residentship
  - Singapore：Easing regulations on work permits and application for residentship
- Taiwan Already in Severe Competition with its Neighboring Countries in Terms of Attracting Foreign Talents
  - Not only Taiwan but also Japan, Korea and China can claim their niches to cooperate with India by taking advantage of India's strengths in software.

Ⅴ. Suggestions for Policy of the Cultivation of Human Capital in Taiwan

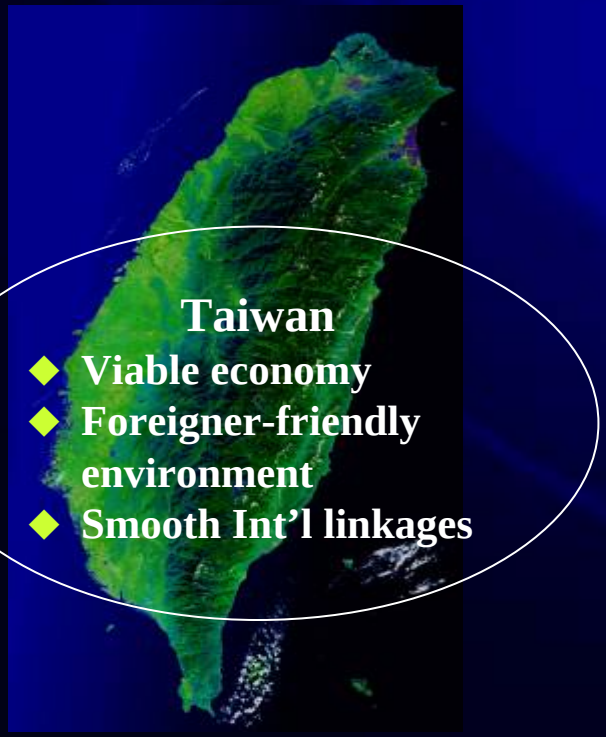
A. Challenges ahead for Taiwan in terms of the Cultivation of Human Capital

- Taiwan will need to go through a substantial transformation in terms of economic and industrial development
  - The high-caliber human capital needed may not come out from the current developmental trajectory.
- Taiwan's international knowledge network regarding human capital is in the process of structural change, with its current trend possibly not favorable to Taiwan.
  - A bad scenario: Brain circulation (with Silicon Valley) may turn into brain "diversion" (away from Taiwan).
    - Brain circulation between the US and East Asia (China, India and Korea) remains or become strengthened, except for Taiwan.
- Something new need to be done in order to cultivate the high-caliber human capital needed.
  - Taiwan's strengths of recruiting, resourcing & retention through economic development weakening

B. A New Strategy for Consideration

Recruiting expatriate & foreign talents

- Through major S&T programs to incubate overseas Chinese-led new technology-based enterprises in Taiwan
- Postgraduate programs for overseas Chinese in Taiwan
- Incentives to recruit foreigners & appropriate living environment



Links bet. university & industry

- Exploring and exploiting the capacities of the university by strengthening its links with the industry

Resourcing through outposts

- Utilizing such an intermediary as NIIT in India to recruit Indian skilled workers & to train Taiwanese software engineers
- Through major S&T programs to establish lab-to-lab links for human capital as well as R&D collaboration
- Offshore R&D by Taiwanese firms, with the HQ strengthening int'l coordination capabilities

End of presentation

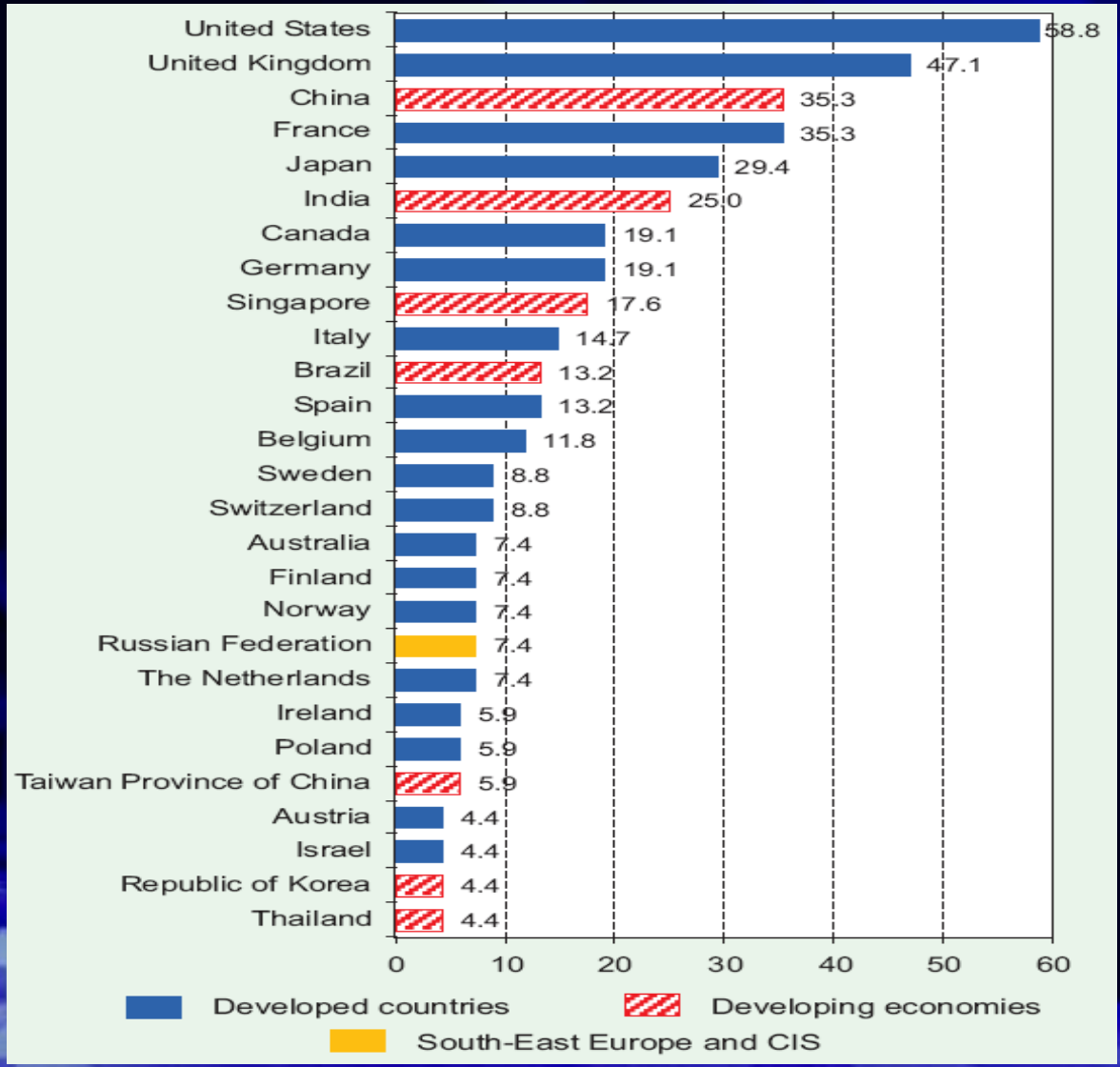
Thank you for your attention

A. Characteristics of Knowledge-based Innovation

- Degree of Knowledge Codification
  - Explicit knowledge vs. Implicit knowledge
- Degree of Path-Dependence
  - Fashion design vs. product development
  - R vs. D
  - The extent of knowledge being bypassed；possibility of leapfrogging
- Relationships with the External Environment：Milieu-related
  - Fashion design (local community) vs. science research (ivory tower)
- Relationships between the Two Sides of the Transaction：Knowledge Context-related
  - Complexity and specificity of the knowledge system
  - Onsite vs. offsite

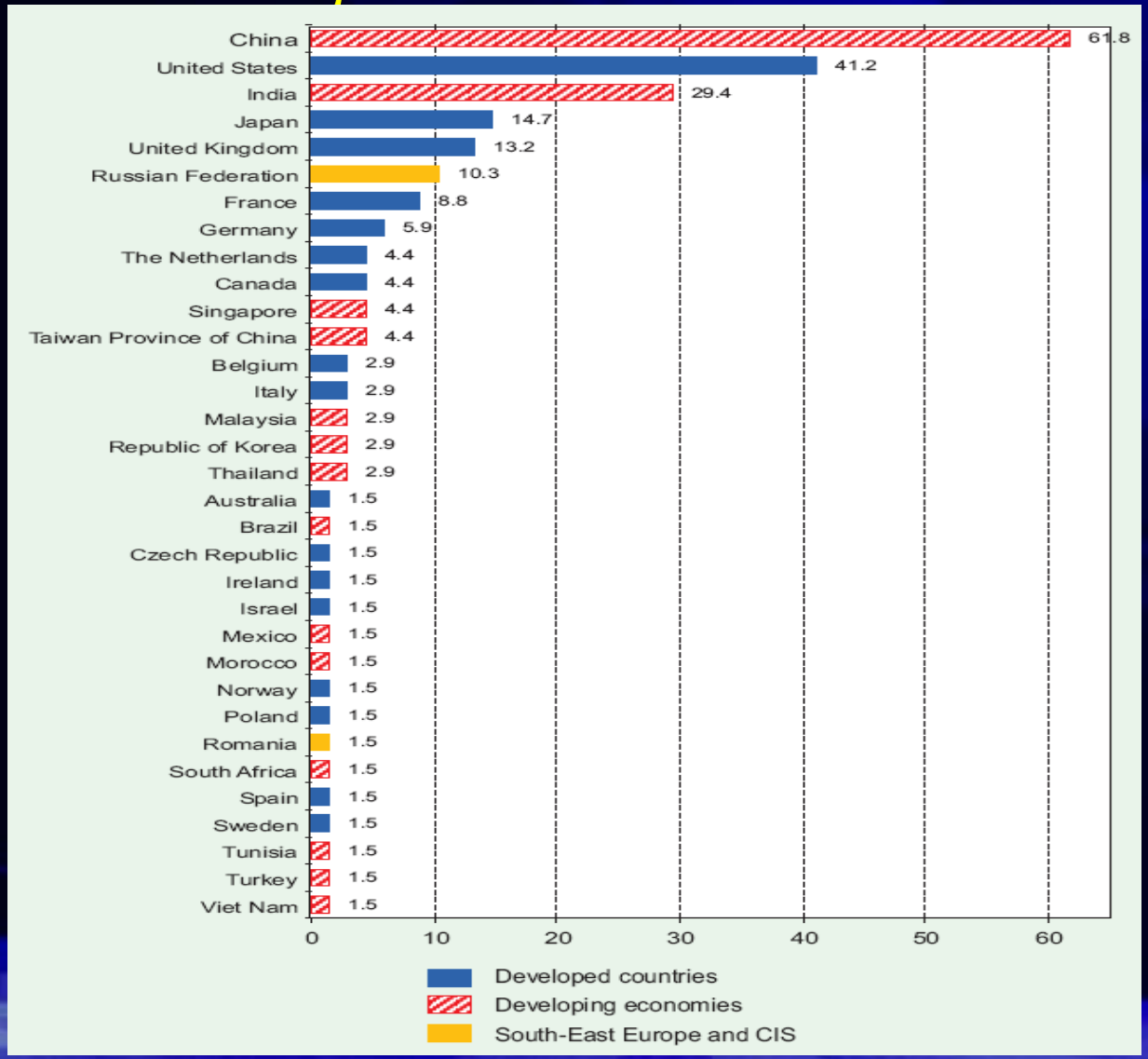
(All in relative terms)

Major Host Countries of MNCs' Offshore R&D, 2004



Source： UNCTAD（2005）

Major Host Countries of MNCs' Offshore R&D, 2005-2009



Source： UNCTAD（2005）