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Promoting knowledge and learning for a better world

Building Knowledge Economies: Education in a Global and Competitive World

IFEES Global Engineering Education Summit
Istanbul, Sept. 30, 2007

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Outline

Understanding Globalization and Knowledge Based Economy (KE)

Education and the Growing Competition for Talent and Skills

Educating Scientists and Engineers (S&E) for the Global Workplace

Strategies for Closing the Skills Gap

Conclusions

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- Understanding Globalization and Knowledge Based Economy (KE)
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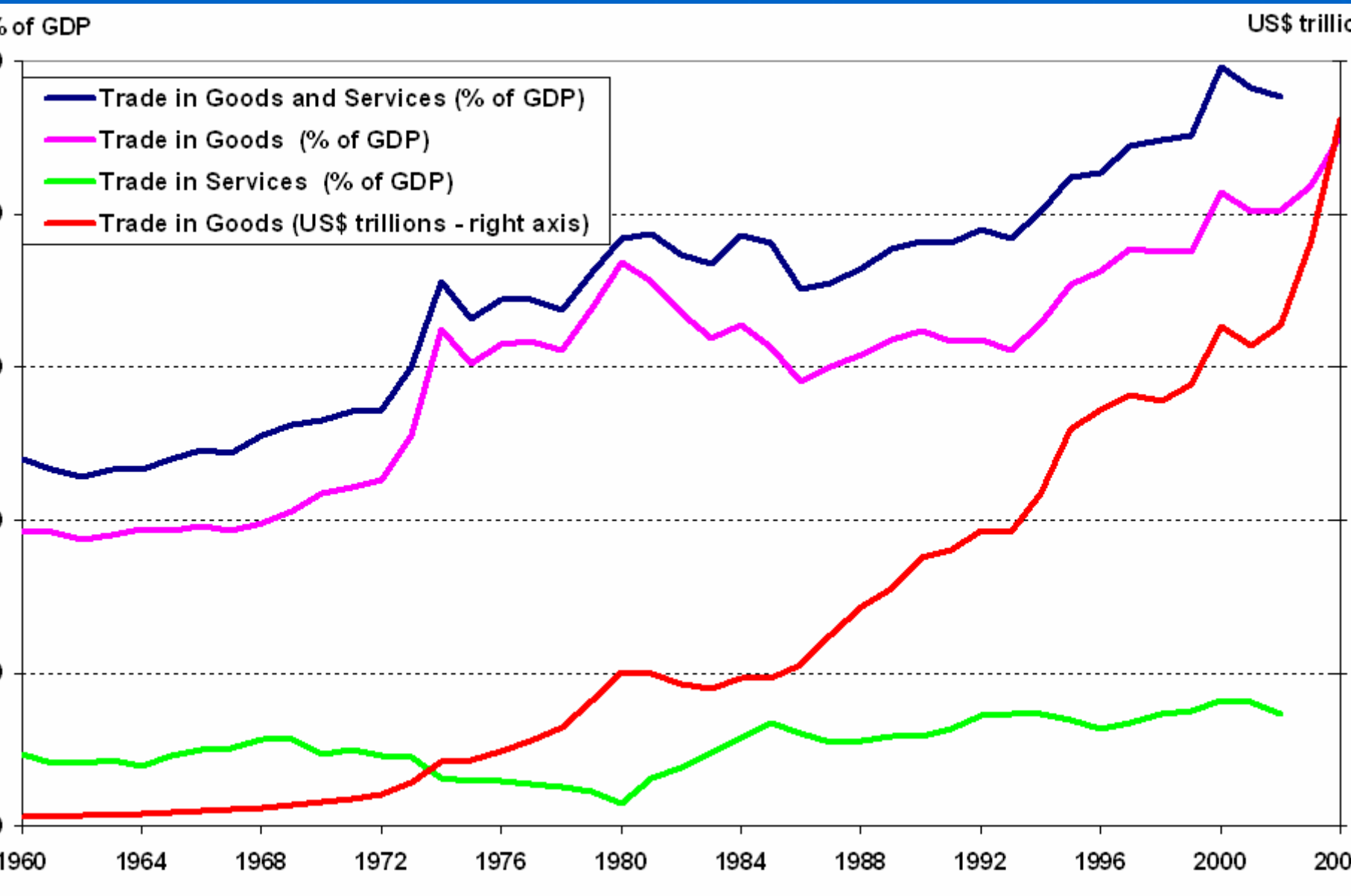
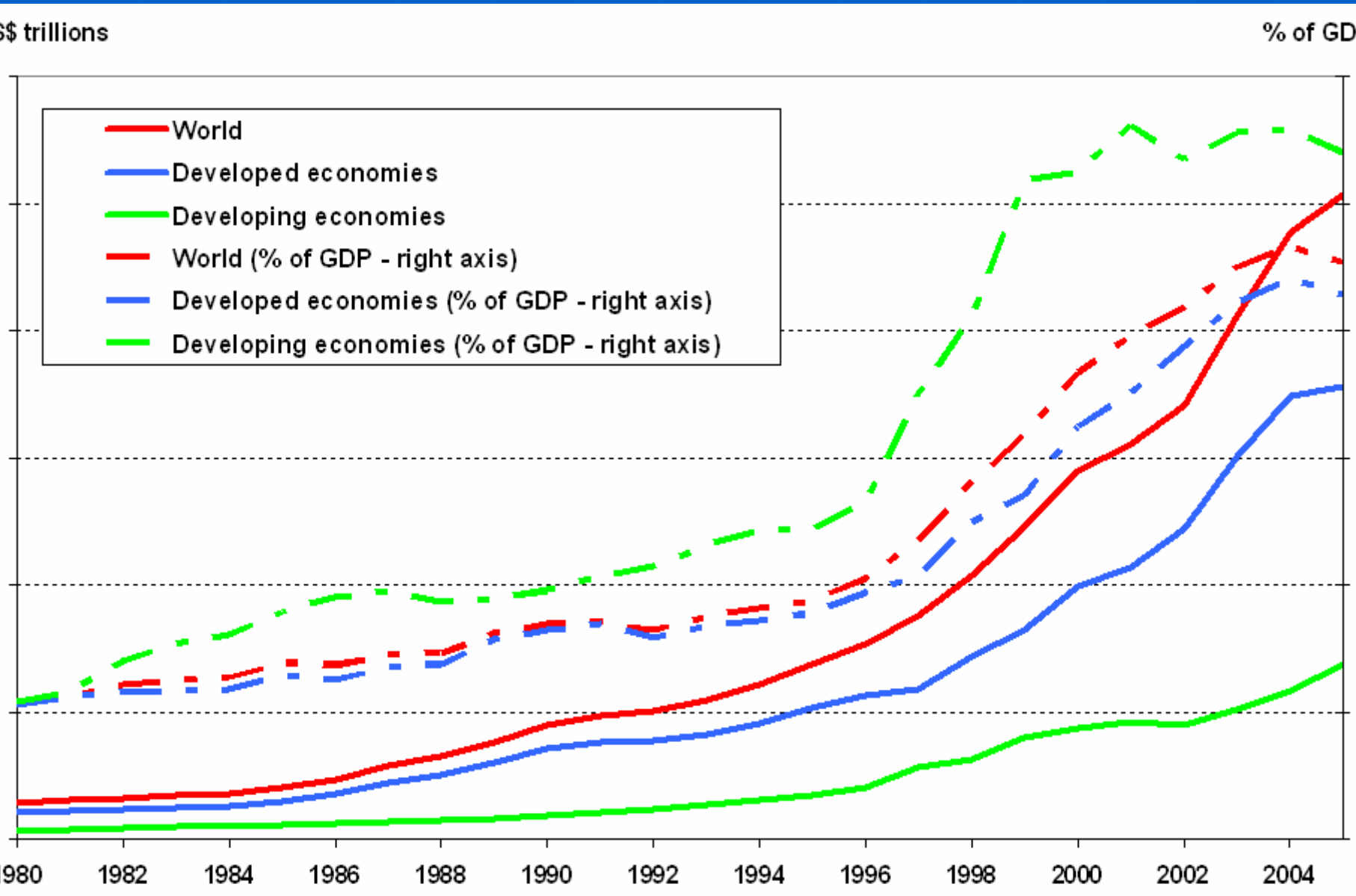
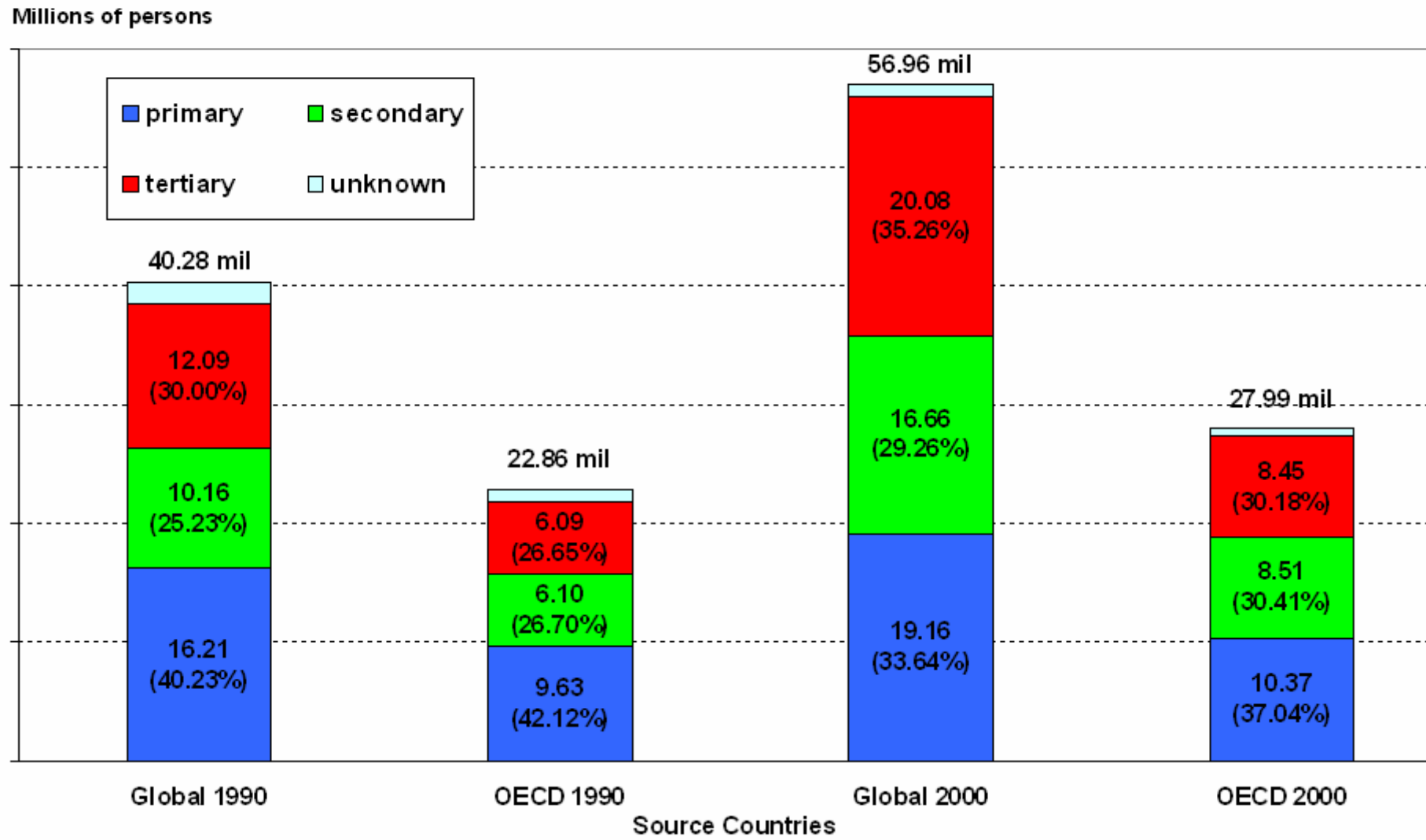
Global Trade in Goods and Services



Inward FDI Stock (1980-2005)



Immigration into OECD Countries (1990 & 2000)



ource: Frederic Docquier and Abdeslam Marfouk (2004). "Measuring the international mobility of skilled workers (1990-

Increasing Globalization of Labor

Dramatic increase in the size of the global labor force

Requires flexible domestic economies that are able to adjust and respond to the pressures of globalization

- Improve the functioning of labor markets to enable workers to move from declining to expanding areas
- Improve access to education and training to develop workers' skills to keep up with rapid technological change and continuing innovation
- Ensure adequate social protection for workers during the adjustment period

Understanding the Knowledge Economy (KE): Key Trends

The ability to create, access and apply knowledge is becoming a fundamental determinant of global competitiveness

Innovation policies are critical to the ability of countries to compete and grow in a globalized environment.

New models of knowledge production, access and distribution are emerging (e.g. open source, knowledge communities…)

Shift to knowledge-intensive industries highlight the importance of well trained skills and talent

Technological connectivity is transforming the way government, business, and citizens interact

Understanding the KE: Implications

A Knowledge Economy is one that utilizes knowledge as the key engine of competitive growth. It is an economy where knowledge is acquired, created, disseminated and used effectively to enhance economic development

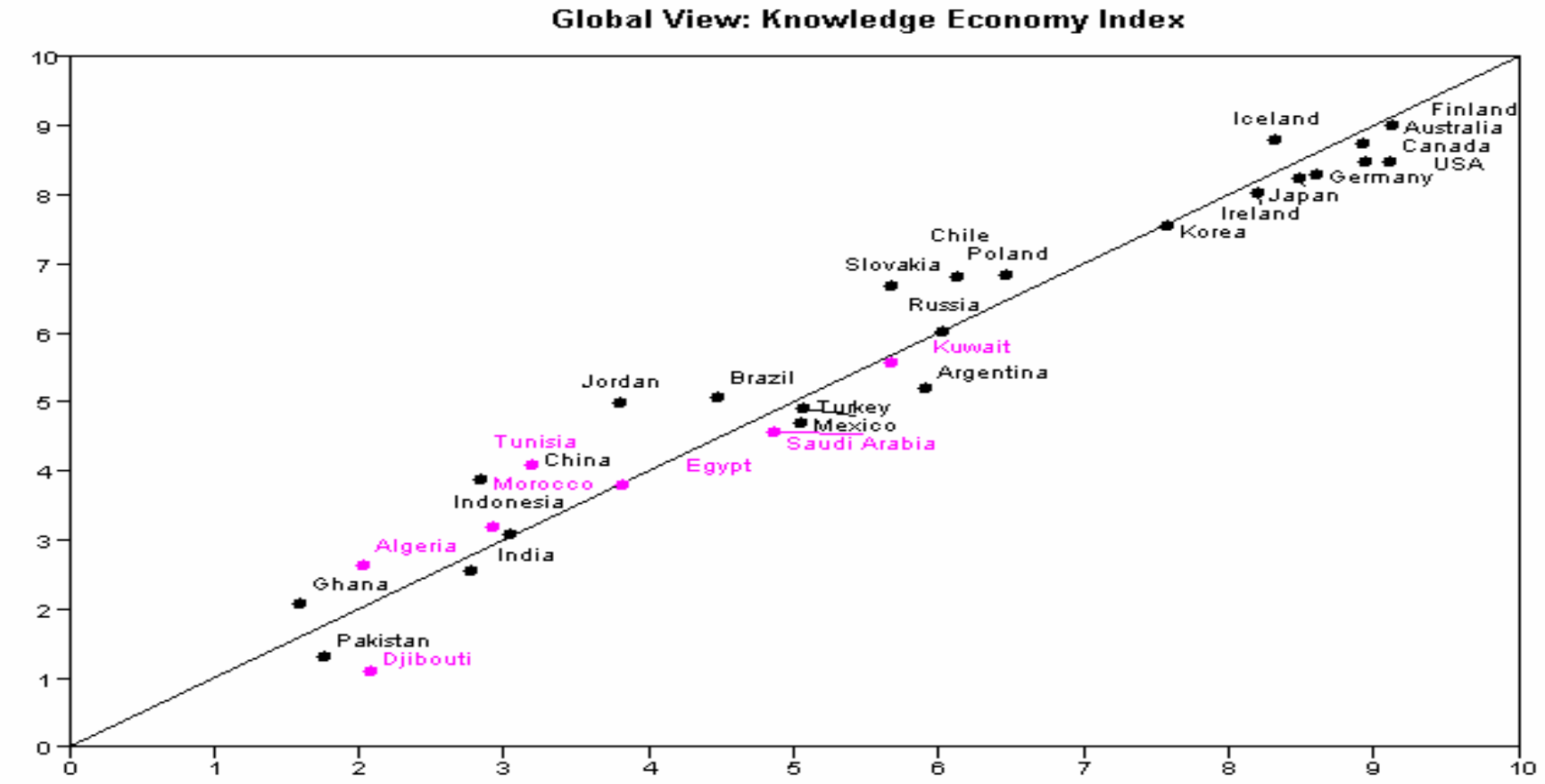
Transitioning from a traditional economy to a knowledge economy requires long term investments in education, innovation, and ICT, and an appropriate economic and institutional regime that allows efficient mobilization and allocation of resources

Knowledge Economy Index Global Over Time Comparison

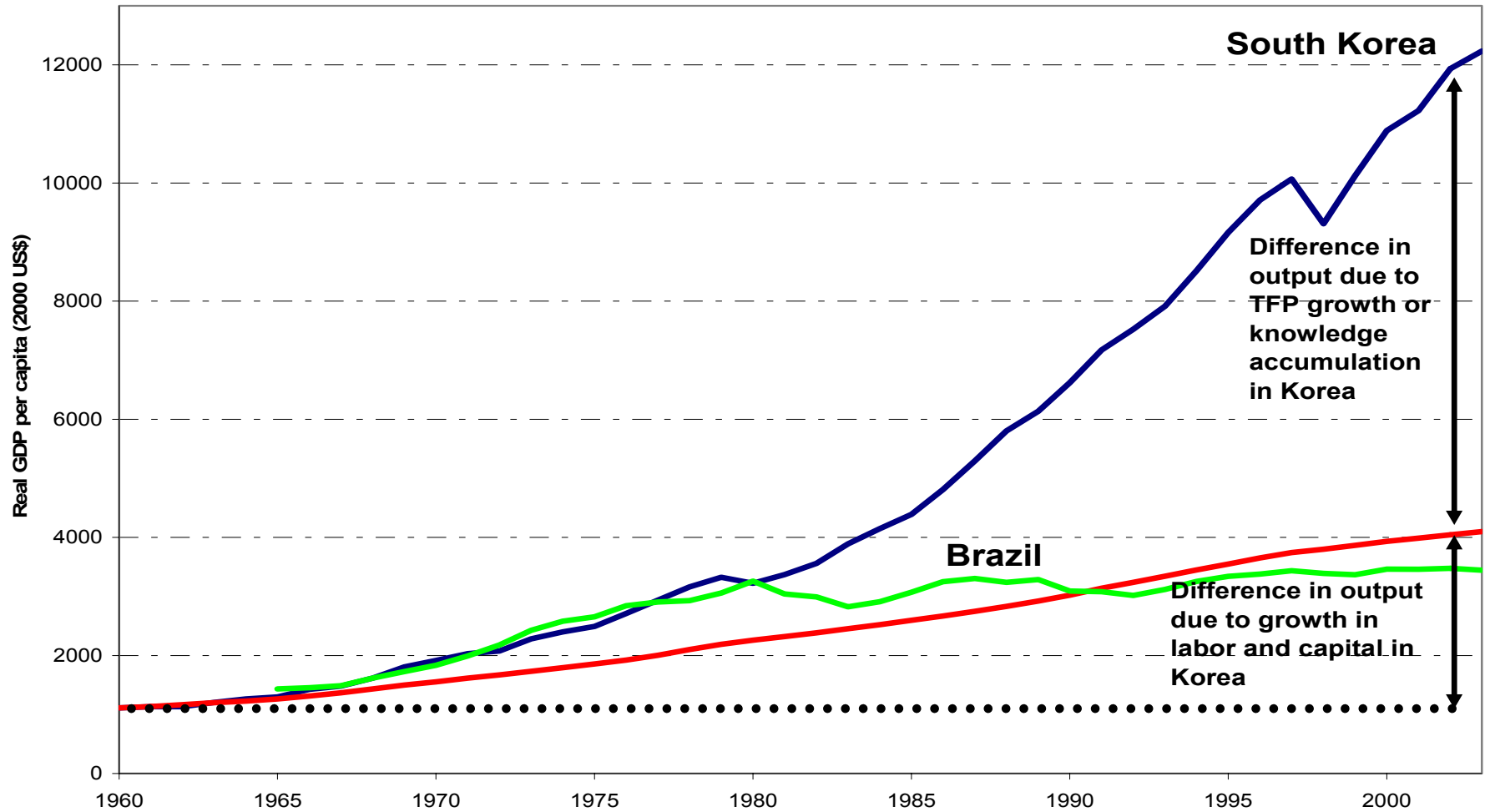
Global Over Time Comparison

Show: (•) Knowledge Economy Index ( ) Knowledge Index ( ) Economic Regime ( ) Innovation ( ) Education ( ) Information Infrastructure

Innovation variables are (•) weighted ( ) unweighted



Knowledge and Growth
GDP/Capita Growth: Brazil vs. Korea



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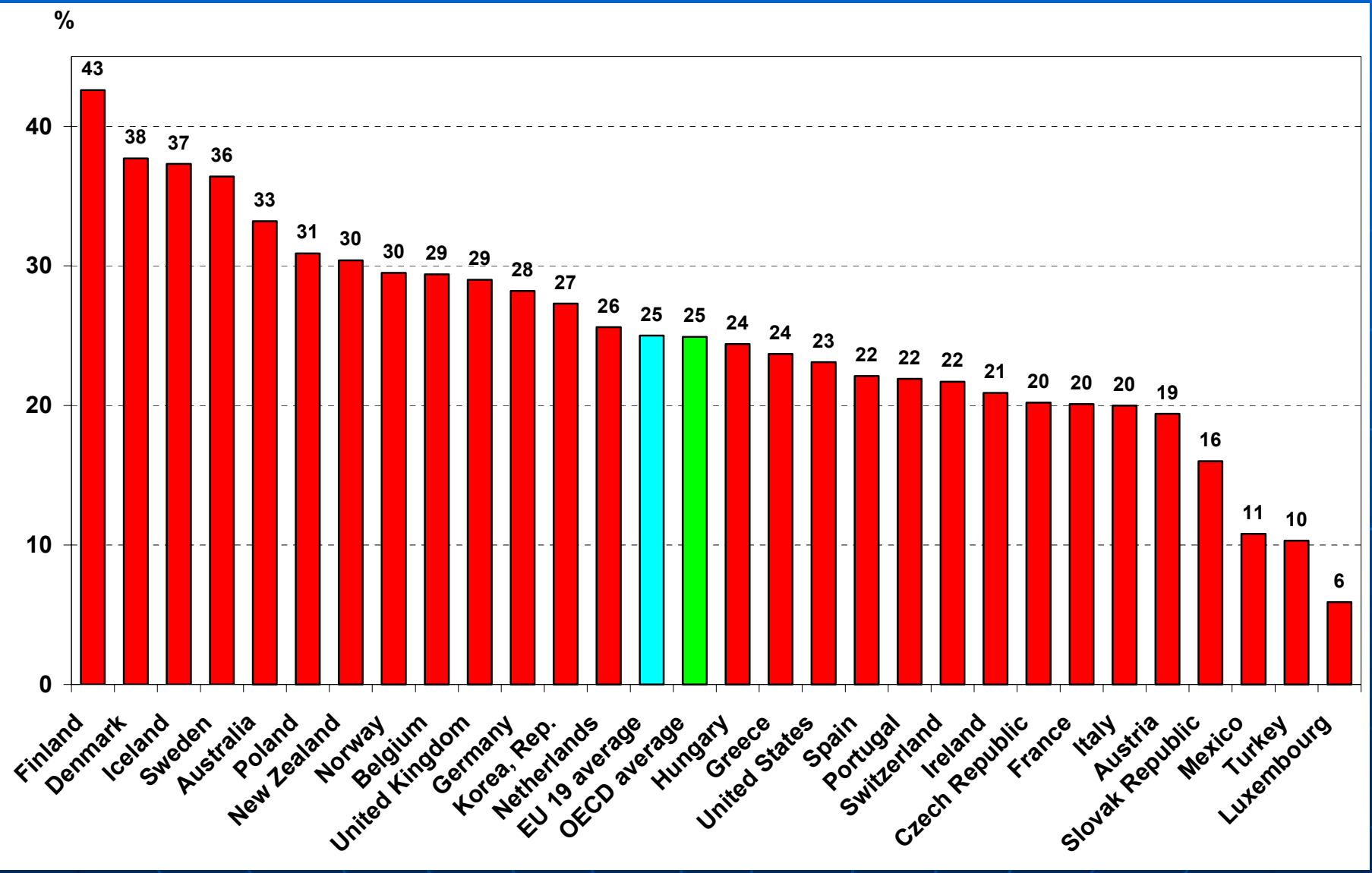
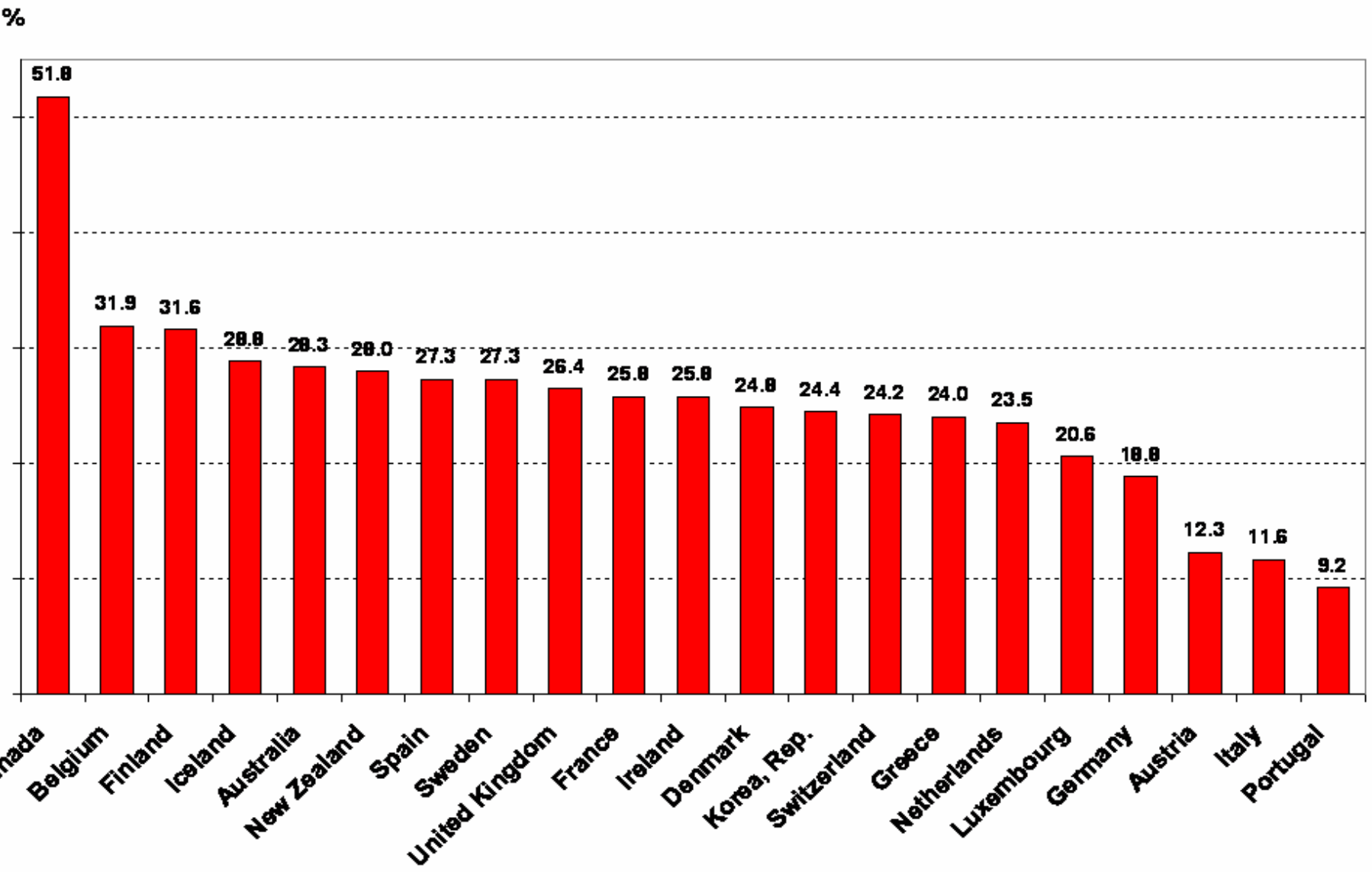
Education: Fundamental Enabler of the KE

- Many of the growth stars owe their success to solid gains in human capital.
- Knowledge enabled economies, have constantly transformed their education systems in line with changes in economic policies
- Education reforms have been both broad and systemic, and deep affecting the nature of teaching and learning

Net Education Enrollment Rate (%) Ages 20-29 (2005)



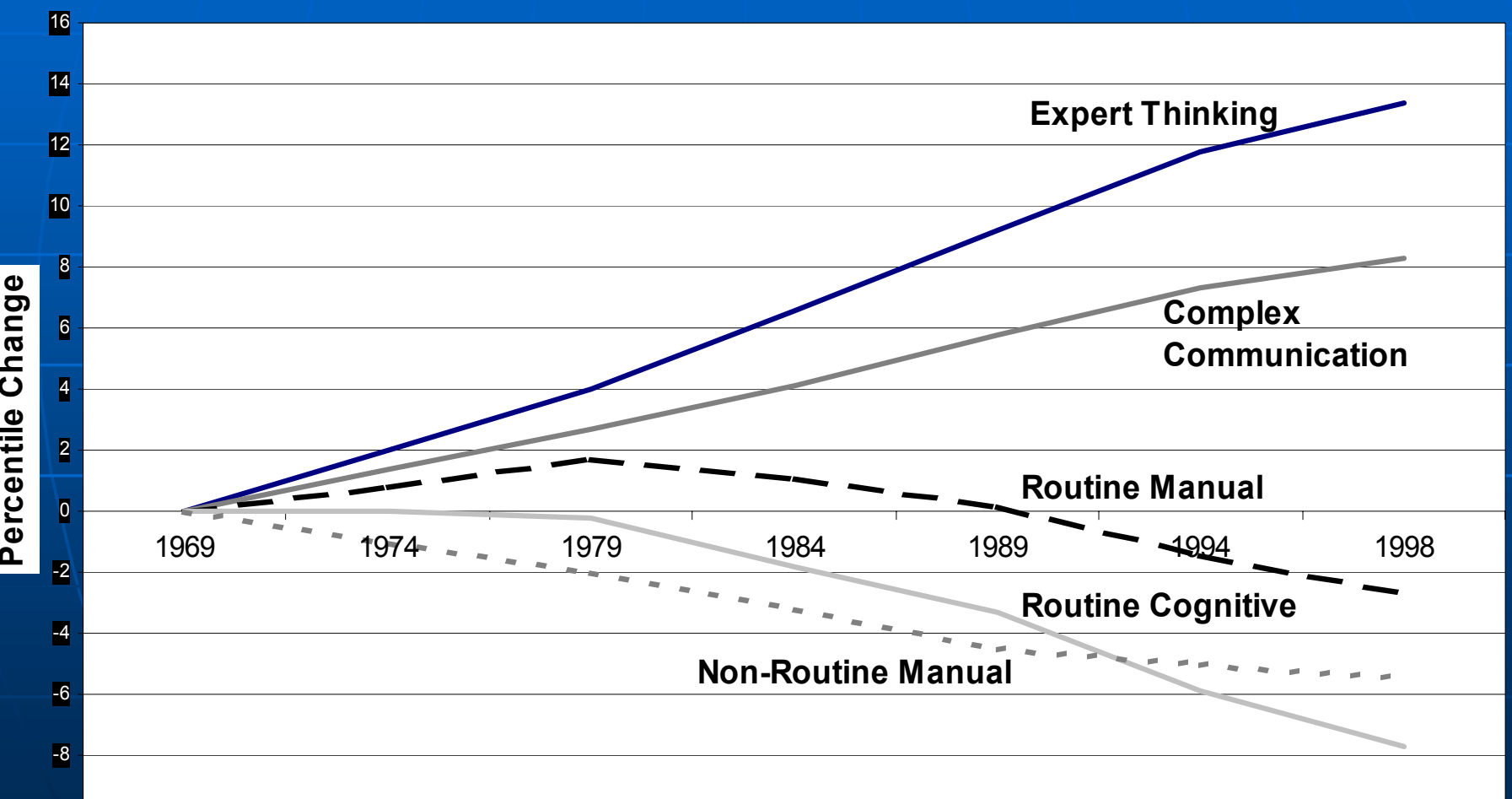
Share of Labor Force with Tertiary Education (2000-01 Average)



Skills and Competencies Needed for the KE

- Performance in the marketplace is driven by the quality, skills, and flexibility of labor and management
- In addition to traditional "hard" skills (the "3Rs") and, recently, ICT competencies, the KE demands new set o "soft" skills
- Teaching and learning environments need to foster:
  - spirit of enquiry
  - adaptability
  - problem solving
  - communications skills
  - self learning and knowledge discovery
  - social empathy
  - motivation for work

Changes in Job Task-Skill Demands in the US: 1960–98



Source: Autor, Levy, and Murnane (2003) "The Skill Content of Recent Technological Change: An Empirical Exploration," *Quarterly Journal of Economi*

Growing Competition for Talent and Skills

- Talent and skills have become world's most sought-after commodity.
- International poll of HR managers in 2006: 3/4th said that attracting and retaining talent was #1 priority; some 62% worried about company-wide talent shortages. (Economist, 2006)
- Even in Asia -- home to many of the world's fastest-growing economies, biggest problem facing employers is a shortage of people.

And Growing Demand for Scientists and Engineers (S&E)

- Science, technology, and innovation have taken center stage in efforts to boost economic growth and improve social well-being.
- Demand for HR in science and engineering (S&E) has increased in OECD countries:
  - Workers in professional occupations related to S&E are now between 25% and 35% of total employment.

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Countries are Acting to Boost Supply of S&E…

Reforming school curricula to make science more attractive to young students; improving quality of teaching in math and science; increasing flexibility so students have chance to enter S&T studies at later points.

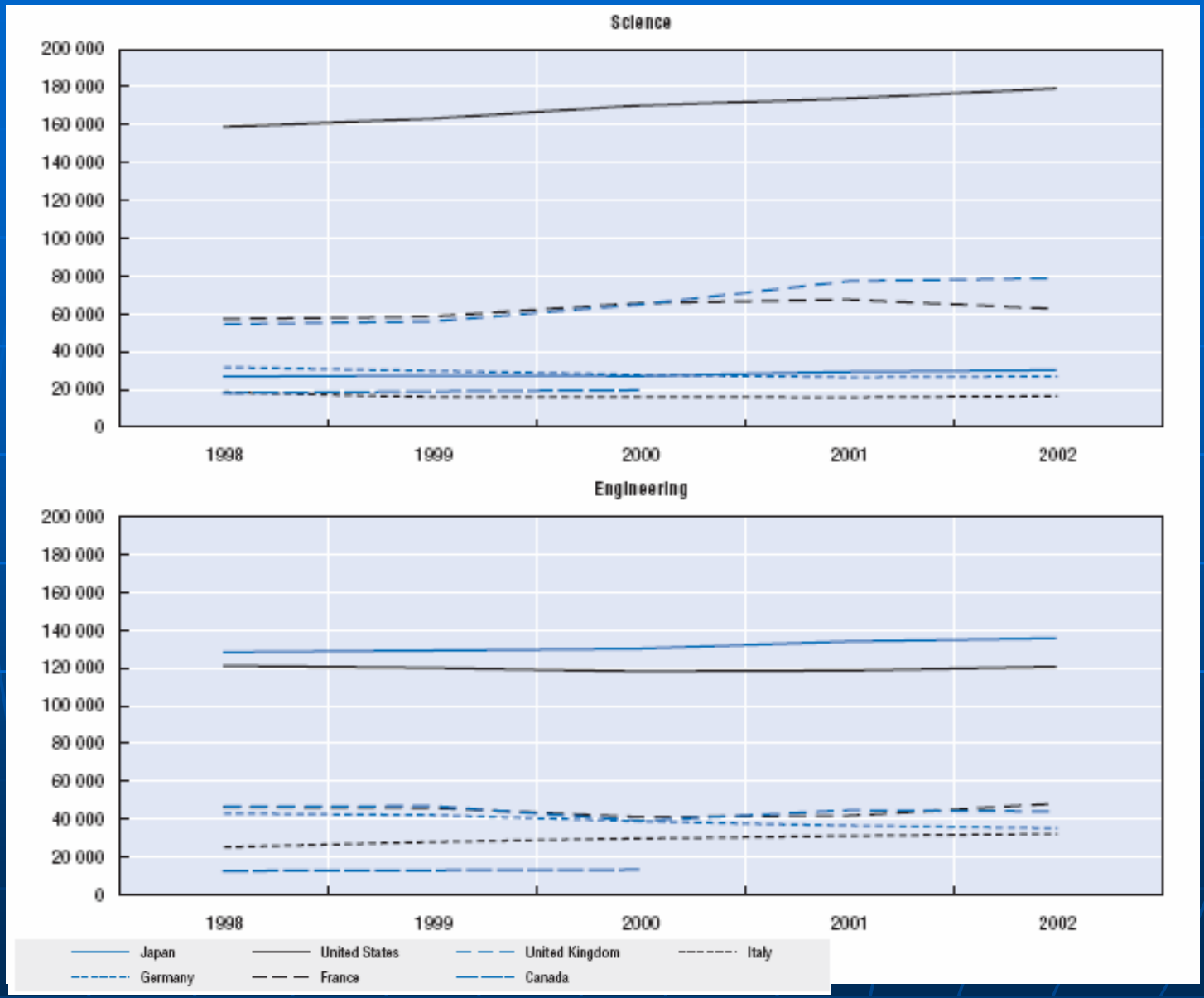
Developing PPPs between industry, tertiary institutions and secondary schools to enhance relevance of instruction, raise enrolments.

Improving international mobility as a way to match supply and demand, esp. for specific skills in short supply.

And are also Focusing on the Demand Side for (S&E)

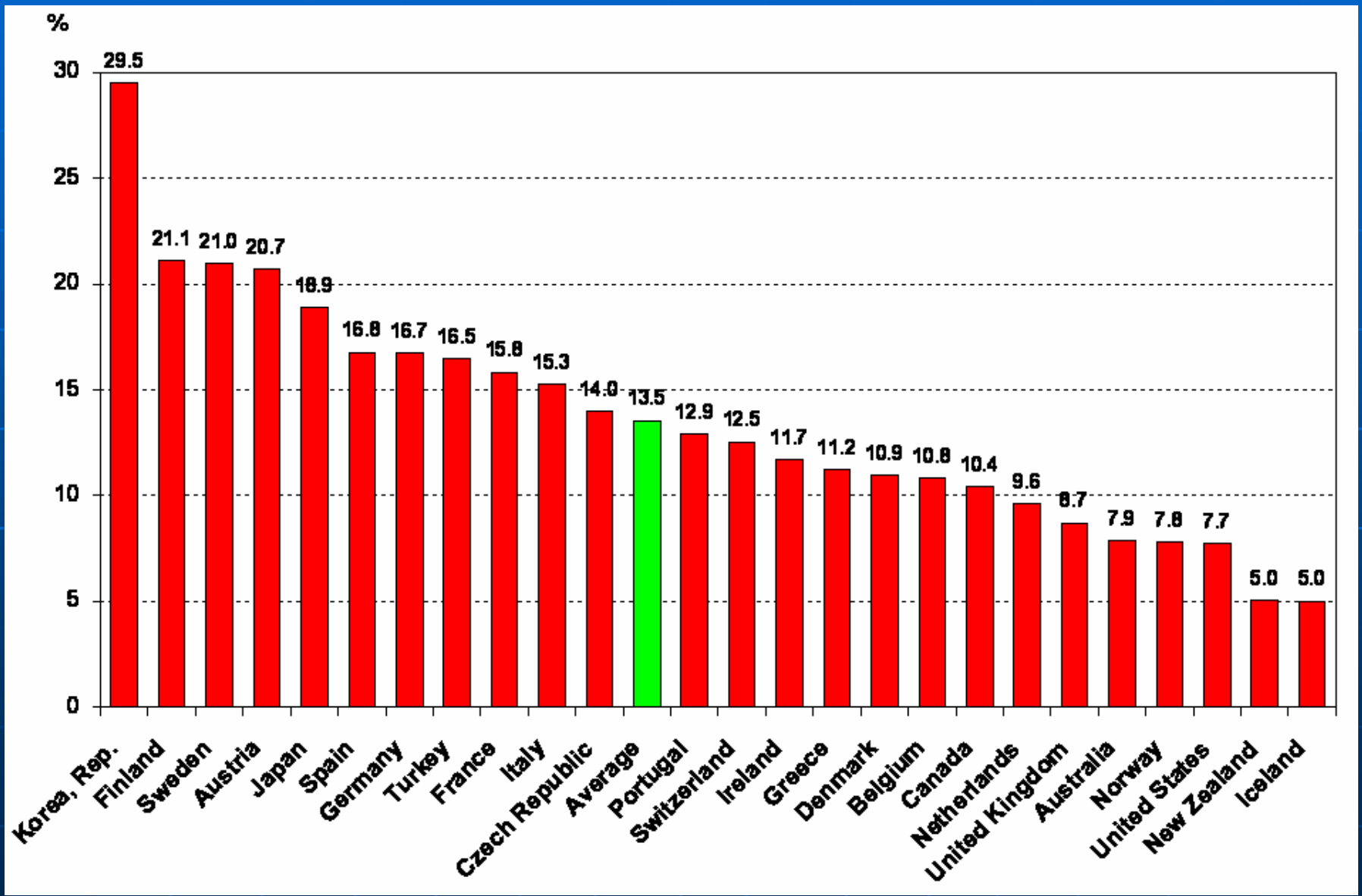
- Developing policies for human capital that focus on demand side
- Ensuring that their EIR fosters mobility and academic entrepreneurship
- Creating govt. incentives for business R&D for job creation
- Increasing amount of stipends/fellowships for PhDs and post-doctoral researchers, expanding access to social welfare benefits, improving conditions for recruitment and mobility of early-stage researchers.

Supply of S&E Graduates in G-7,1998-2002

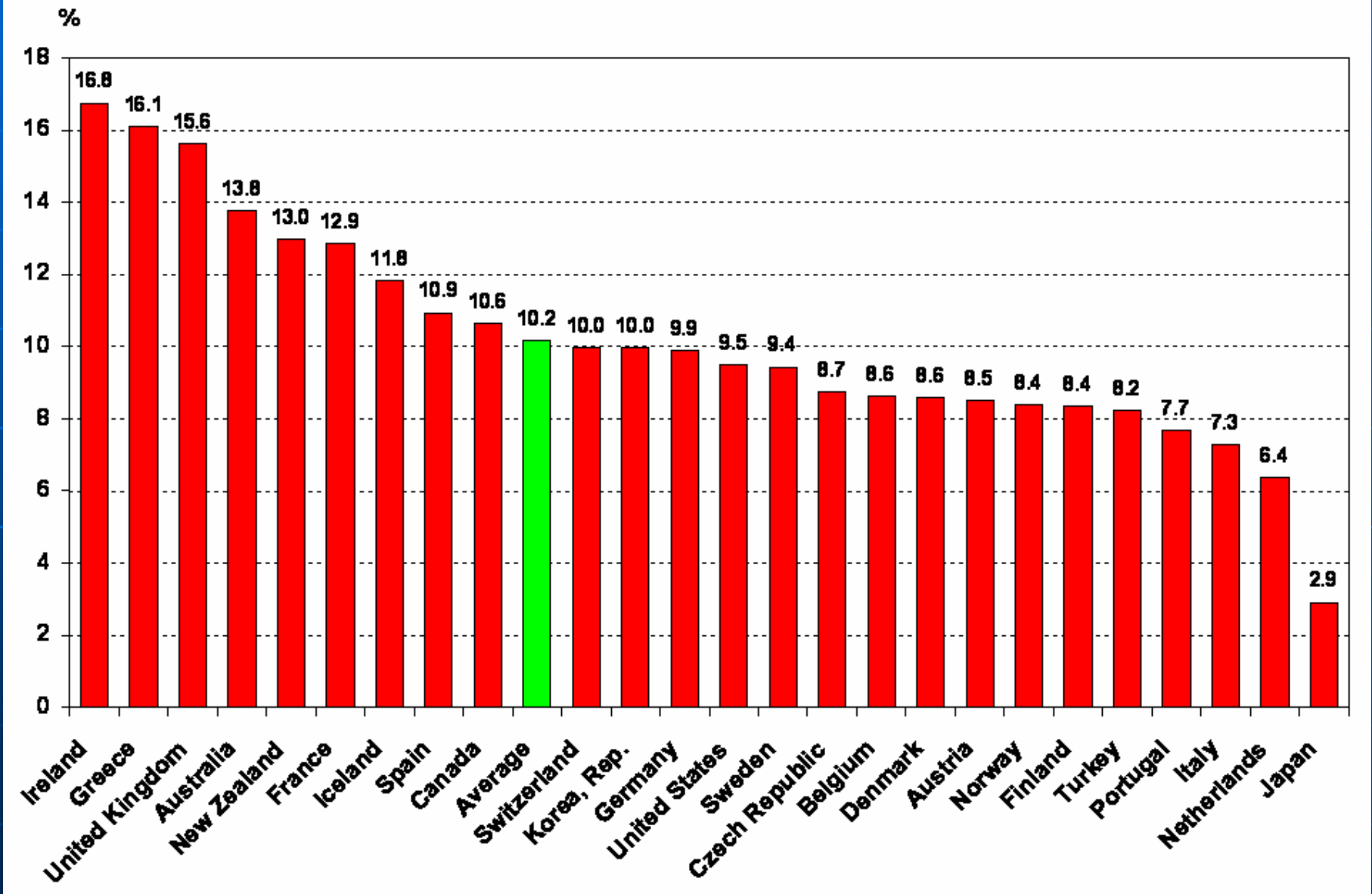


Source: OECD Science, Technology and Industry Outlook 2006

Graduates in Engineering, Manufacturing, Construction (% of total tertiary graduates, 2002-05 Average)



Graduates in Science
(% of total tertiary graduates, 2002-05 Average)



Educating S&E for the Global Workplace: What is needed

- S&E students need to have broad skills and know-how, be flexible and mobile, and be able to work internationally
- Challenge for promoting global S&E excellence is to link education to practice.
- What is needed is to:
  - Develop global competence as a key qualification of S&E graduates
  - Enhance flexibility: competencies not only in engineering, but also business, management, finance skills
  - Strengthen transnational mobility of students, researchers, and professionals
  - Create partnerships, esp. linking science/engineering education to professional practice
- Capabilties required by global S&E are therefore entrepreneurial capabilities, relationship capabilities, and change management capabilities.

urce: Global Engineering Excellence Study, 2007

Educating Engineering Students for the Global Workplace: Good Practice Examples

- Increasing students to spend time abroad during under-graduate career (internships, research experiences abroad)
- Internationalizing education for grad students: enrollment in foreign institutions (dual/double/joint degree programs)
- Stressing language proficiency as a critical skill
- Increasing experience by exposure to real world problems by more exchanges between academia and private sector
- Internationalizing the faculty
- Formulating an overall institutional framework
- Integrating experience-based programs at all levels

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Strategies for Closing the Skills Gap: Countries are Increasingly Investing in S&E Education

Science education is increasing in primary schools

- La Main à la Pâte (LAMAP)

Secondary school curricula are being updated to increase responsiveness to labor market demand

- Secondary ed. curriculum in India has greater focus on math/science

Universities are contributing to economic revival

- Kigali Institute of Science, Technology and Management

Locating near high-tech clusters/research institutes to boost tech-based industry

- University of Campinas (UNICAMP) in São Paulo

Universities seeking new ways to address sustainable devt.

- Costa Rica's EARTH University

S&T education is being enriched through partnerships with NGOs

- Foundation for Application and Teaching of Sciences in Colombia.

Countries Investing in S&E Education:

National University of Singapore: Towards a KE University

NUS is oldest, largest University; mission to increase innovation and entrepreneurship among students & faculty in 2000

- Industry and Technology Relations Office (INTRO)
- New Venture Support Unit (NVS)
- Entrepreneurial Centre
- Attracting foreign talent
- NUS Overseas College (NOC) Program

Results – increased innovation

- Increased number of published research articles
- Increased number of USPTO patents

Indo-US Collaboration for Engineering Education (IUCEE)

- Engineering education/business leaders from US and India met at ASEE/IUCEE Forum, in Mysore, June 3-5, 2007 to develop action plan for improving quality/global relevance of engineering education in India and in the US.
- Key outcomes: Establishment of Indo-US Engineering Faculty Institute
- Focus: Curriculum and delivery, quality and accreditation, R&D, and innovation and entrepreneurship.
- Benefits:
  - **For India:** increase in number of qualified engineering faculty, access to better curricular experiences for students, better employability of engineering graduates with skills needed by industry, increase in the research activity, and increase in Ph.Ds. in engineering colleges.
  - **For the US:** opportunities for global experiences for faculty and students, collaborative research, development and entrepreneurship in emerging technologies of global relevance.
- Second Forum, Aug. 29-31 in Wash, DC that delved into the specifics of setting up of such an Institute.

Countries Wooing Diasporas to Boost S&T

China

- Introduced a range of enticements (bigger apartments, access to the best schools, high-tech labs, fancy titles)
- Chinese Academy of Sciences has established a program of generous fellowships for expatriates—the "hundred talents program"
- Beijing has an office in Silicon Valley, and Shanghai has established a "human talent market"
- Results: about 25,000 Chinese students returned to China in 2004.

India

- Indian govt. has relied as much on the goodwill of business people as it has on the wisdom of bureaucrats
- Cast a wider net: focusing not just on luring back expats but on putting wealth and networks of diaspora to work for country's development
- Special visa for "People of Indian Origin"
- Results: NASSCOM estimates that in 2001-04 some 25,000 Indian techies returned home.

Conclusions

- Capacity of countries to perform in the KE depends critically on the availability of highly skilled, innovative, and flexible human resources, especially in the area of science and engineering
- Adjusting education and learning systems for the KE requires sustained investments and strategic and systemic interventions
- It also requires a new partnership between the government, the private sector and civil society
- What is most needed is a different type of leadership, and capacity development across the various education and learning systems