The role of research & Higher Education in Developing Countries.

Implications and challenges for a future active contribution to human and social development

Hebe Vessuri

- This is a time of renewed enthusiasm with higher education and research as the way forward to development.
- Yet I argue that this assertion can no longer be taken for granted unless we qualify it.

Little dispute about some dimensions of reality

- The world has made enormous economic progress during the second half of the 20th century.
- Over the past 50 years, world GDP multiplied almost 12-fold while per capita income more than trebled.
- Growth has been impressive even in the LDC.
- In a world more interconnected than ever, globalization has opened door to many benefits: innovation, wealth creation & entrepreneurship; better communications, enhanced awareness of rights & identities.

- Yet, behind the limelight, S&T have contributed directly to the problems societies face today, from the challenge of arms of mass destruction, to GMO & human cloning, & increasingly nanotechnologies.
- On the way, the self-proclaimed values of science (objectivity, generosity, universalism, communism) are being abandoned by the subordination of knowledge institutions & researchers to the interests of powerful private stakeholders.
- Globalization has exacerbated the existence of two worlds co-existing in space even if they are far apart in wellbeing.
- Reducing poverty requires that poor countries achieve technological upgrading, master & produce knowledge, & invest in innovation.
- However, this is easier said than done.

All this does not imply that these countries would have been better off without HE and without S&T- only that research capacity, per se, unguided and isolated from other essential components of social & moral responsibility, cannot fulfill its full potential for improving people’s lives.

Rethinking research

- We need to return to the question of how much we can expect to get from research in contemporary LDC.
- The first limitation of the conventional view of research is the argument of the unquestioned faith in unharnessed science and technology as the solution for LDC.
- It fails to recognize that there is no magic in science and research.

Harnessing science

- The canonical view of free-rein unfettered research is not necessarily the most appropriate one to be followed, since the types of problems and challenges that countries face vary considerably, according to their stage of scientific and technological development.
- A way, among others, of harnessing science and technology is in the production and use of knowledge for sustainable development, in which the concepts of freedom, justice, & fairness, prevail.

Lessons from the past half century

- How to structure knowledge systems for sustainability is an open question for research, practical experimentation and comparative learning.
- A coordinated global approach to scientific data & information is required that ensures equitable access for research, education & informed decision-making.
- Sloppy, improvised or mediocre education and research, which has been one of the problems haunting HE under the pressures of massification in LDC is unacceptable.
- But quality itself has to be redefined in terms of richer and diversified forms of evaluation.

- One can no longer take at face value the conventional description of scientists & technologists as agents of modernization & change in their countries.
- Their role has been much more complicated than that, with positive and negative implications.
- The specific growth of middle sectors in LDC often created situations of partial modernization that acted as reins and resulted in a source of distortion, deviation and even frustration of modernization, particularly in connection with the possibility of strengthening a democratic modernity.

Scales, from the local to the global

- Combining the exploration of problems at different scales from the local to the global, from an strategic position that seeks to impact with relative autonomy upon the national and international research agendas, could help re-orient the production of knowledge in LDC towards local needs of cohesion and social equity.
- However, it would be a mistake to forget the strong influence of international organizations.

…from the local to the global

- There is need for a greater understanding of the realities of multilateralism and of the obstacles and difficulties the new S&T knowledge pose to the delegates of countries, particularly LDC ones,
  - when debating issues that involve mastering the intricacies of new technology sufficiently to be useful to LDC negotiations,
  - or when struggling with applications because of inadequate grasp of the state of the art in the scientific literature,
  - or in situations in which government representatives from LDC cannot tell the difference between crucial and just interesting or banal data.

Government policies

- Prudent macro-guidance/management of scientific research at the national level is both necessary & desirable.
- Within DC, there is widespread consensus that government policies should support R&D activities, whether in the public or the private sector.
- Government policies are even more necessary in developing countries, although the existing global rules encroach upon essential policy space in them.
- The current tight system for the protection of intellectual property rights could pre-empt or stifle the development of domestic technological capabilities in LDC.

…and the new international agenda

- Taken together, the rules and conditions in the new international agenda are bound to curb the use of industrial policy, trade policy, and financial policy as strategic forms of intervention to foster industrialization.

- Public policies for S&T, which are subsidiary to the previous ones, and could help foster the domestic R&D activities needed in LDC for building comprehensive national S&T capacity, to encourage technological learning as well as innovation itself, suffer accordingly.

… the new international agenda

- Despite rhetorical claims that research and the science establishment serve to promote society's 'ownership', there is a continuous push for a greater market role and international competition.
- While the desirability of tackling poverty is universally accepted, actual policies to achieve this are severely constrained by the market context.
- Multinational corporations are global institutions that constrain moves towards a transformation in that direction.

What dosage for state intervention?

- The key issue is not whether states should intervene in policy issues related to R&D.
- Rather, it concerns the kind of interventions and policies that are appropriate to countries at different phases of their development.
- It is still common to find in many LDC a limited understanding of the role of the productive sector in promoting innovation.
- This leads to contradictory policy measures. For example, a government may make efforts to strengthen links between universities and companies without at the same time taking complementary steps to strengthen the demand for knowledge in the productive sector.

Research for development

- Although in every society, economy and polity are closely intertwined, and it is the interaction of economics and politics that shapes outcomes for people, there is a tendency to ‘isolate’ certain policy areas from the normal processes of politics, transferring power to special interests.
- Science, since Weber (1919), has been assumed to be foreign to both economic and political concerns.
- Technocratic governance without politics may in the short term improve policy implementation in certain areas.
- In the longer term, however, it is not likely to provide a real solution for it will induce a decline in societal cohesion generating a ‘confidence gap’ between political office-holders & citizens.

So, what & how much expertise?

- Excessive reliance on experts' opinions has been shown to contribute to depoliticization & to induce further distance from political citizen participation.
- Scientific knowledge & expertise are today more crucial than ever in democracy, but it is also true that the *'knowledge problem'* has emerged as one of the current major governance problems in terms of the difficulty in understanding & correctly assessing complex societal issues as well as the causal linkages between resources & objectives.

- Scientists have opened *Pandora's Box*, and the powers unleashed require deft steering and societal restraint to prevent irreparable damage and ensure welcome benefits for humankind.
- A new politics of knowledge is emerging in the playing field in which political goals and economic interests have to come to terms with universal norms and values.

Thank you

Science, Technology and Innovation for Development

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UNU/UNESCO International Conference "Pathways Towards a Shared Future: Changing Roles of Higher Education in a Globalised World", Tokyo, 29-30th August, 2007

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Outline

- A historical view: the knowledge economy from the pre-industrial age to the 20th Century
  - The emergence of "tight" science
  - The national policy focus: technological competitiveness and national dreams of leadership…
- The 21st Century challenges: globalization, localization and A2K
  - Global integration: doubling of world labour force
  - Knowledge as a "joint" production factor: the global locational multiplication of hotspots
  - The role of collaborative innovation
- "New" innovation and new development challenges

1. The knowledge society in the pre-industrial age

- Knowledge has always been an essential part of human activities
  - In pre-industrial age, the economic value of science was limited:
    - like artists the funding structure of scientists was strongly elitist based
    - as a consequence the locus of science in society was outside of the economic and commercial sphere
  - Industrial revolution represents a fundamental brake with respect to such "islands" of S&T knowledge
    - crucial role of the spirit of industrial enlightenment (Joel Mokyr, Margareth Jacobs)
    - Crucial role of the interaction between "les savants et les fabriquants":
      - need for scientific proof on the part of manufacturers,
      - hunger for application and understanding of scientific principles (Diderot's 82 volume "Encyclopedia des Arts et Métiers, Lunar Society).
- Formalisation with the emergence of the industrial R&D lab in US in the late 19th Century

The 20th Century: the emergence of "tight" science and technology based knowledge

- The 2nd World war and later on the Cold war was the ultimate political recognition of the role of S&T
- In economics reflected in a black box vision on S&T:
  - "not to be opened except by scientists and engineers" (Freeman)
  - A residual (Solow); a reflection of our ignorance (Abramowitz)
- Yet with a strong emphasis on public policy role:
  - Social returns to basic research being by definition higher than the private ones (Nelson 1959, Arrow, 1962)
  - Well identifiable, sequential view of basic and applied research, dominance of the so-called linear model of S&T, later broadened to the Schumpeterian trilogy invention, innovation and diffusion
  - Measurement based on novelty as opposed to routine knowledge (UNESCO and OECD different definitions in late 60's)

Nature of technological progress changed with impact of ICT on R&D

- Shift in the nature of knowledge accumulation: from "tight" to undetermined outcomes, trial and error science and technology
- Traditional industrial R&D was based on:
  - Clearly agreed-upon criteria of progress, and ability to evaluate ex post
  - Ability to "hold in place" (Nelson), to replicate, to imitate
  - A strong cumulative process: learn from natural and deliberate experiments
- Still the case in many manufacturing sectors from automobiles, to consumer electronics, chemicals but even here tightness is becoming more difficult with the increase in complexity

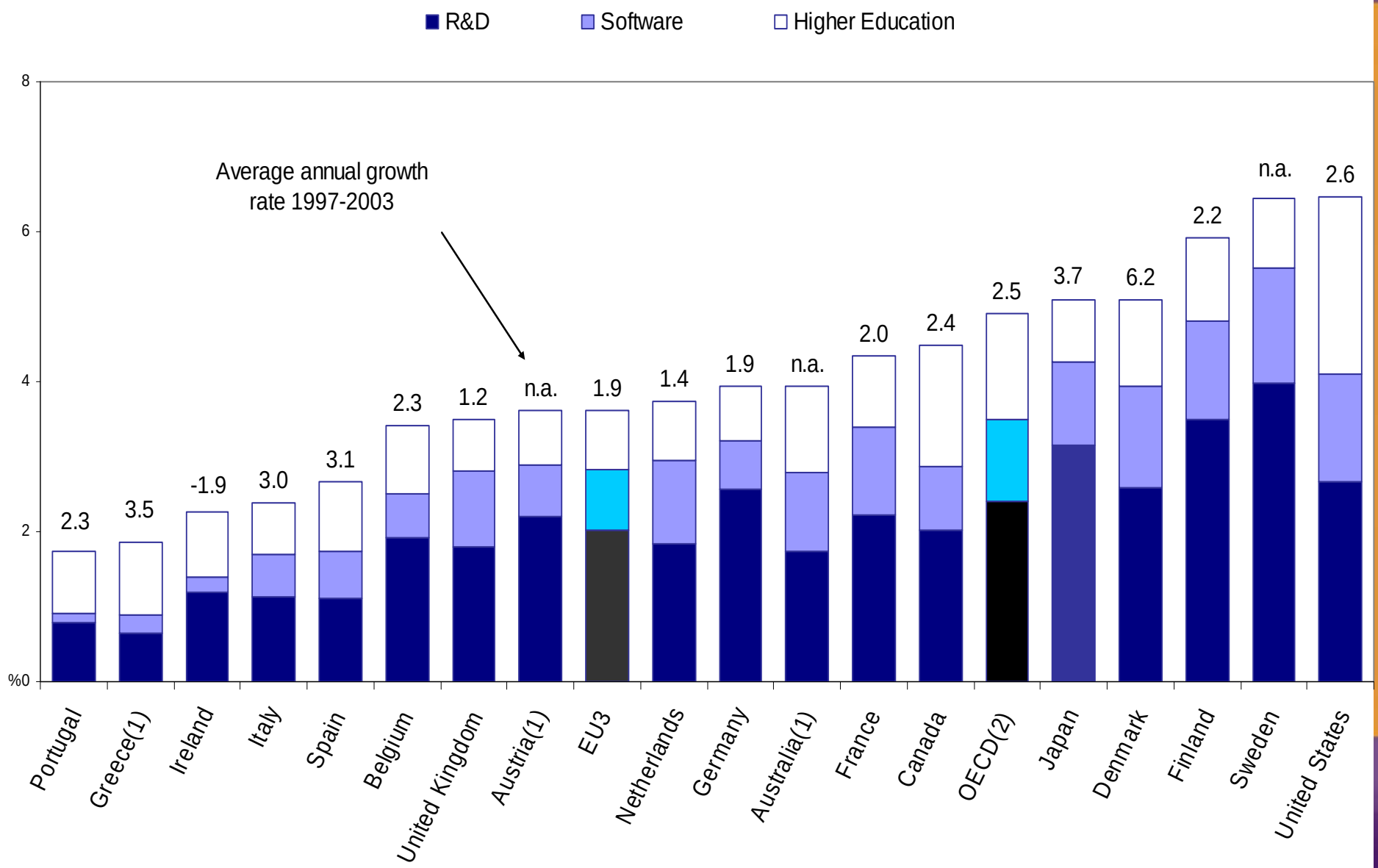
“New” characteristics of innovation

- New technological change appears more based upon:
  - Flexibility, hence difficulty in establishing replication;
  - Trial and error elements in research with only “ex post” observed improvements
  - Problems of continuously changing external environments: over time, across sectors, in space; difficulty to evaluate
    - E.g. In many IT-intensive sectors (education, health, mobility, safety, business) efficiency improvements remain complex “stories” only to be told ex post
  - Particular role of users in the R&D process itself and much larger role for entrepreneurial, “creative destruction” based innovation
  - “Codified” parts of knowledge easy, but difficult to appropriate the efficiency improvements leak quickly away, tacit parts much more difficult, imitation never complete

From R&D to Innovation policy

- Distinction between novelty and routine reflected in essential features of R&D definition and its policy support:
  - Professional R&D with professional S&E manpower versus routine production with routine high/low skilled manpower
  - Dominance in-house R&D over outsourcing, licensing, "open" innovation
  - STS activities such as design, engineering, etc. outside of R&D
- At innovation side blurring distinction between innovators and users:
  - Innovation outside of R&D system, associated with entrepreneurs
  - Innovation as novelty with respect to firm's market, country's market, world market?
  - Role of knowledge management, organisational innovation

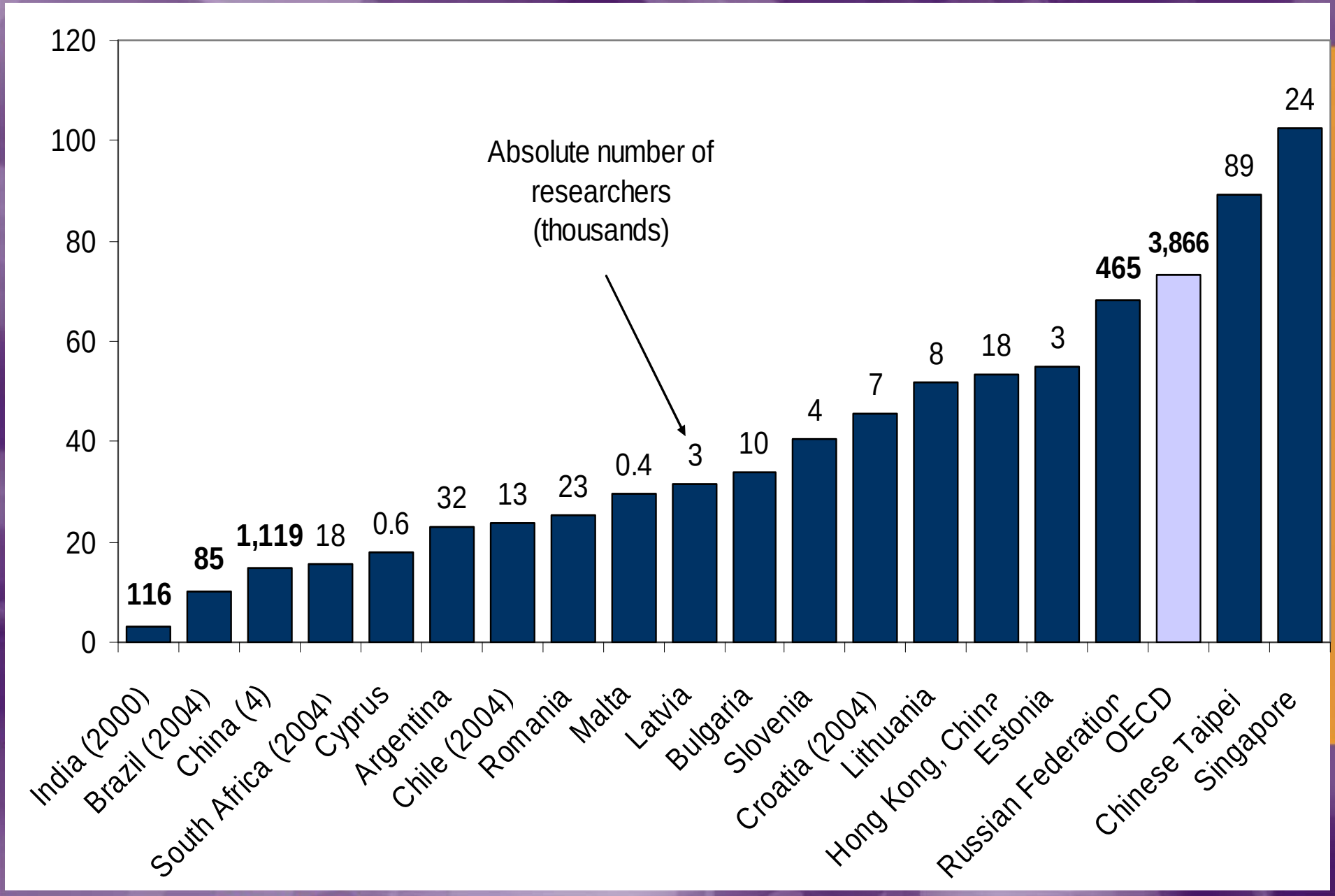
Investment in Knowledge, as a % of GDP (2003)



2. The 21st Century challenges: the mutual globalization and localization of knowledge

- Globalization of S&T: importance of international access; of exchange of codified knowledge, global scientific communities, where knowledge is shared.
- But at the same time strong localization of knowledge: knowledge appears a "joint" production factor (codified and tacit knowledge) subject to different local increasing returns and global access features
- As a result dramatic increase in knowledge hotspots:
  - Agglomeration effects in knowledge increasingly at level of tacit knowledge accumulation, hence crucial importance of universities
  - Up to now US and to a lesser extent other Anglo-Saxon universities (Canada, Australia, UK) have acted as global attractor poles for international scientists and engineers

Researchers per 10,000 persons employed (2003)



Development challenges: different policies at different levels of development

- Three broad categories of policy challenges:
  - For high income countries, such as Japan or the EU, the policy challenge is one of the sustainability of Schumpeterian dynamism
  - For emerging economies (BRIC), the policy challenge is the design of "backing winners" innovation policies
  - For developing countries, the policy challenge will have to focus on the disarticulated knowledge systems: e.g. design of pro-poor innovation policies within e.g. context of agriculture and rural development
- These are only though accents: e.g. particular relevance of technological advance as a cumulative process for emerging economies (BRIC), today maybe less for developed countries?

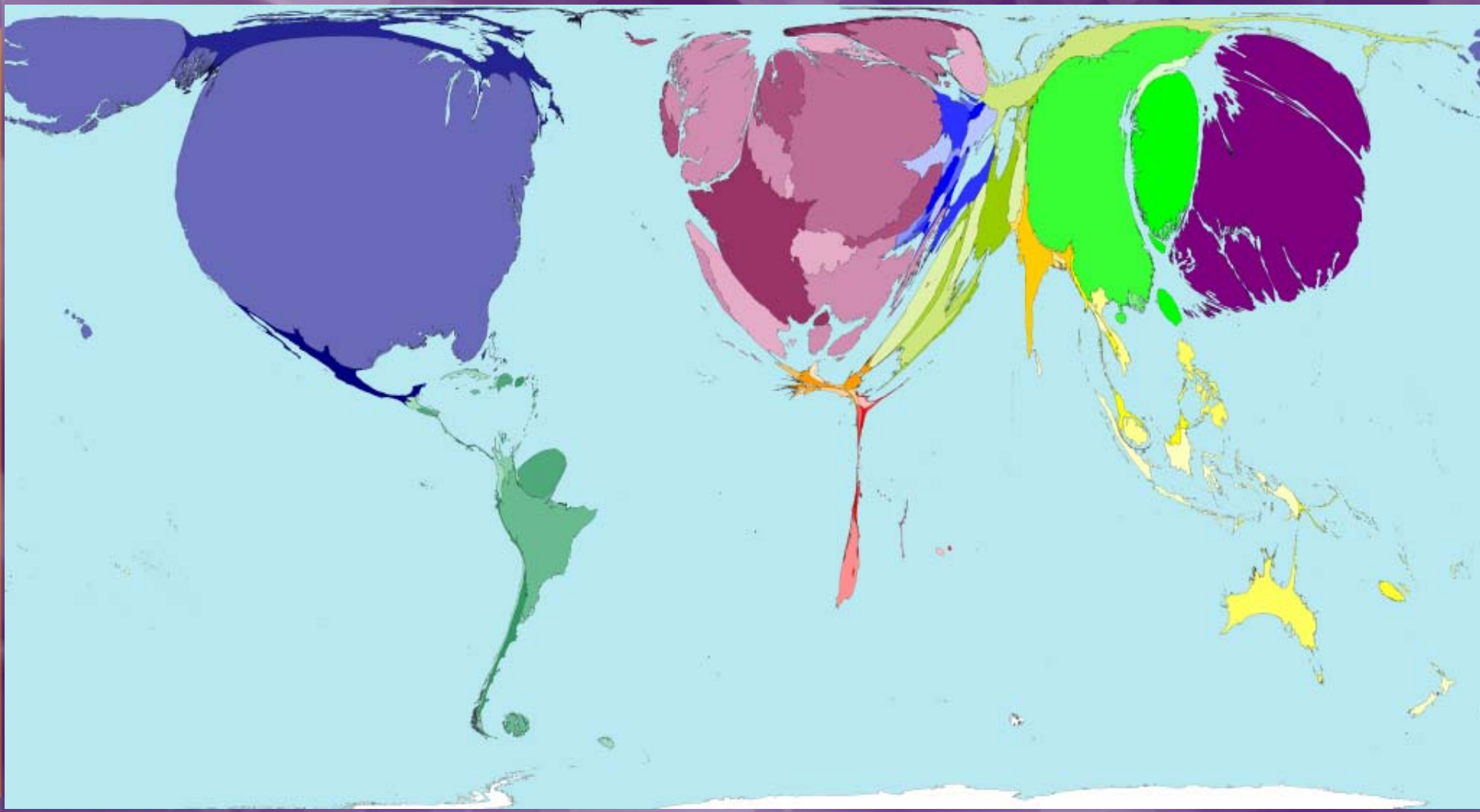
But with one common feature: A2K

- A2K is essential at all levels of development:
  - With respect to global issues the list is increasing day by day: food, health, climate change, environment, energy, safety;
  - But also with respect to local issues such as water management, transport, logistics, urban mobility, migration, innovation and entrepreneurship, etc.
  - The complexities of the problems confronted with imply a more open innovation process, involving many players: public, private, local, national, international.
  - In all those areas the old policy obsession with national technological competitiveness appears today completely outdated. One witnesses the coming to an end of geographically determined technological competitiveness

Global sharing of knowledge as new source of private and public innovation

- The global dimensions of collaborative innovation can go hand in hand with the huge concentration of R&D efforts in the US, Japan and the EU with the BRIC countries catching up
- But such physical concentration will need increasingly to address global welfare problems and demands:
  - In this sense the most important long term enabling factor of OECD countries' over-concentration of R&D is in enhancing A2K
  - Not just access to the required knowledge but also to the tools to replicate and improve upon knowledge
  - Access not as passive consumption but as right and ability of participation: as a factor enlarging the resource base of potential innovators

R&D-expenditures



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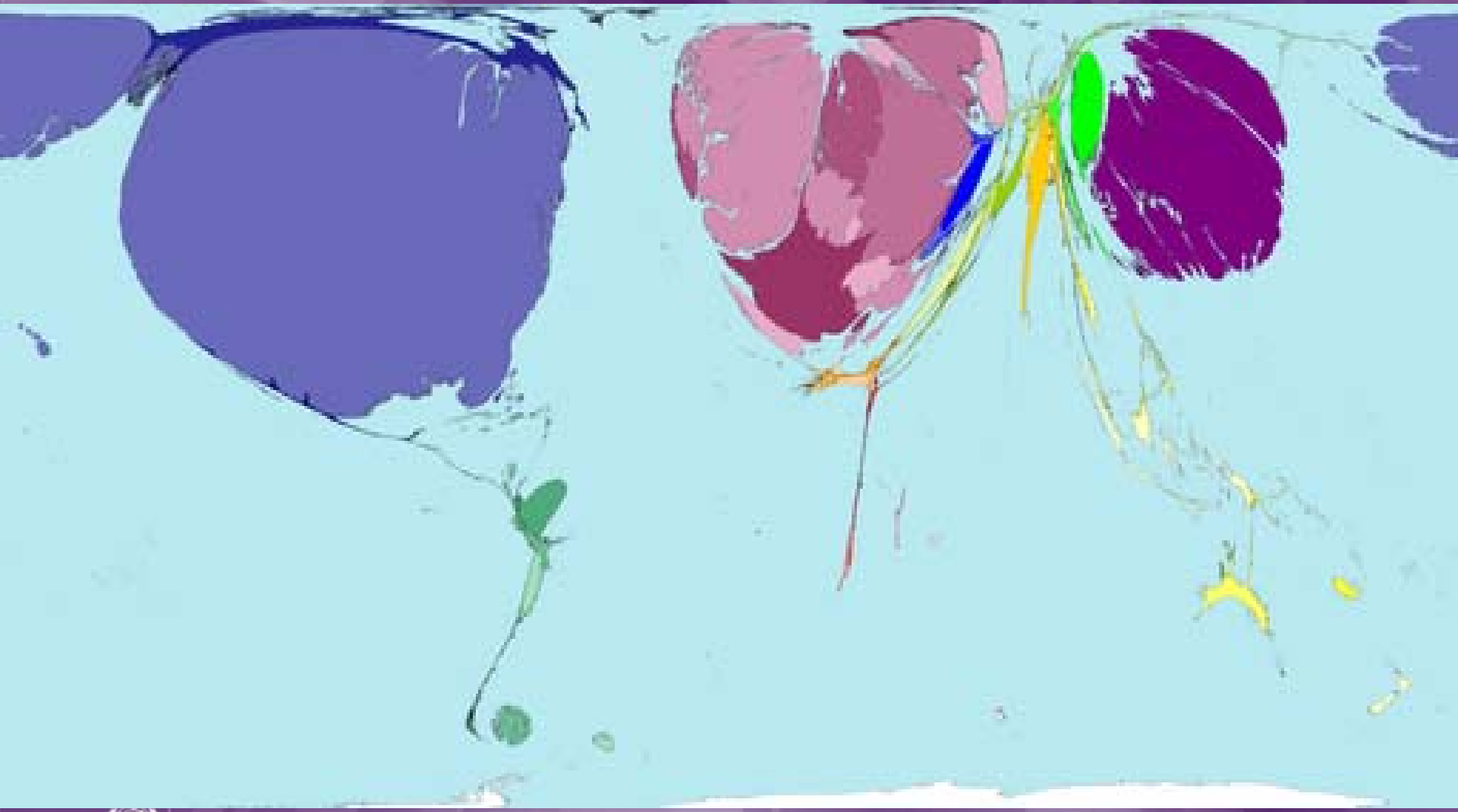
http://www.sasi.group.shef.ac.uk/worldmapper/

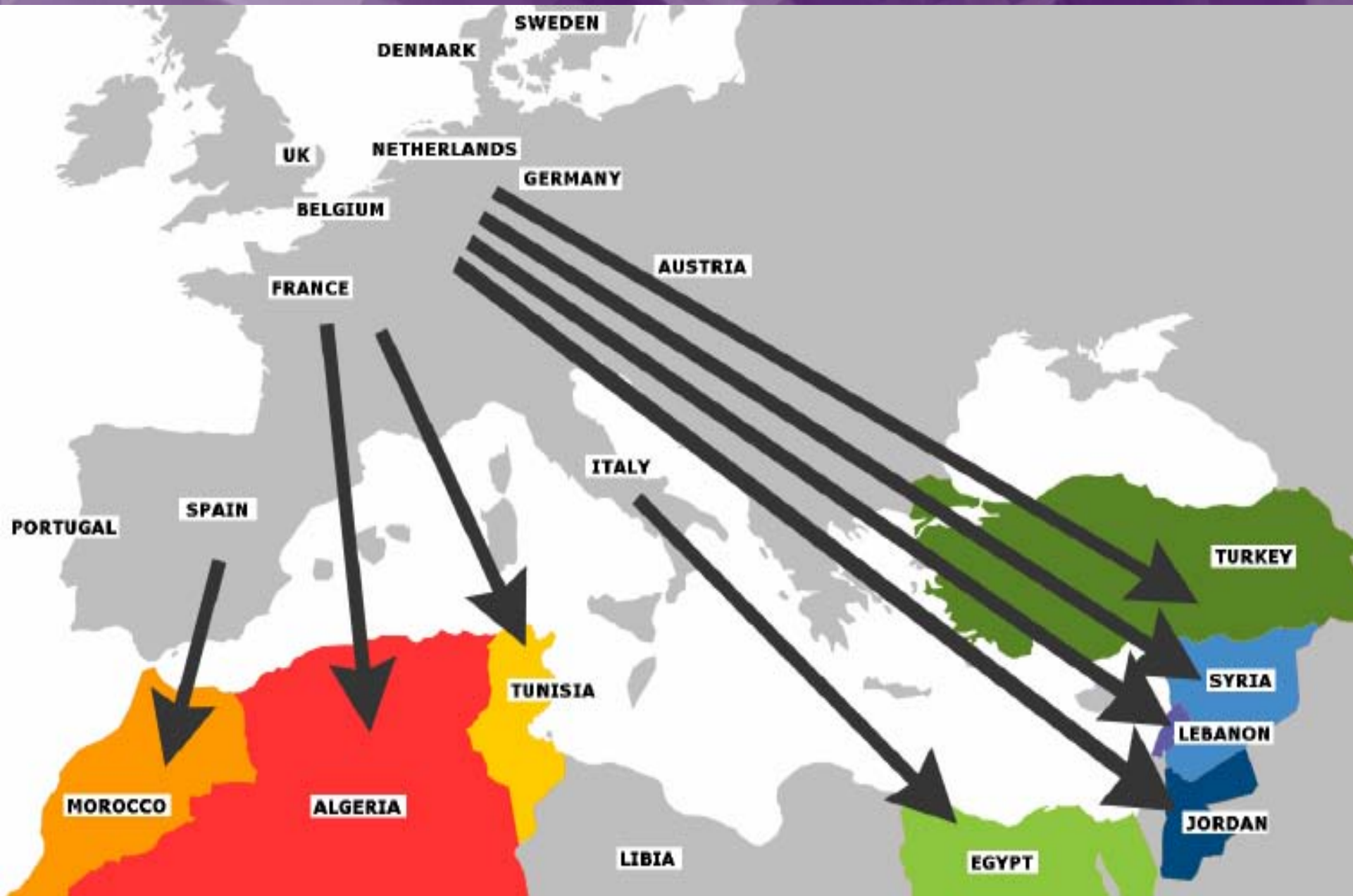
Technological revenues



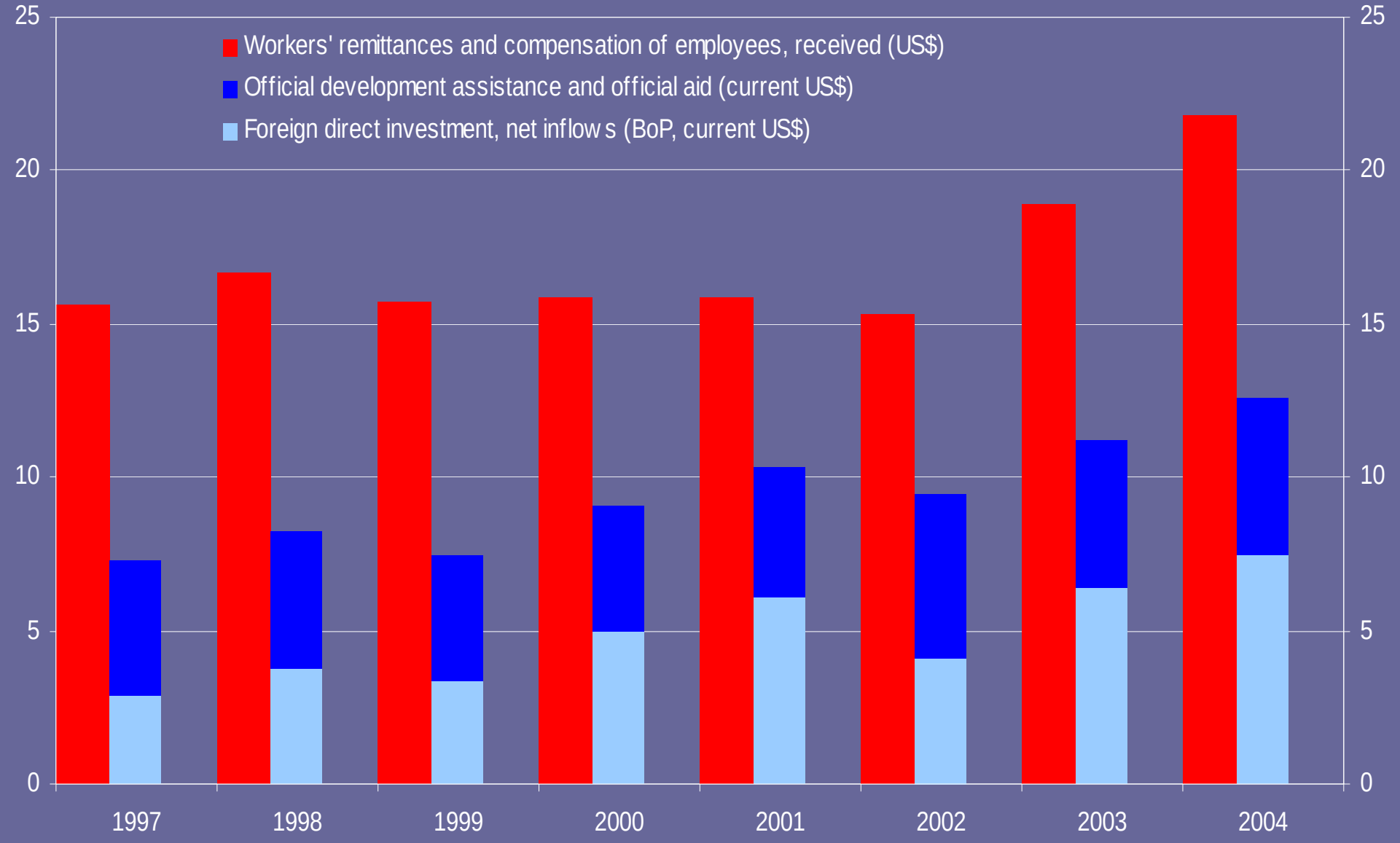
Local sharing of knowledge as new source of private and public innovation

- New private BoP innovation policies:
  - From large foreign companies: from development through profits to social entrepreneurship
  - Link with micro-financing and access to knowledge
- New forms of strategic alliances with public sector and NGOs
  - Private challenges of pro-poor innovation policies:
    - it is expensive to be poor
    - it is expensive to service the poor
  - Private sector to some extent follower with NGOs as the identifier of innovation niche opportunities
- Role of local public sector in setting the fences of the commons in nature but also in innovation, in “creative commons”
- Not just in manufacturing, health and public utilities…

An out of the box example: workers' remittances



Considerable importance to Mediterranean countries: remittances larger than FDI and ODA combined



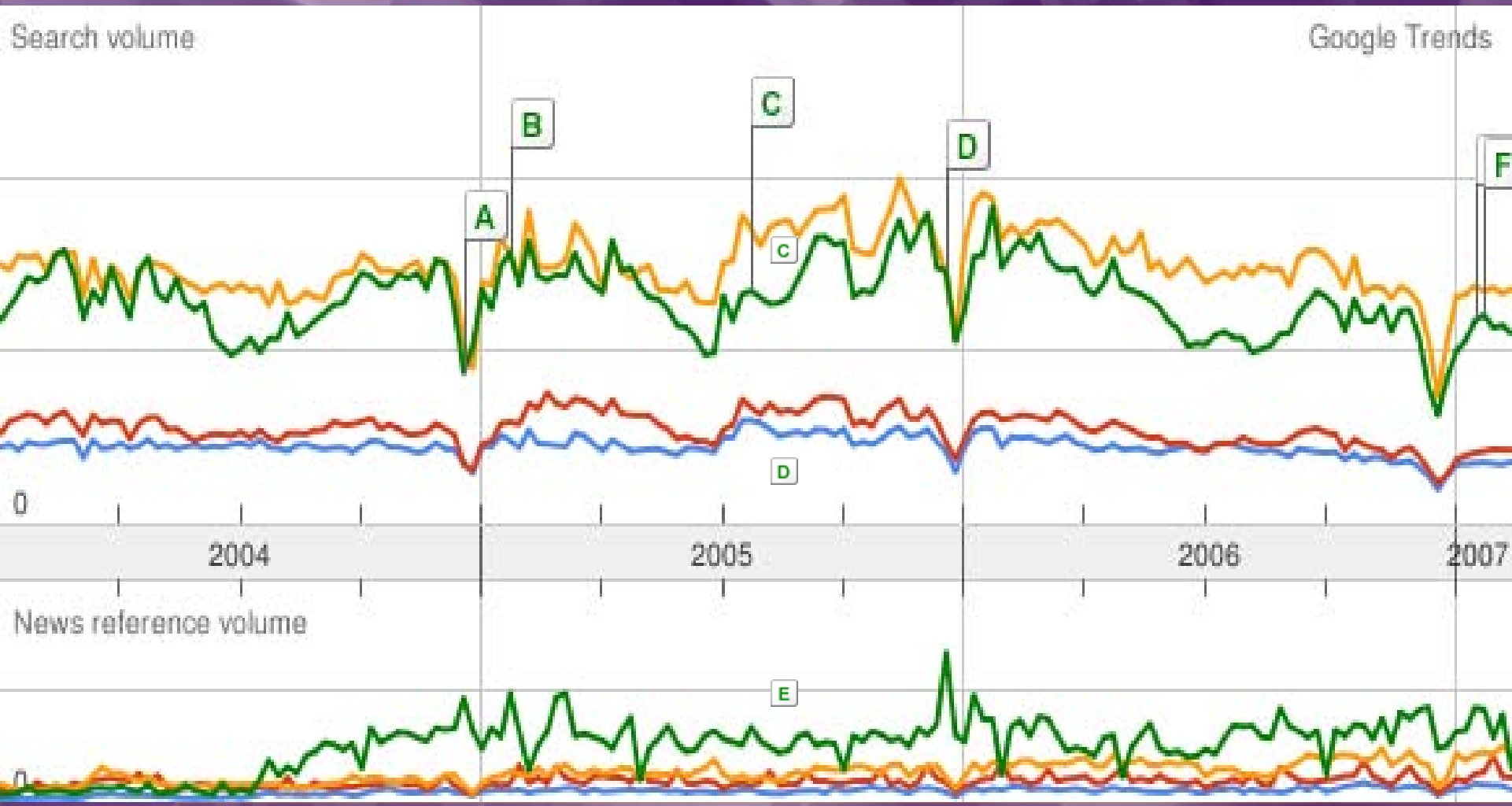
EIB proposal: improving the efficiency of workers' remittances in Mediterranean countries

- Particularly large market imperfections and information deficiencies
  - Exclusivity contracts for MTOs in post offices
  - Lack of transparency on transfer costs (particularly re exchange rate fees)
  - Inadequate information regarding available transfer mechanisms and associated costs, speed and reliability
  - Inadequate payment systems and limited usage of bank accounts in Mediterranean countries
  - Accessibility to banking accounts for emigrants residing in the EU is also limited and banking products are not sufficiently tailored for remitters, with few exceptions
- Imperfections result in high transactions costs, which can exceed 16 percent of capital sent.
- EIB idea: use remittances as collateral for the issuance of bonds/notes (future flow securitization)

Conclusions

- Knowledge sharing shifts the attention away from the purely technological aspects of research to the broader organisational, economic and social aspects which are today in many cases a more important factor behind innovation.
- This is reflected to some extent in the much greater popularity of the term innovation today than R&D
- Innovation is at the same time as relevant to poor countries as it is to rich countries. This holds a priori for countries with large, young populations where the potential for innovation, once users/consumers are identified as source of innovation, can easily be enhanced.
- In doing so, innovation is becoming less driven by R&D and at the product end by the continuous search for quality improvements, typical of the old mode of technological progress, identified with the high income groups in society, but by broader user needs across society.
- At the same time, such innovation demands might feed back to R&D departments in new ways, further globalising the impact of research.

Innovation, GDP, R&D, Productivity



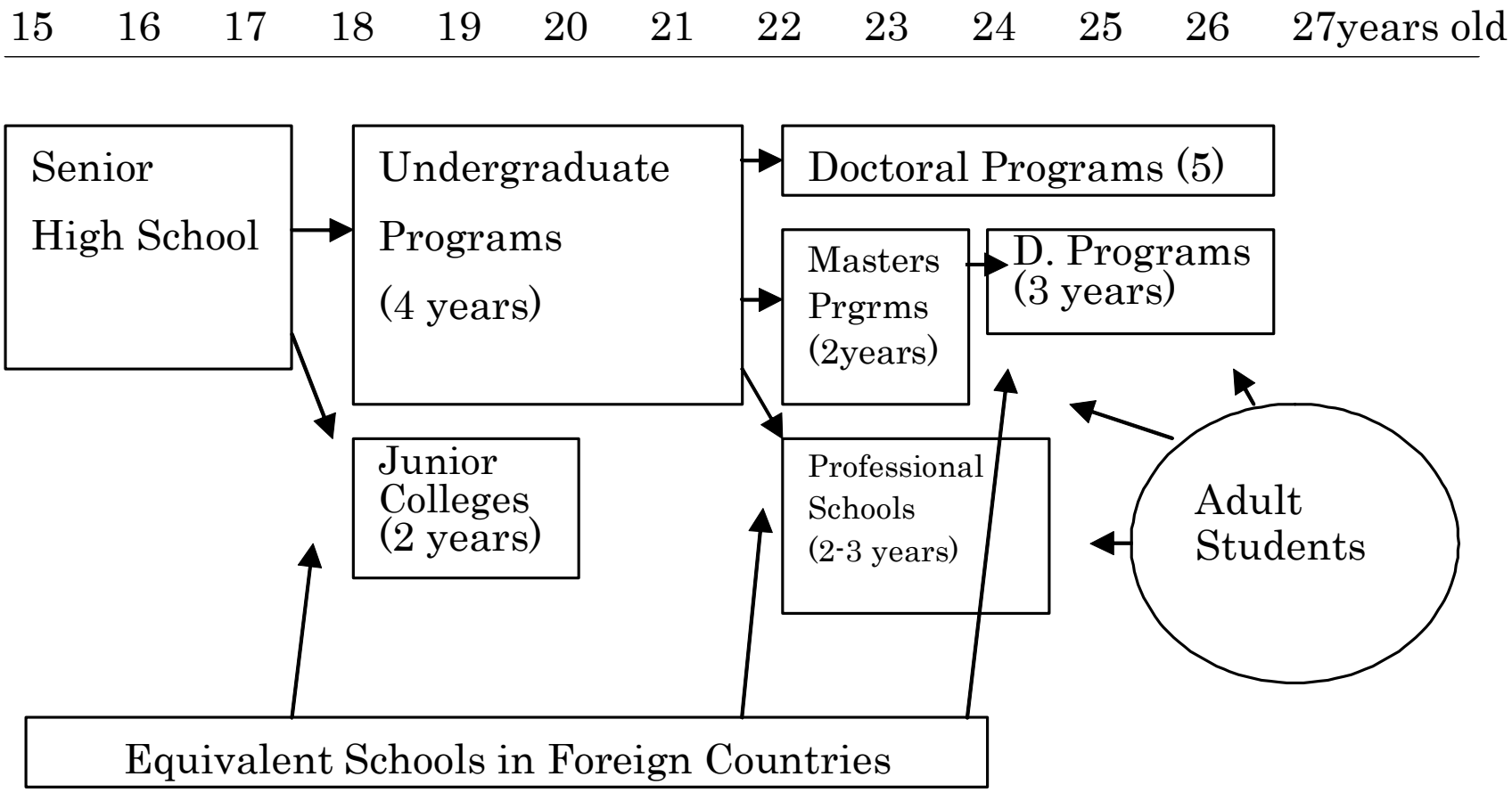
University Research in Transition
~Japanese case~

Research Institute for Higher Education

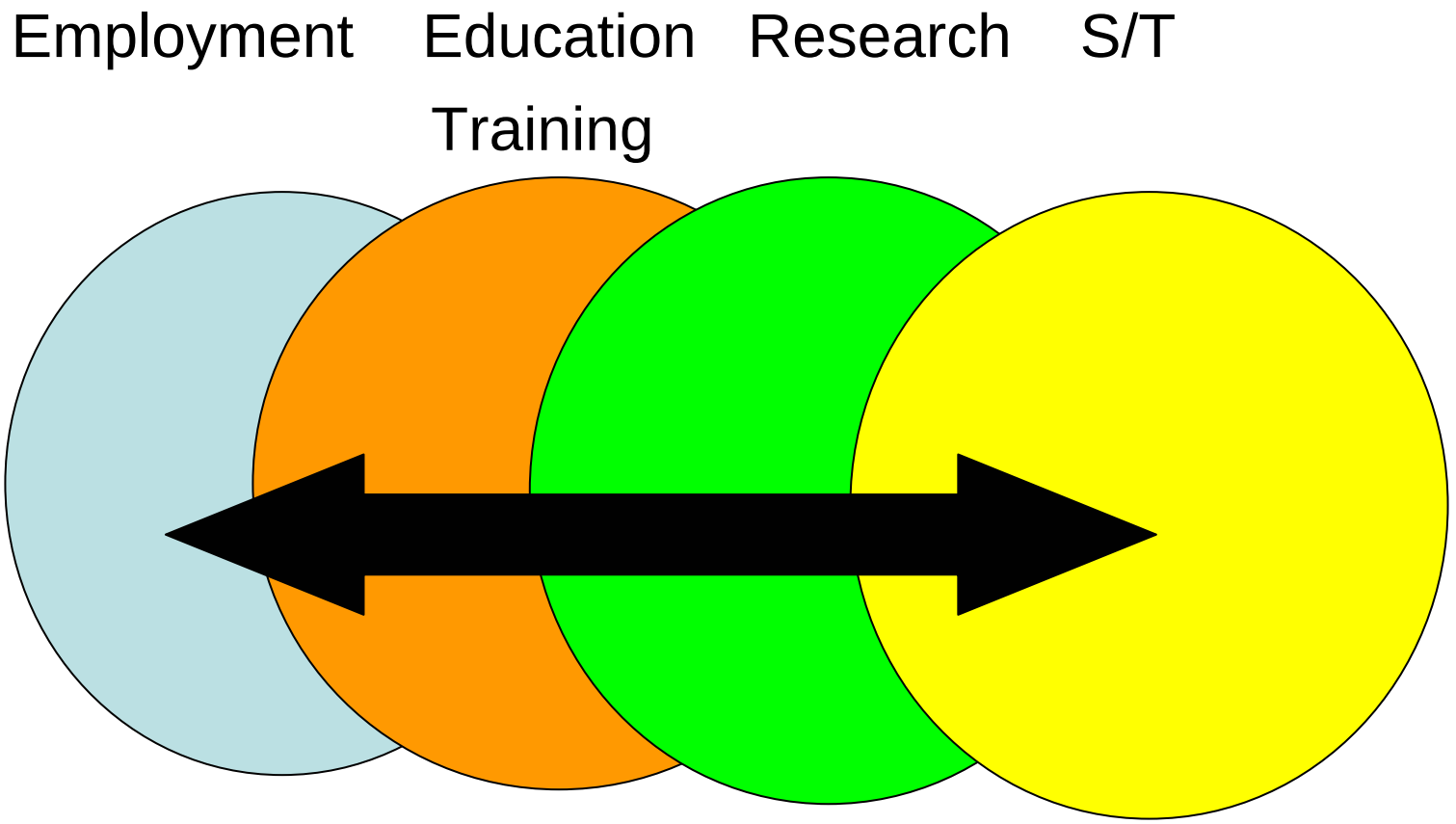
Hiroshima University

Shinichi YAMAMOTO

Current University System in Japan



The Role of Universities



The Development of Higher Education in Japan

1. The Imperial University in 1887
2. Expansion of Higher Education System in 1918
3. Big Reform after the War II
   Various HE Inst. → Universities
4. Massification of HE in 1960s and 70s
   Quality and Managerial Problems
5. The 15-years Great Reform in HE since 1990s
   Why so FAST?

The First National University in Japan

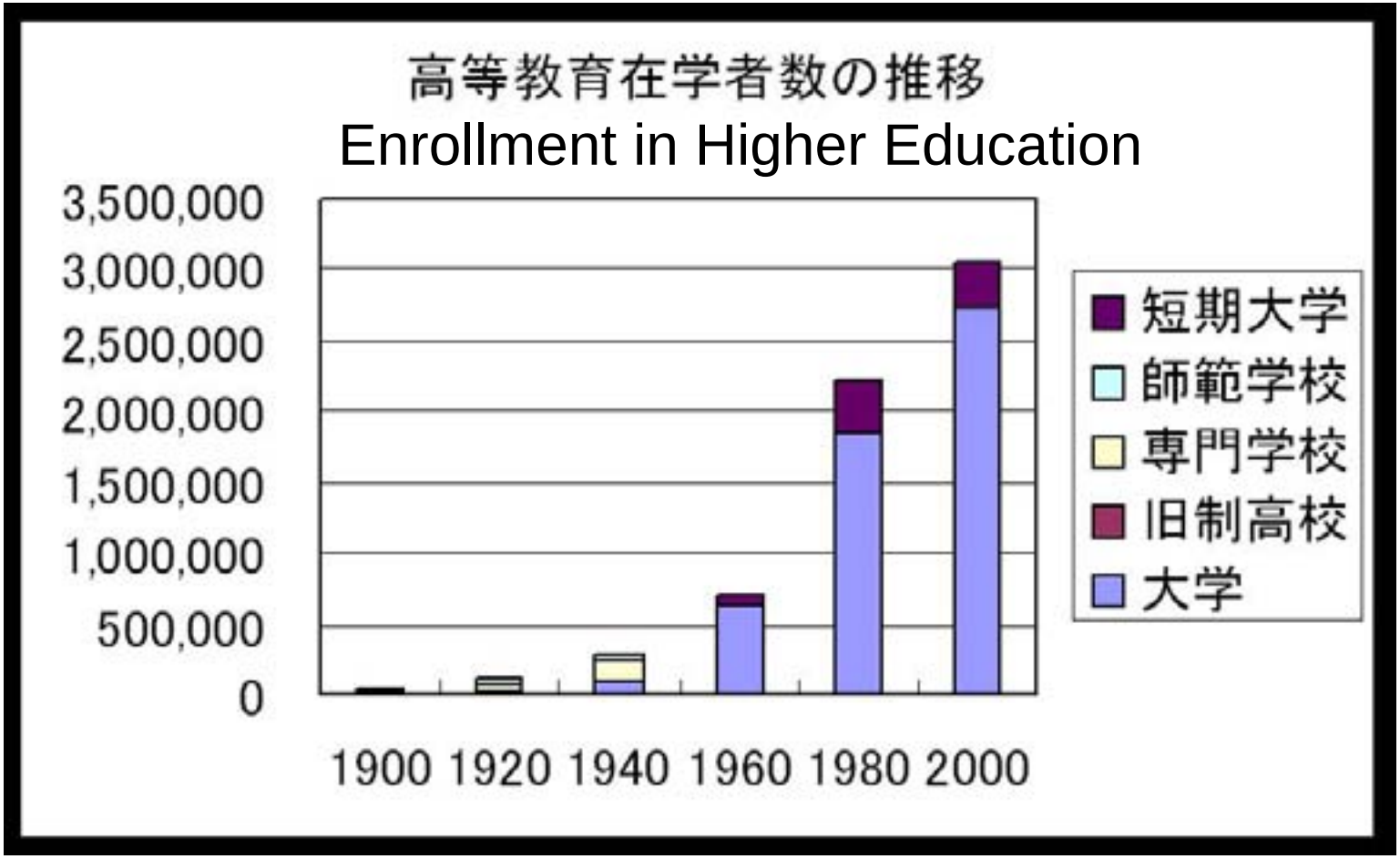
1877 University of Tokyo

↓

1886 The Imperial University (in Tokyo)

Responding to the National Mission
to introduce advanced research
and
to train future elite for the state

Expansion of Higher Education



Current Higher Education in Japan

4-years Universities and Colleges (2007)

	Institutions	Enrolment
Total	756	2,826,635
National	87	627,401
Local Public	89	129,592
Private	580	2,071,642

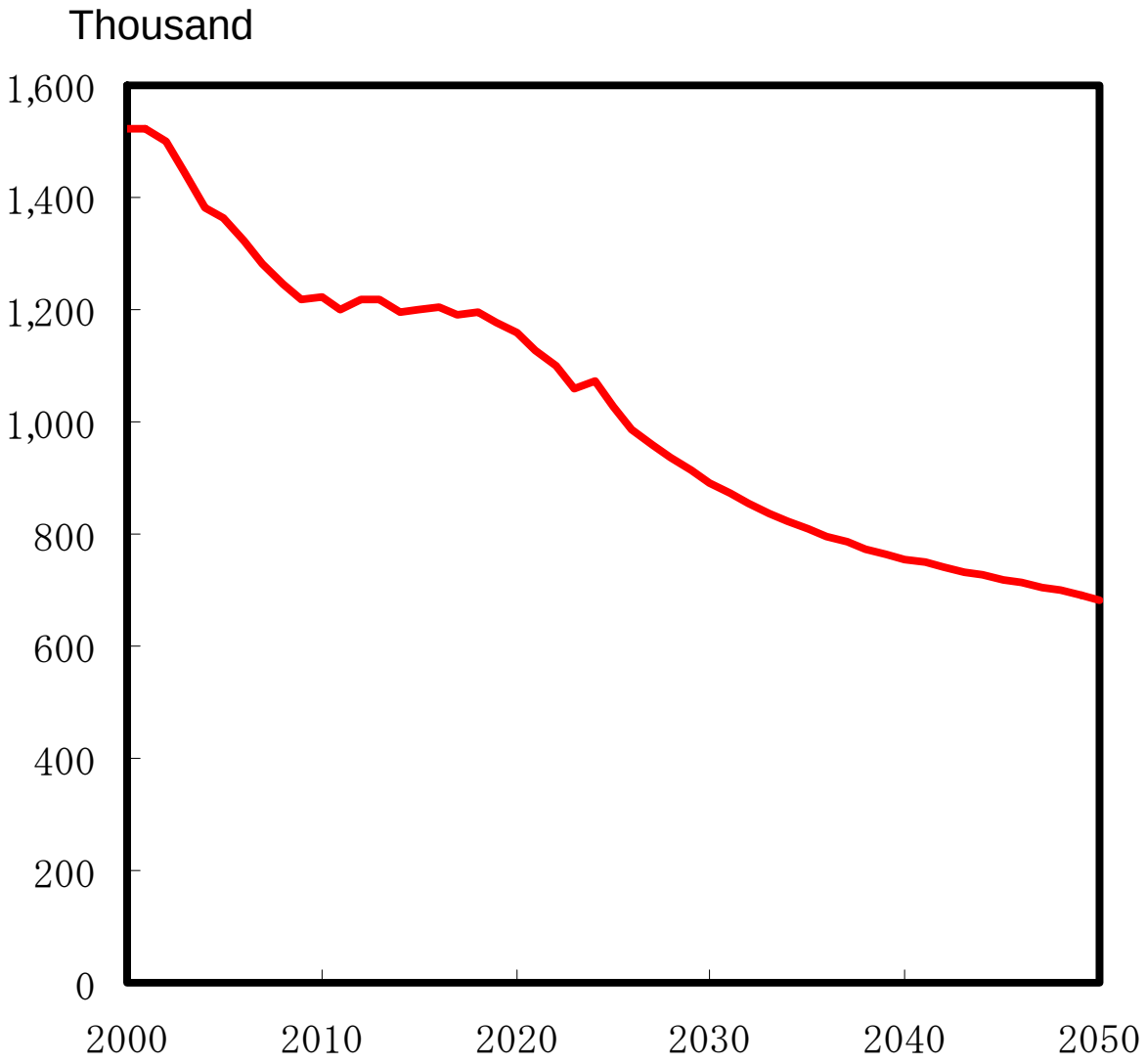
Distribution of Enrolment per 1,000 students in 2005

		Humanities	SocialSc	Science	Engineering	Medical	Education	Others
Undergrad	Public	17	37	13	53	24	25	22
	Private	120	283	17	*93*	39	23	82
Master	Public	2	2	4	15	2	3	6
	Private	3	5	1	7	1	1	3
Doctor	Public	1	1	2	4	6	0	4
	Private	1	1	0	1	2	0	1
JuniorC	Public	*1*	*1*		0	*1*	0	*1*
	Private	*9*	*8*		*3*	*5*	21	*22*

Humanities and social sciences are major field of study for undergraduate level

Graduate enrolment is relatively small especially in doctoral programs

Decline in 18-year-old Population



The 15-years Reform since 1991

1. The Cold War Ended
2. The Bubble Economy Collapsed
3. 18-year-old Population Declining
4. Science and Technology Gain Priority
5. HE Becomes More Globalized

All Factors Demand University Reform

Changing Environment around Universities and Colleges

1. 1960s and 1970s

   Massification 10% → 40%

   Campus Dispute → New Univ.

   Increasing Role of Private Univ.

2. 1970s and 80s

   Discussion of University Reform

3. 1990s ～

   Rapid Execution of University Reform

   15-years Great Reform

Reform Measures in the 1990s

- **Deregulation**
  - Curriculum and Management
  - Diversification of HE System
- **Accountability**
  - University Evaluation and Accreditation
  - Information Disclosure
- **Competition**
  - for Resources (Research Grant and others)
  - for Students (18-year-old population)

To improve university education

- The Ministry of Education Japan started a new funding program in 2003. This program is called GP (Good Practice) and accepted each project is funded with 15 million JPN (about 125 thousand USD) annually (for 4 years). Applications from universities are evaluated by several kinds of review criteria, e.g., clearness of objective, effectiveness of teaching, quality of curriculum and so on.

National University Corporation

(**Newly Independent Administrative Institutions) continued**

- Independent Legal Status, not a branch of the government
- The President, appointed by the Minister, appoints vice presidents and other administrators including people from business and others
- Six-year Plan MUST be approved by the Minister of MEXT
- The result of six-year plan will be EVALUATED by the external panel located at the Ministry, which reflects next term’s resource allocation from the Ministry

National University Corporation

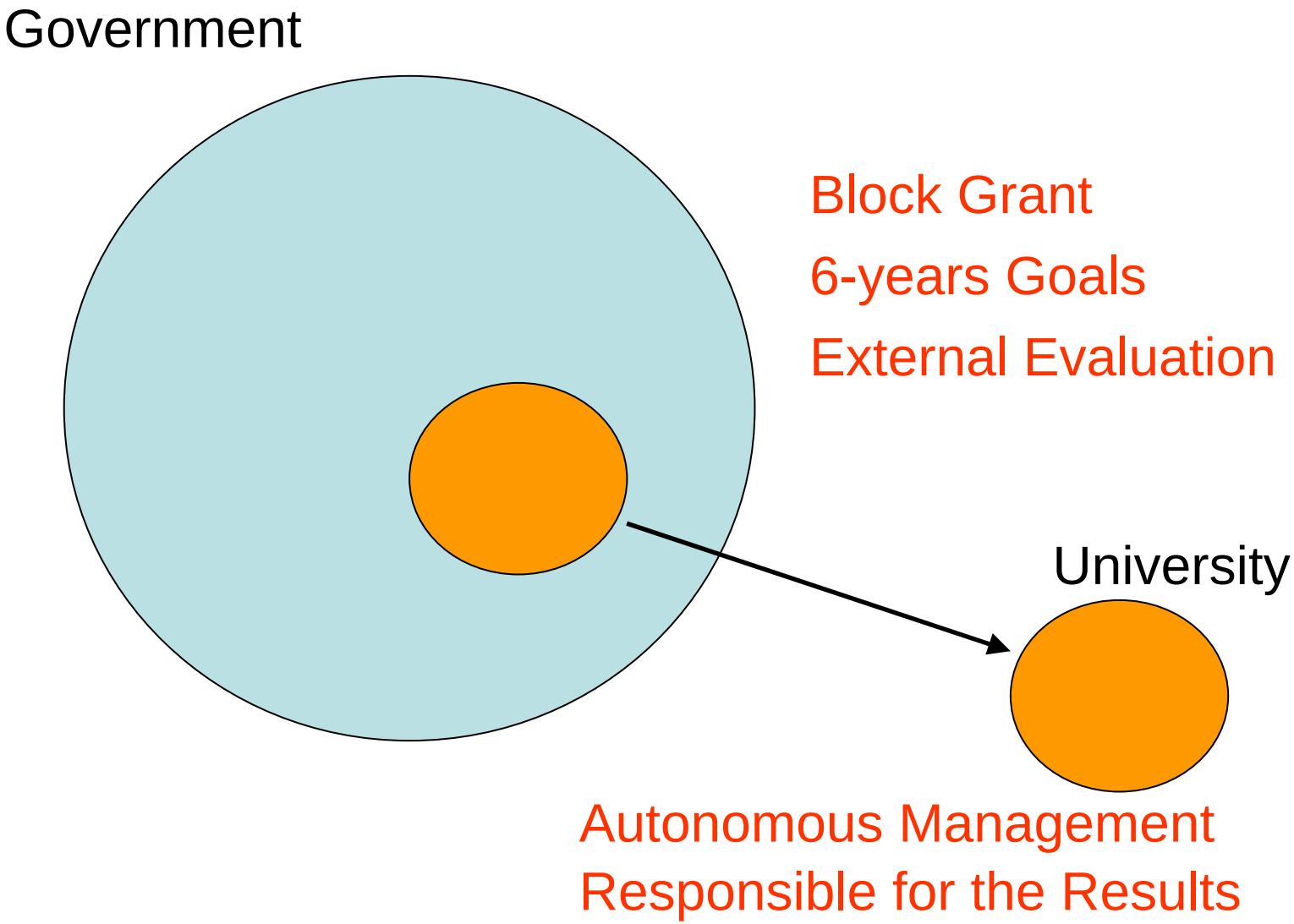
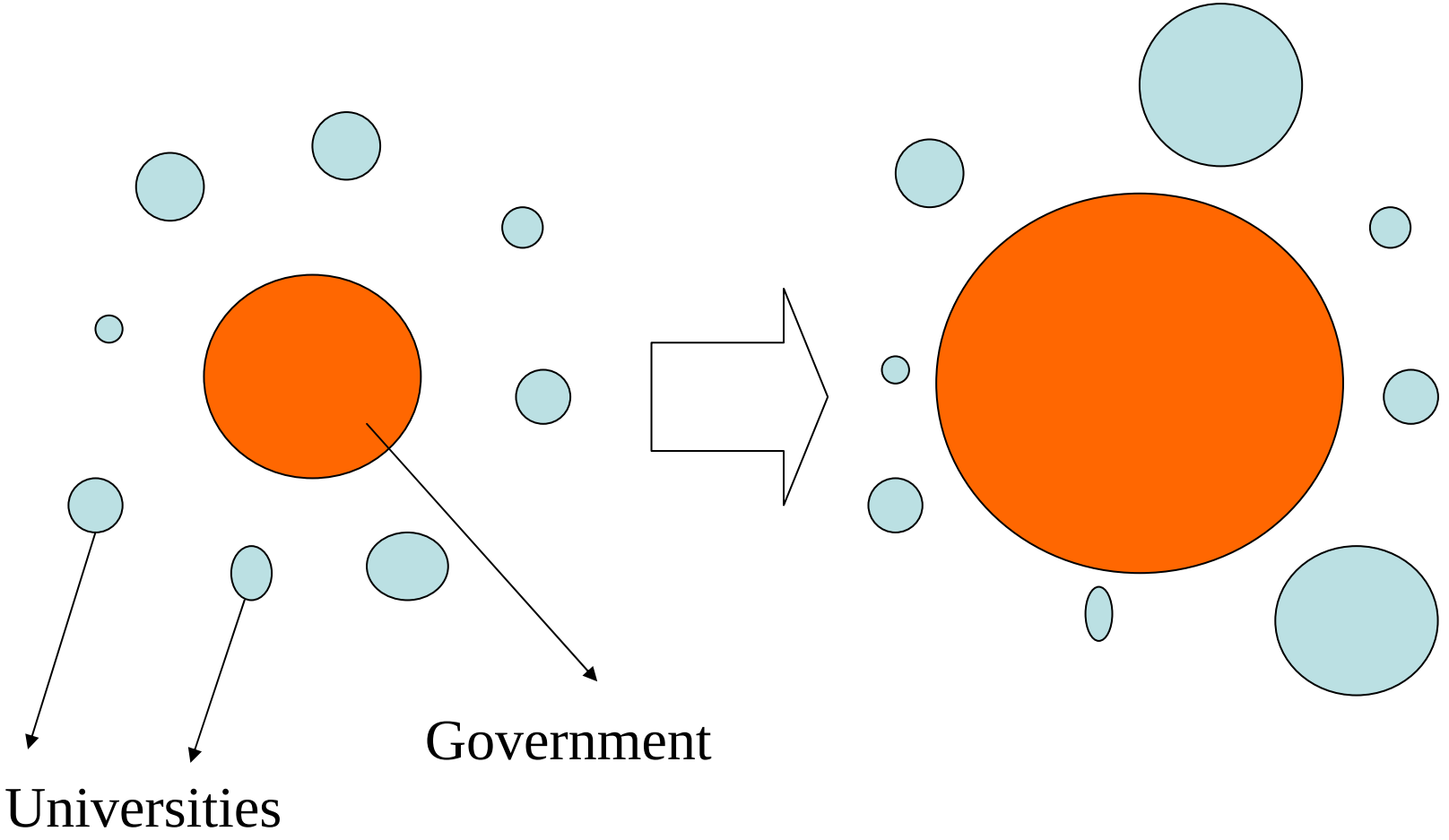


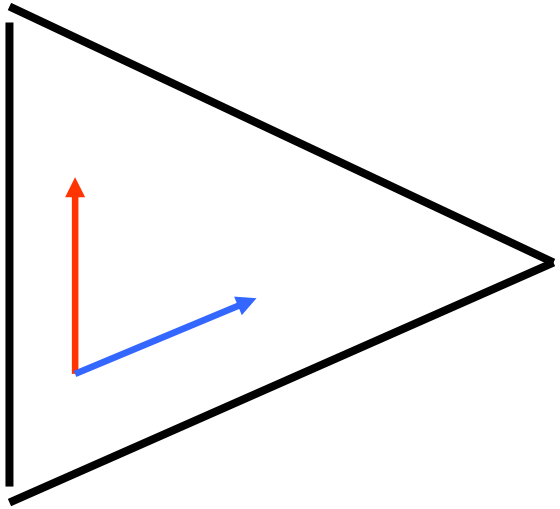
Image of Relation between Universities and Government



Government – University –Market Triangle

Inspiration from Burton Clark's Model

Government



Market

(general public)

Universities

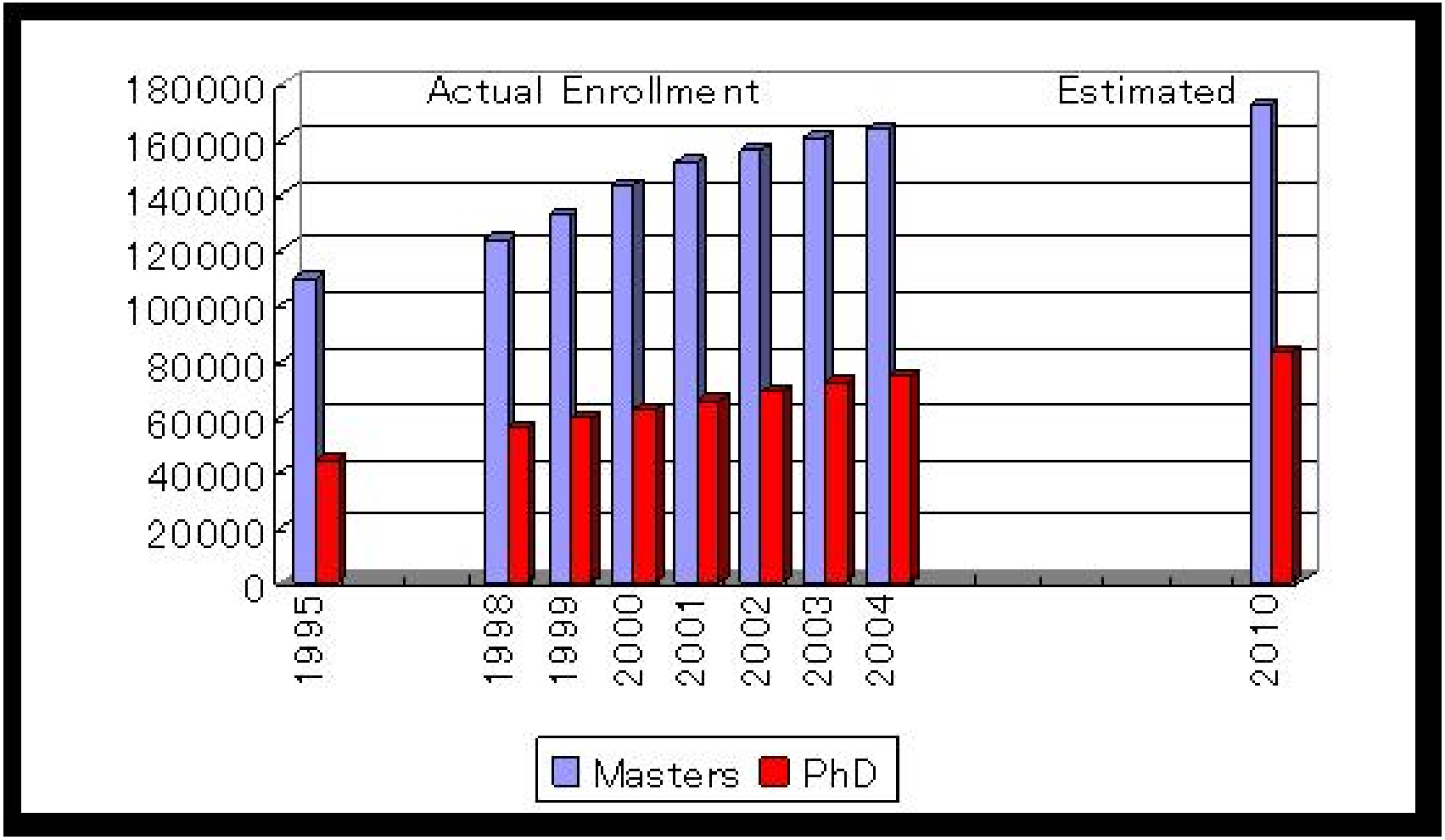
(academic oligarchy)

How much does a professor spend for research in 2004?

	Upper 10%	Median	Lower 10%
Humanities	5,000	1,100	330
SocialSc	5,000	1,200	400
Science	28,000	4,000	1,000
Engineering	27,200	5,200	1,300
Agriculture	2,000	5,100	1,300
Medical	46,200	9,250	1,800
Others	13,800	1,900	500

Source; Yamamoto's Survey (thousand JPN)

Foresight in 2010 and Actual Growth of Enrollment in Recent Years



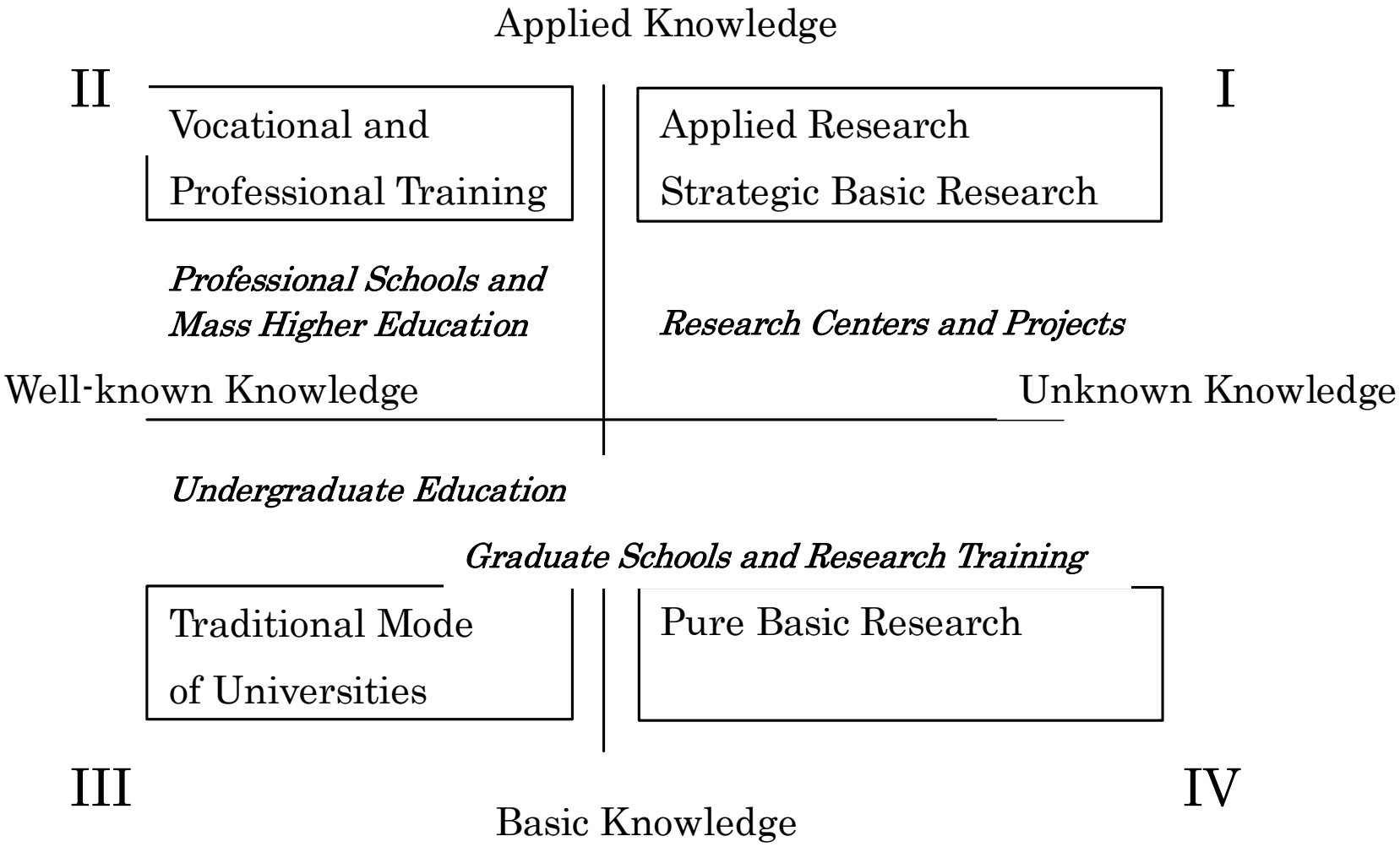
The Future of Japan and the Role of Universities

2001, The Association of National Universities

National Universities as the Knowledge Infrastructure

1. Creation of New Knowledge and Technology
2. Nurturing of Talented People
3. Guarantee of Equal Opportunity for Higher Education

Expansion of University Functions



What are the Rationale of UNIVERSITY REFORM?

Still left for Further Discussion

University Research in Transition
(Draft)

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(Abstract)

The issue of research activities in universities had not been seriously discussed in Japan before 1990s because people were more interested in so called "examination hell" problem at universities rather than research function of universities. In addition universities were regarded ivory towers in terms of research. Due to the various changes around higher education in 1990s, the research function of universities and other higher education institutions became one of the largest issues in higher education policy and management. It is not only in Japan but also in many other countries that universities have become involved in science system more than ever. I will discuss the reasons and analyses by using two axes in terms of knowledge, i.e., well-known vs. unknown, and basic vs. applied. Also discussed are priority setting of science policy, selective and competitive allocation of resources, and research training, all of which are important elements that compose science system of each country.

1. Introduction

Research is a very important function of universities because they contribute to the national economy and local community through creating knowledge as well as they do so through transmitting knowledge to the next generation (teaching) and through transferring it to the industry and others (servicing). Performing the most advanced research is one of the major indicators that show the institution is a research intensive university. Research intensive universities have led the higher education system in Japan as well as in the rest of the world since the beginning of the industrial revolution in the 19th century and after.

However, research function of universities had not been paid much attention by the general public until 1990s in Japan partly because the main concern of the people tended to be so called "examination hell problem" that meant universities and colleges at that time were very difficult to enter because of too many applicants for a few prestigious institutions. This

problem had been one of the biggest issues in the arena of education policy that should be solved. Another reason was that universities were regarded as "ivory towers" that should not be intervened by the society as well as by the government. Thus the research at universities should be performed without any relations with the rest of the society although there always were important exceptions like some good relationships between academia and industry in the field of engineering and medical research.

In this situation, people regarded the university system as a device of finding diligent youth, by its strict entrance exam, who might work hard for the industry after graduation rather than a place of teaching and learning. Thus people did not demand so much for university research and teaching. University management was a steady business because they could easily recruit new students every year without tough effort for improving their teaching.

Universities and colleges in Japan, however, have recently experienced a great change in their research activities as well as teaching, management and administration due to the impact of knowledge-based society. People's expectation and thus demand for university research and teaching become greater. The enactment of Basic Law for Science and Technology in 1995 and the initiation of Science and Technology Basic Plan in 1996 were an epoch making events for university research as well as for the development of science system in Japan.

Before discussing about the new relationship of universities and research, I will start with the brief history of Japanese higher education system.

2. The Role of Japanese Universities in the 19th and 20th Century

The first modern university in Japan was created by the government in 1877 as the national university. University of Tokyo, it was called so, was composed of several colleges and soon reorganized as the Imperial University in 1886. The mission of the Imperial University was to introduce the most advanced research from developed countries and to nourish talented students to be the elite for the state. It was set up as the highest ranked higher education institute because it was the only university in Japan. It was composed of 5 colleges and graduate schools; law, medicine, engineering, literature and science.

Later, the state added six more Imperial Universities, in Kyoto, Sendai, Fukuoka and so on. These institutions have led higher education system in Japan. Thus national universities tended to be regarded as prestigious

higher education institutions even today. Besides Imperial Universities, the state established other kinds of higher education institutions such as technical colleges, commercial colleges, medical colleges, normal schools, and so on.

Universities had not been allowed to establish by the local government and private sector until the reform in 1918. After that, the number of universities increased in number to be 46 in the 1940s. However, national universities continued to take initiative for advancing research as well as for nourishing talents.

After the War II, the higher education system in Japan was completely renewed. The most specific feature of the renewal was that all kinds of higher education institutions were integrated into a single system of four-year university. Thus the number of universities suddenly increased in the 1950s. National universities, however, were renewed according to the designated policy that only one national university should be established in a prefecture. Then many pre-war national higher education institutions, technical colleges and normal schools, in the same prefecture were merged to be a single new national university. This policy made national universities be more prestigious than private universities because of its small number and also because of its comprehensiveness.

During the 1950s and 60s, the national universities enjoyed its privileged position regarding research and services as well as teaching and training. People tended to prefer national universities when they advanced to higher education from the secondary schools. People regarded national universities as the important place for the students to get prestigious career after graduation. Thus, the admission of the national universities was highly selective and so called "Examination Hell," which meant that the entrance exam of national universities was so hard, was one of the most serious educational problems at that time.

National universities, as well as private universities, enjoyed strong university autonomy after the War II. This notion was led by another notion of "academic freedom." Academic freedom is regarded as a very important notion for promoting original knowledge and teaching, and thus the Constitution of Japan, at its Article 23, guarantees this right to the people.

School Education Law requires every university to have faculty meeting that consists of professors and other academics to discuss about important matters for the university. This regulation is so simple and the law does not define what kind of matters is "important." Actually, in many universities, a faculty meeting deals with very wide range of matters, not only academic matters but also administrative and financial matters. It was quite usual

that every decision making even managerial matters did not go ahead without approval of the faculty meeting. Faculties tended to regard faculty meetings as the place of final decision making and they thought even the presidents cannot make any decisions without approval of faculty meetings.

This may sounds very ridiculous but to some extent this power was quite real if we see the personnel matters of academics. The Special Law for Officials in charge of Education requires that recruitment, promotion and punishment of national and local public university professors must be executed after the approval of faculty meetings. This process is for job security for academics and also regarded as the guarantee of academic freedom in the national universities. However, this law has been seriously restricted the discretion of the president who should appoint academics.

The Ministry of Education and Science has tried to reduce the power of faculty meeting by clearly defining the role of it; it shall deal with academic matters, not managerial and administrative matters. The incorporation has changed the actual role of the faculty meeting and also academic senate. According to the Act of National University Corporation, the role of academic senate is restricted only to deal with academic matters and not managerial matters.

3. University Reform since 1990s

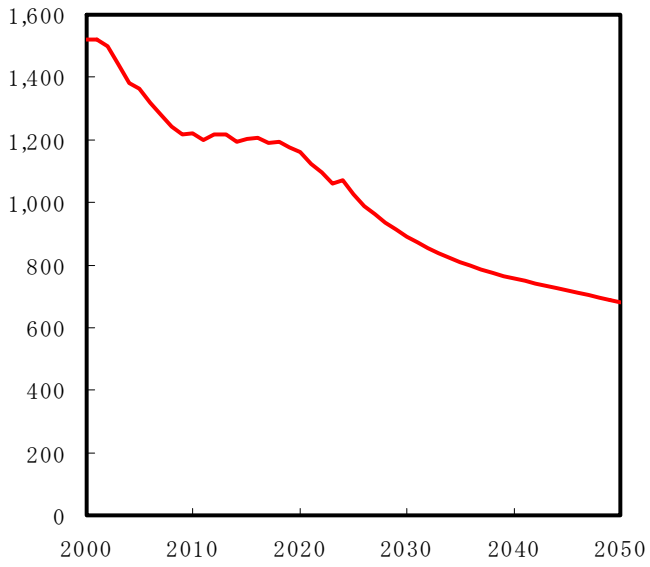
The 1990s was witnessed the decade of university reform in Japan. Various kinds of reform, such as governance, management, funding, student services, and curriculum, intended to make the university more accountable to the students, the funding agencies, and the general public, in contradiction to the traditional notion of university or faculty autonomy. It has been regarded that expanded, broadened higher education and the progress of scientific research have made the Japanese university system no longer fit to the new requirements of the people. The university reform mode has continued since then into the early 2000s.

Why has the reform advanced so fast? Some people, even in the Ministry of Education and Science, say that the reform has realized much faster than original expectation. The most important reason is that the universities have been situated in the competitive environment due to the sharp decline of 18-year-old population and also due to the growth of competitive resources provided by the government.

Regarding the 18-year-old population, it was about 2 million in 1992 but, due to the sharp decline, it will be 1.2 million in the 2010s. Furthermore it is estimated to be only 0.7 million in the middle of 21st century according to

the published data of the Ministry of Welfare and Labor. This causes difficulty in recruiting new students in many private universities and colleges because they heavily depend on the youth population, unlike American and European universities where they accept many adult and part-time students. The competition for recruiting students forces universities to reform their system of teaching and research.

Chart 1　The Sharp Decline of 18-year-old Population



(Source) Ministry of Welfare and Labor, 2006

The second competition is for limited resources provided by the Ministry of Education and Science. Japanese universities, especially national ones, had enjoyed receiving uncompetitive block fund based on the number of faculties and students. The Ministry has changed its policy and various kinds of competitive fund have grown their share. The typical kinds of fund are COE (Center of Excellence for research) program and GP (Good Practice for improving teaching) program. Research grant provided by the Ministry has also grown much more than the block fund has so.

One of the important movement for research was “Graduate Programs Intensive,” or “Jutenka” in Japanese, which was initiated in early 1990s by the government as a policy that aimed at promotion of graduate (doctoral) programs at major national universities, made every national university think seriously of graduate programs. This policy intended to give national universities additional resources for the expansion of doctoral programs. Then most national universities shifted quickly their priority of

management from undergraduate programs toward graduate programs. They submitted budget request to the Ministry of Education and Science for creating new programs and/or for expanding existing programs. They said their graduate programs would be useful for training human resources that would work not only for academia but also industry and regional society.

Professors at universities that achieved the "Jutenka" were called as graduate professors rather than just professors at some departments or schools. A graduate professor became a symbol of higher status among academics. In addition to the symbolic merit, they enjoyed higher salaries and more resources. Moreover, in science and engineering area, professors did need manpower that helped greatly their research activities. According to my survey, academics in science and engineering prefer research associates and research assistants if they were given additional resources other than money. Their preference is very different from those in humanities and social sciences where they prefer time and books to manpower (Yamamoto, 2004-1)

Chart 2 Preference of Resource

What kind of resource do you need most?

	Humanities	Social sciences	Science	Engineering	Agriculture	Health	Others	Total
Time	42.2	39.3	30.5	26.7	26.2	16.8	35.7	30.8
Money (non-competitive)	13.0	14.3	12.1	13.2	16.7	20.4	14.0	13.8
Money (competitive)	3.5	3.5	4.0	4.5	6.0	8.4	4.1	4.5
Domestic travel	5.8	6.4	1.8	2.1	2.0	0.4	7.0	3.0
Oversea travel	8.8	11.8	3.8	2.9	2.1	0.4	9.4	4.8
Space	4.3	2.7	5.2	5.0	4.5	4.0	5.8	4.6
Facilitiesa	0.8	0.6	7.3	9.6	9.7	4.0	6.4	6.6
Books and Journals	10.6	9.3	2.7	0.8	0.9	1.3	2.9	3.6
Research Associates and Assistants	7.7	9.1	21.2	23.5	21.4	27.0	11.1	18.8
Technicians	1.1	0.6	7.0	6.2	5.9	10.2	1.2	5.1
Clerical Stuff	2.2	2.3	4.4	5.5	4.5	7.1	2.3	4.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source) Yamamoto, 2004-1

4. Incorporation of National Universities

Incorporation or "Hojin-ka" of national universities is one of the most important events that feature recent university reform in Japan in terms of research as well as management and teaching. The aim of incorporation is, according to the Ministry of Education and Science, to make national universities be more autonomous institutions by separating them from the main body of the government. The Ministry says that, by the incorporation,

national universities are expected to be more attractive and unique institutions and to perform the most advanced research and teaching. That means national universities should be more responsive to the various needs of the people and society.

The incorporation, however, is not only for university reform but also for administrative and financial reform of the Japanese government itself. This means that universities are expected to perform better research and teaching, while they should spend less money and staff. Thus the situation is quite complicated and the solution is not unique.

The concept of "incorporation" emerged in the 1990s as a tool for administrative and financial reform of the government structure and activities. Japanese government had often implemented reforms by reducing the number of officials who worked for the government. The incorporation was something new because it did not directly aim at reducing the number of officials but it aimed at reducing the role of the government.

The General Law of Administrative Corporations enacted in 1999 states that administrative corporations will deal with public matters that need not be carried out by the government itself, but that are also not expected to be carried out by the private sector. By letting the corporations perform their work by their own responsibility, it is expected that the work will be done more effectively, i.e. more work with less resources. To enforce effectiveness, the government shall set up mid-term (usually five years) goals that the corporation must attain and the corporation set up mid-term plan of the work that should be approved by the government.

Since the national university corporation is a kind of administrative corporation, national universities are expected to be more responsible to the general public. Some critics say that this scheme aims at reducing money that has to date been granted to universities. Although this may be true to some extent, the real aim is the clarification of responsibility of university activity. To do so, the government has introduced the following; (1) each university have its six-year action plan, such as improving the quality of teaching, performing more research activities, reducing the number of employees and so on, that must be approved by the Minister of Education; (2) the results of the six-year plan must be evaluated by the panel within the Ministry; (3) external administrators must be involved in university governance; (4) so called "faculty autonomy" will be replaced by presidential initiatives, which means that the decision-making is not controlled by faculty meetings but by the presidents; and (5) the government will provide funds that may vary depending on the results of the Ministerial Reviews.

Although the university corporation scheme is not the privatization of

national universities, each institution compete with other institutions for the limited resources that is available for the national universities. University administration will change drastically from the past norm. This scheme has been implemented in April 2004.

By the incorporation, management of national university has been changed. Decision making is done by the executive director of the institution, i.e., the president. The president and the board of trustees have gained initiatives. Even before the incorporation, the power of the president had been described that the president deals with university administration and direct all the people who work at the institution. But it had not been realized until the incorporation was implemented.

4. Impacts of Incorporation on Universities

By the Incorporation, the national universities have gained some merits. Among them, decision making process is changed enormously. Before the incorporation, the main actors of the decision making were academic senate, faculty meeting and various kinds of committee composed of faculties both institutional wide and in each school and department. Decision making by a single person, including the president, a dean, and a director, was tended to be avoided. This meant that national universities before incorporation were managed without strong leadership of the president because many managerial matters were fixed by the national regulations or they must be approved by the faculties.

After incorporation, however, strong leadership of the president became indispensable. The basic scheme of the national university corporation is that it should be managed by the president and several trustees who are appointed by the president. There are two important meeting, academic senate and managerial council, but their main role is discussion and making advices not decision making.

On the other hand, the incorporation has caused demerits on the national universities. Although the incorporation gave national universities more autonomy of decision making than before but this was not entire autonomy. The autonomy, if it were given fully, the universities would make their managerial decision at their own will and it should be market that would control their management finally. However, the national universities cannot do that because there are many restrictions, financially and administratively, by the government. For example, the amount of block fund for universities in each year is based on some formula decided by the Government and each institution must follow the rule.

Each year the Ministry reduces the block fund by one percent for

efficient use of the money. If the corporation would like to recover the reduction, they must apply the competitive resources such as COE, GP and so on. Getting money from industry is also encouraged strongly by the Ministry.

Evaluation system by the panel within the Ministry is a strong tool for controlling national universities. It may be necessary for guaranteeing accountability to the general public, but it may reduce the autonomy of the national universities. If an institution cannot attain the six-year mid-term goal or does different activities that are not listed up on the goal, the institution may be punished by the Ministry in terms of resource allocation or even in terms of executive order by the Minister. This makes very delicate relationship between national universities and the Ministry of Education and Science in terms of university autonomy and accountability to the general public. Who should take direct responsibility to the general public; national universities or the Ministry?

5. Reform in Graduate Training

Graduate training has played a major role in university research. University Council made various kinds of recommendations on higher education policy in the 1990s. Among those, in 1998, the council made a recommendation titled "Universities in the 21st Century and their Reform." In this recommendation, the expansion of the role of graduate education was mentioned. As the background information, the recommendation made a foresight on the supply of and demands for graduate students, both in master's programs and doctoral programs. The result was as follows: in 2010, demand for graduate students with master's degrees will exceed slightly over supply (students who will complete the programs), while supply of doctoral students will exceed over demand for them. This foresight was based on the past 10-15 years' data of growing graduate enrollment and of growing demand for graduate students.

To do this foresight, the Ministry of Education and Science asked a research group, which is composed of several scholars of higher education research and economists, to study and foresight future demand and supply of graduate students. I myself was involved in this research as a member of the group. This study was done in 1997-98 funded by the Minisrty. The main issues of the study were 1) the trend of the enrollment of graduate programs, 2) the trend of job market for the graduate students, i.e., universities and other academic sector, and industry sector, 3) foresight of the enrollment of graduate programs in 2010, and 4) foresight of the demand for graduate students in 2010. The year of 2010 was regarded as an important year

because the 18-year-old population would continue to decline until that year and the enrollment would also continue to decline. The decline would cause serious problems on the higher education management and its system. Thus various kinds of systemic change will have to be done by that year. Graduate education system is no exception.

We analyzed the findings and foresight the future demand and supply of graduate students. The main figures is shown in the Chart 3. In addition to the figures that we focused, our analyses are as follows.

First, it would not be easy, in 2010, for the students to find their job at universities and colleges. Due to the decline of 18-year-old population, the academic job market is going to shrink. Our foresight was that the number of academic staff (professors and others on full-time base) would be 153,000 in 2010, while it was 158,000 in 1995. The new positions opened to the students would be only 2,300 to 2,500 annually.

Second, the job market at industrial sector would be the key role in terms of demand and supply of human resources. According to our foresight, in manufacturing industry, the demand for master's programs students would grow 1.5 - 1.7 times as large as in 1997. In service industry, the demand will become more. The demand for doctoral students would also grow in 2010 but supply would become more.

Chart 3 Foresights of Supply of and Demand for Students

	Supply of Studtens		Demand for Students	
	Case A	Case B	Case A	Case B
Master's Course	171,928	168,141	181,298	164,989
Doctoral Course	82,009	81,446	60,108	55,786
Total	253,937	249,587	241,406	220,775

(Source: Ushiogi et.al. 1988)
Case A is based on past 10 years' trend and Case B is based on past 15 years' trend.

However, we appealed that the foresight we made was mainly based on the past 10 to 15 years' trend observation and did not necessarily include the elements such as technology innovation, big educational reform for graduate schools and so on. Those are also important factors that would determine the future supply and demand of graduate students. Actually the growth of doctoral enrollment has been larger than our foresight. In 2004, the enrollment of doctoral programs is 73,446 and will be larger than 82,000 that we estimated in 2010 (Yamamoto, 2004-2).

It must be noted, however, the figures we showed are important signals that

policy makers and university people, both are important stakeholders in science system, should see and consider next step toward better science system in Japan.

In 2005, the National Council on Education (well-known as "Chu-kyo-shin" in Japanese), which is an advisory organ to the Minister of Education and Science, published its report on graduate education policy titled "Graduate Education in a New Ages toward the Formation of Internationally Attractive System" to enrich graduate programs in Japan. The council listed up four major functions of graduate education in Japan and suggested a way for the reform. These four ones are to train 1) researchers for R&D who are rich in creativity and imagination, 2) professionals with highly sophisticated skills, 3) academics with good teaching and research skills, and 4) highly talented people who play active role in the knowledge-based society. Among these, training researchers and academics are mainly for doctoral programs, while professionals and highly talented people are mainly for master's programs (MEXT, 2005-2).

Until late 1980s, the main stream for the reform of graduate education had been to secure professional education in the master's programs rather than to enrich research training in the doctoral programs. That was partly explained by the fact that even master's programs had tended to be regarded as preparatory stage to the doctoral programs and thus, in spite of growing demand for professionals, the main aim of the master's programs also tended to be academic research training. Another explanation was that most of the faculties had been trained at graduate schools and directly got the job at universities and thus they did not know much about training of people who would work for industry and so on. They therefore were not interested in teaching practical and professional matters.

For the improvement of this situation, the Ministry sometimes revised "The Graduate School Standard" and each university must follow this standard when they plan to establish and expand their graduate programs. By the revision of the standard, graduate schools today can open their programs in the evening, can enroll part-time students, can set their main aim to be professional education rather than research training, and can employ people, who have special and practical knowledge and skills, from non-academic sector like industry as their faculties.

The role of doctoral programs should be discussed as the human resource development not only for academia but also for industry and other sectors of the society. There are various kinds of demand for professionals due to the recent fundamental change of industrial structure and the advancement of globalization. One of the problems is that existing graduate

programs do not fully respond to those needs. If there are mismatches between supply of and demand for PhD students, the gap should be filled up by improving the quality and system of graduate education as well as making people in industry be aware of recent reform of graduate education in Japan.

In Japan, outside of the academia, PhDs are still regarded as a special kind of people whom employers are difficult to manage because the employers believe that PhDs tend to care about their specialty and thus are not flexible against changing environment of the businesses. Overcoming this belief and giving PhDs important roles, I think, are the solution that will respond to the new environment of globalization of the society. To do so, there are a lot of agenda remained that the government and universities should do.

6. The Future Perspective of University Research

Recently, OECD has published various reports and books which insist the importance of science and science system. The 2003 publication says that among the member countries the important reforms on their science system are 1) priority setting in science policy, 2) selective resource allocation, and 3) reform of research training. (OECD, 2003) These points are also applied to the situation of Japanese science system and university research.

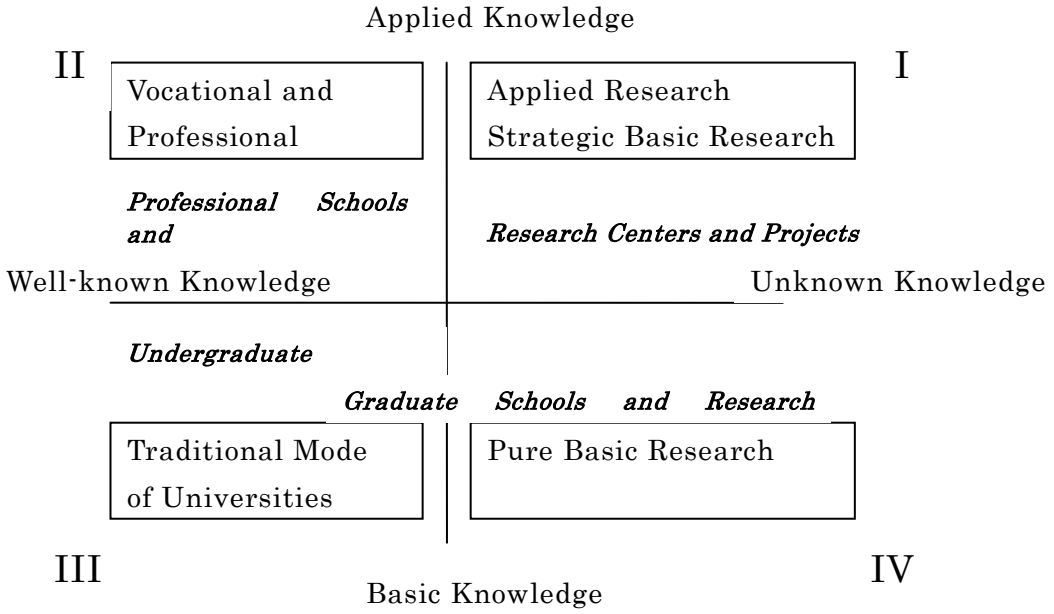
Looking at the environment surrounding universities, the role of universities has gained much more importance. Chart 4 shows growing or expanding role of higher education system in Japan. In this chart, knowledge is divided by two axes; well-known or unknown, and basic or applied. Since Japanese higher education system started late among major countries in the 19th century, the main role of universities was to introduce the most advanced research from overseas and to nourish talented students to be the elite for the state. This has made universities to deal with mainly the knowledge of well-known and basic mode. Japanese universities have been fit to this mode since their beginning and have not changed even in the massification of higher education and sophistication of science in the late 20th century.

However in reality, the research at universities has expanded greatly into the dimension of unknown and basic knowledge which means that Japanese leading universities compete with other leading universities around the world. In terms of teaching, universities have to respond to the massification and also advance of professional knowledge that leads universities to teach more vocational and professional contents, i.e.,

well-known and applied knowledge. Recent establishment of professional schools in law, business and management of technology is one example. Applied and unknown knowledge is the most recent matters that some universities must deal with. In this dimension, university-industry relationship catalyzed by the government is important. Life science and information technology are some example of this dimension.

Thus, the role of universities is expected to grow more in the knowledge based society in the 21st century. The national universities are expected to play leading role in this regard. Again, whether the incorporation of national universities will help this or not is the very critical matter for the future of national universities.

Chart 4 Driving Forces for Expansion of University Function



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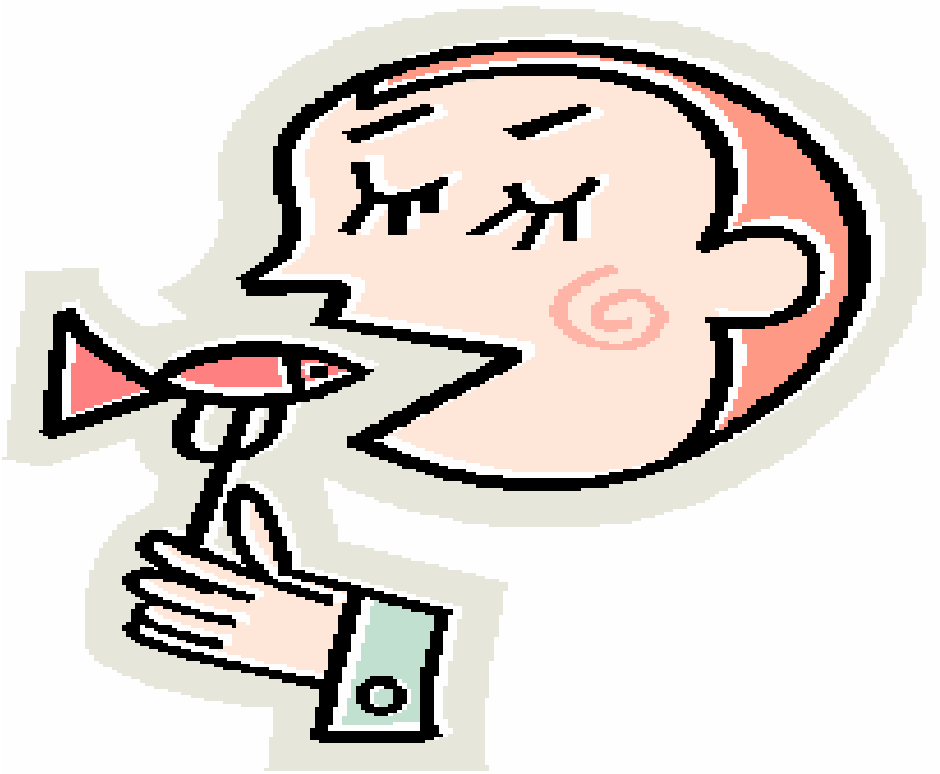
“Research on Research” for Innovation and Human and Social Development….

UNU/UNESCO Conference: August 2007

UNESCO Forum on Higher Education, Research and Knowledge

The Fable of the Fish: Fish to eat



Fishing skills

Fisheries: Managing,Repositioning, Innovating a National Industry

Meta-Focus on Research and Knowledge Systems

- Policy making
- Infrastructure
- Human resources
- Financing

Partnerships for Progress

- Long-term knowledge base and capacities

VS.

- Partnerships: immediate direct aid (Gates Foundation)

Where is Research Done in the World?

OECD countries: 90%

- In industry
- In the military
- In universities
- In research institutes

Developing countries :10%

- Mainly in universities

Key Issues: Wealth Creation, Innovation, the Labour Market

- R and D success stories: India, China, Brazil, South Africa, Republic of Korea, Chile, Singapore
- Annual Patent Production : less that 5 % are produced in developing countries
- SMEs: generate 70%+ of GNPs and jobs

Training a Skilled Workforce: % of Skilled Workers amongst Residents

- USA/Canada : 51%
- Australia/New Zealand : 32%
- Europe : 18%
- Asia : 6%
- Africa: 4%
- Sub-Saharan Africa: 2.8%

Intersectorality: Bringing the Disciplines Closer

- STI: High level knowledge/research in science
- Higher Education : where this knowledge is generated
- The Social/Human Sciences: understanding the socio-economic context
- .....with support from UIS/Statistics

Higher Education: Growth, Internationalization, the Brain Drain

- Tertiary students: 68 million in 1991 vs. 138 million in 2004
- 100% increase in West Asia, East Asia, LAC, Arab States.

- USA, UK, Germany, France, Australia: receive 66% of foreign students at tertiary level
- Per 10 tertiary students studying abroad: 4 Asian, 3 Europeans, 1 African.

- Africa: G8 $8 billion to strengthen HE and research in Africa
- Arab States:80% gaining PhDs in OECD countries remain abroad.

Who has the Monopoly on Advanced Knowledge/Research in Higher Education?

- 20 leading Research Universities in the entire world (Super RUs) – most in the USA

- Aspects: market niche, innovative governance, public/private partnerships, graduate schools, endowment funds for research and scholarships….

Research and Knowledge Management for Development

Teach a person to fish – feed them for life

BUT - there is a need for research, knowledge, management, marketing etc, otherwise …

Research and knowledge need management and marketing - science, engineering and technology are changing

- Little science: <1940s, policy for science
- Big science: 1950-1970, science in policy
- Technoscience:>1970s, innovation, foresight

Changing types of knowledge production

Mode 1: <1950/60

- disciplinary, continuous, research group, universities, national, government support

Mode 2: >1960/70

- interdisciplinary, discontinuous, networks, uni-commercial, international, govt/industry support

Also changes in research/knowledge goals

Policy Implications for SET, R&D, education

Implications for developing countries?

Innovation Systems

Knowledge and development

Developing countries - knowledge needs:

- social and economic development, poverty reduction
- technology transfer is problematic, “just add water”

Developing countries – issues and constraints:

- limited resources – SET, R&D, capacity, finance, university system, industry, innovation system

Need better understanding of knowledge change and promote integration of SETI in development policy and planning, PRSPs

Knowledge for development

Need to:

- strengthen policy, planning, resources, networking, applications for development and poverty reduction
- develop resource base **and** applications

This is the goal of the UNESCO Forum in the field of knowledge, innovation and development

To help people fish for knowledge

This of course takes place in a social context …

Research and the Social Sciences

Participatory and democratic, focusing on transnational processes to help understand:

- How the future which is shaped by science and technology shall actually work
- What kind of social and economic impact it will have
- How it will transform society

Knowledge and/for Policy

Policies should succeed thanks to:

- Relevant knowledge that is available to policy-makers, actually used, monitored and evaluated.

Evidence-based policy making implies:

- That knowledge be translated and constructively put to use in different contexts of application
- International, interdisciplinary research on cross-cutting themes serving as the basis for comparative analyses

From Knowledge to Policy

The MOST Programme and Knowledge Systems:

- Analyzing the research-policy interface(s)
- Designing knowledge transfer methodologies
- Fostering and disseminating international, interdisciplinary, cross-cutting research
- Networking high-level policy-makers

Forum's Knowledge Application

Serve target needs of Policy *AND* Research communities at once:

- Evidence research capacity, productivity, relevance and utility, as well as crucial and emerging issues
- Compare cases in context and assess the relevance of the options available
- Identify trends and causalities
- Link to other dynamics (social, health, urban…)