Public-Private Linkage in Biomedical Research in Japan: Lessons from the Experience in the 1990s

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1. Motivation

Important policy issues in Japan in the 21st century:

(1) competition policy,
(2) safety net,
(3) innovation policy (today's topic)

1. Motivation

Does public-private linkage in research work well in Japan ?

Not really…

The following issues are keys to enhance the performance of industry-university-government collaborative research

(1) efficient public funding scheme

(2) well-designed pro-patent policy

(3) high mobility of researchers

1. Motivation

Today's topics in detail

(1) Major legislative initiatives in Japan

(2) Government and university patenting in biotechnologies

(3) Mobility of Japanese researchers among industry, university, and government

2. Legislative Initiatives in Japan

After the enactment of the basic law on S&T, a wave of legislations took place encouraging collaborative research among industry, government, and university.

The Basic Law on Science and Technology (1995)
The Law on the Promotion of Technology Licensing by Universities (1998)
The Law on the Special Measures for Revitalizing Industrial Activities (1999)
The Council for Science and Technology Policy (CSTP) (2001)
Reorganization of the national research institutes into *independent administrative agencies* (IIA) (2001)
The Basic Law on Intellectual Property (2002)
The Law on National University Foundations (2003)

Table 1 Innovation Policy Initiatives in Japan

Year	Initiatives
1995	The Basic Law on Science and Technology
1996-2000	The First Basic Plan for Science and Technology
1998	The Law on the Promotion of Technology Licensing by Universities, etc.
1998	The Law on the Promotion of Research Exchange
1999	The Law on the Special Measures for Revitalizing Industrial Activities
1999	The Law on the Promotion of New Business Incubation
2000	The Law on the Enhancement of Industrial Technologies
2001	Reorganization of the national research institutes into independent administrative agencies (IIA)
2001	The Council for Science and Technology Policy (CSTP)
2001-2005	The Second Basic Plan for Science and Technology
2002	Biotechnology Strategic Scheme
2002	The Basic Law on Intellectual Property
2004	The Law on National University Foundations
2006-2010	The Third Basic Plan for Science and Technology

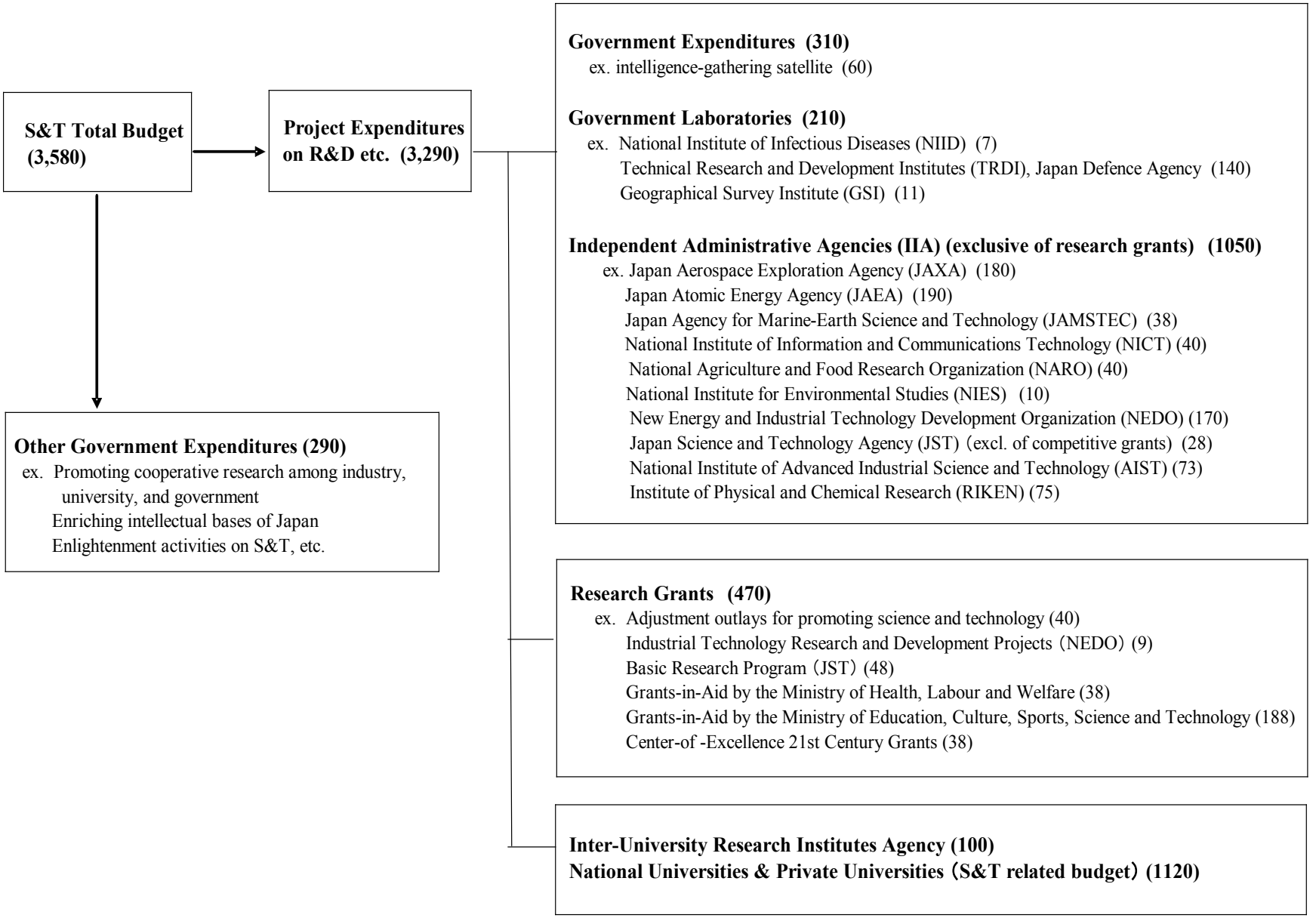
2. Legislative Initiatives in Japan

These policy measures make budget size larger and priority setting of public research fund more flexible.

Total budget is 3,580 billion yen in 2005.

Four prioritized research areas (life science, ICT, environmental science, and nanotechnologies & materials) account for almost 40% of the total public R&D expenditures.

Figure 1 National Expenditures on Science and Technology (S&T) in Japan, FY2005 (billion yen)



Source: *Reports on the Expert Panel on the Basic Policy*, Council for Science and Technology Policy (CSTP), Cabinet Office, 2005/2006.

Table 2 Public Expenditures on Science and Technology in Japan

(billion yen, fiscal year)

	2001	2002	2003	2004
Life Science	390.7	393.4	427.0	436.2
Information Technologies	166.3	175.8	169.6	175.8
Environment	84.7	100.6	109.9	117.5
Nano-technologies /Material	80.4	85.6	91.2	94.0
Energy (Nuclear Energy)	685.6 (370.9)	705.0 (338.3)	671.4 (340.6)	682.6 (302.9)
Manufacturing Technologies	23.2	16.4	19.8	20.3
Infrastructure	266.0	255.4	256.1	263.6
Frontiers (Space / Marine)	306.2	295.3	302.9	281.4
Subtotal (Top 4 Priorities)	722.1 (36.0%)	755.4 (37.3%)	797.7 (39.0%)	823.5 (39.4%)
Total	2003.1	2027.3	2047.9	2091.4

Data Source: The Council for Science and Technology Policy (CSTP)

Note: The above figures do not include the cross-disciplinary research and university research expenditures (around 1.5 trillion yen every year).

2. Legislative Initiatives in Japan

- Research grants constitutes 13% (470 billion yen) of total budget (35% in US).
- Unfortunately use of Japanese research grants are very restrictive (ex. rigid one-fiscal year budget constraint)
- Inflexible use of research grants induce university researchers to do informal collaboration with industry.

Table 3 Execution Proceedings of Representative Competitive Research Grants

		Japan	US	
Grants		Japan Society for the Promotion of Science (JSPS)	National Institutes of Health (NIH)	National Science Foundation (NSF)
Frequency of subscription		Once a year (adoption in April; fund allocation in June)	Three times a year (Feb, June, and Oct)	Year-round subscription
Account settlement		31 March in each year	End year of a project	
Carrying-over of research fund		Prohibited (rigid one fiscal-year budget constraint)	Completely free within a timeframe of research project	
Virement		Upperbound of 3 million yen or 30% of total grants in each fiscal year	No restriction	
Coverage of direct cost of grants	Personnel cost	Part-time employment expense for post-docs and graduate students (wage expense for core researchers is prohibited)	Wages for professors, core researchers, post-docs, technicians, graduate students, secretary, fringe benefits ets.	
	Travel expense	Core researchers only	Core researchers and graduate students	
	Others	facilities and equipment, expendables, printing, services, rewards, expenses for invited researchers	facilities and equipment, expendables, printing, services, rewards, expenses for invited researchers	

Source: *Reports on the Reform of Competitive Research Grants* (CSTP, 2002)

2. Legislative Initiatives in Japan

- TLO Act in 1998 and the Japanese Bayh-Dole Act in 1999 possibly encouraged the public sector to file patent.

- However, the licensing activity by TLOs has not been very impressive, as yet, in Japan.

Table 5 Technology Licensing Organization in Japan and the US

	Japan (FY2005)	US (FY2003)
TLOs	41	165
Patents	1226	7203
Licenses	626	3855
Revenue from licensing	2.9 billion yen	110 billion yen [a)]

a) Calculated by the exchange rate in 2003.

Data Source: CSTP (2005)

3. Government and University Patenting in Biotechnologies

- Japanese Bayh-Dole Act (1999) and other facilitating measures encourage public sector researchers to file patent, and applications filed jointly by private and public researchers have also increased since the late 90s.

- However government patenting is highly concentrated with few top government research institutes (JST, RIKEN, AIST, NARO, and NIAS).

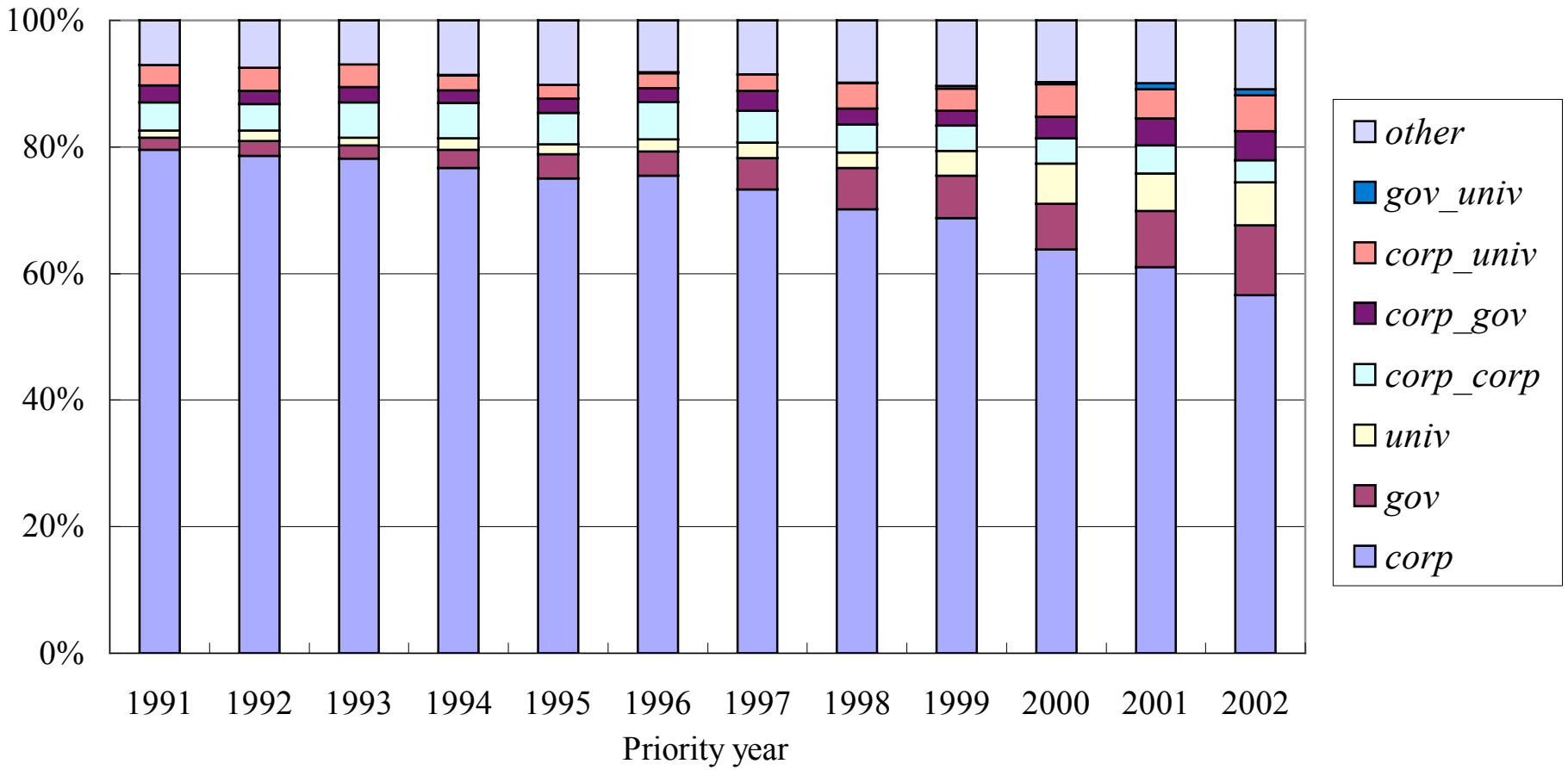
3. Government and University Patenting in Biotechnologies

Mowery and Sampat (2005):

> The efforts at emulation of the Bayh-Dole policy are likely to have modest success at best without greater attention to the underlying structural differences among the higher education systems.

> The emulated Bayh-Dole policies by OECD countries, including Japan, “ignore one of the central justifications for Bayh-Dole, i.e., that government ownership of publicly funded inventions impedes their commercialization.”

Figure 2 Biotechnology patent by assignee type (%)



Note: *corp* : corporations. *gov* : government research institutes. *univ* : university. *corp_gov* denotes patents filed by both corporations and government research institutes. *corp_univ* denotes patents filed by corporations and universities. *corp_corp* denotes the jointly filed patents by corporations. gov_univ denotes patents filed by government research institutes and universities.

Figure 3 Biomedical patents filed by the public sector (base year: 1991 = 100)

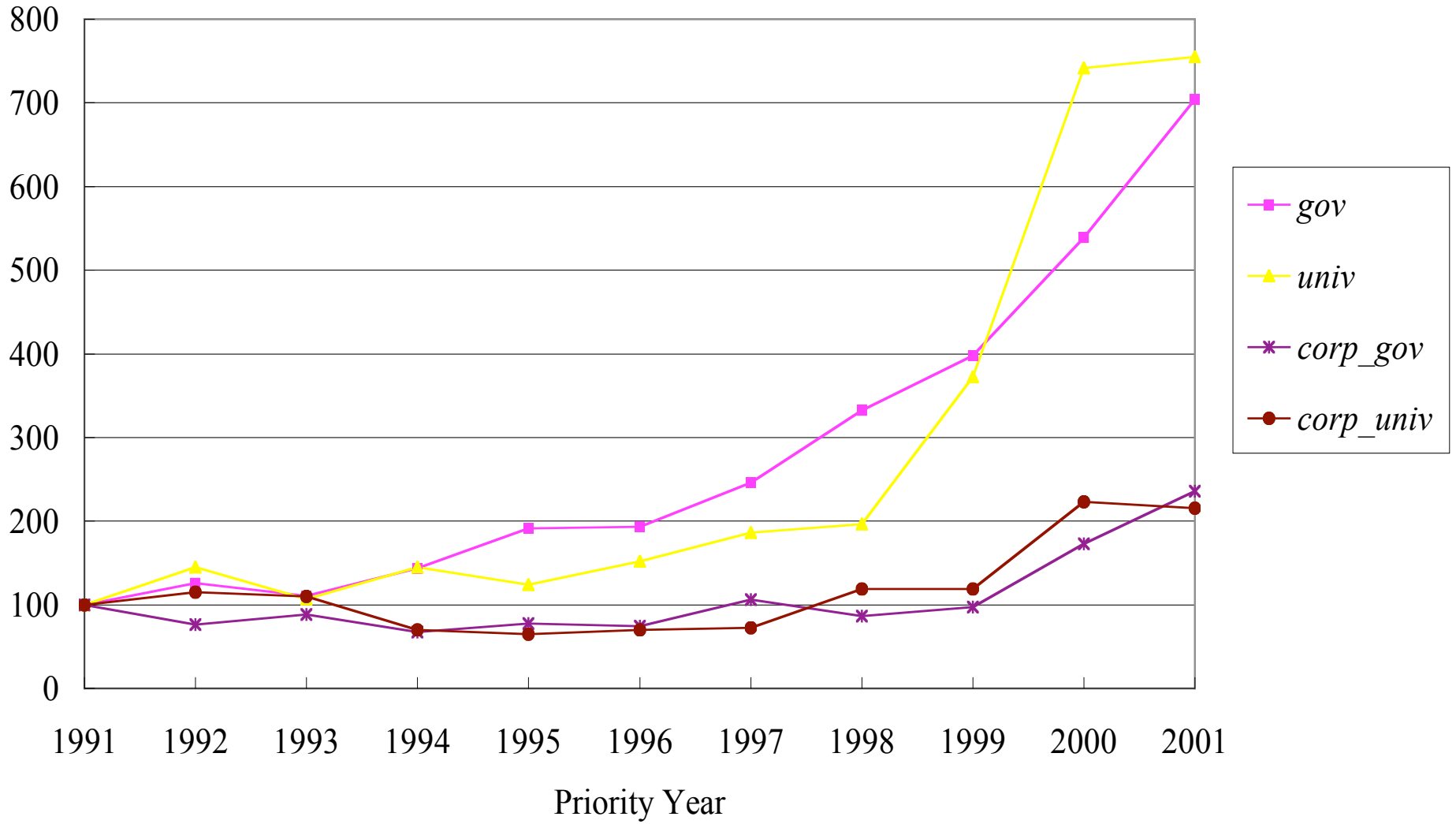


Table 4 Top 5 Government Research Institutes in Biotechnologies

Organization	Patent application	%	Top 3 (%)	Top 5 (%)
Japan Science and Technology Agency (JST)	676	25.1	56.7	70.4
National Institute of Advanced Industrial Science and Technology (AIST)	528	19.6		
The Institute of Physical and Chemical Research (RIKEN)	322	12.0		
National Agriculture and Bio-oriented Research Organization (NARO)	191	7.1		
The National Institute of Agrobiological Sciences (NIAS)	177	6.6		
Total	2692			

Note: These data are based on biotechnology patents whose priority years are from 1991 to 2001 and the priority country is Japan. The top 5 research institutes are defined by the order of the total number of patent application since 1991 through 2001 in biotechnologies.

3. Government and University Patenting in Biotechnologies

One of the most important points for public-private linkage is to reconciling the conflicting incentives for research between the two sectors.

public sector researchers

→ *open science*, *priority-first*

private sector researchers

→ *mission-oriented, appropriation*

3. Government and University Patenting in Biotechnologies

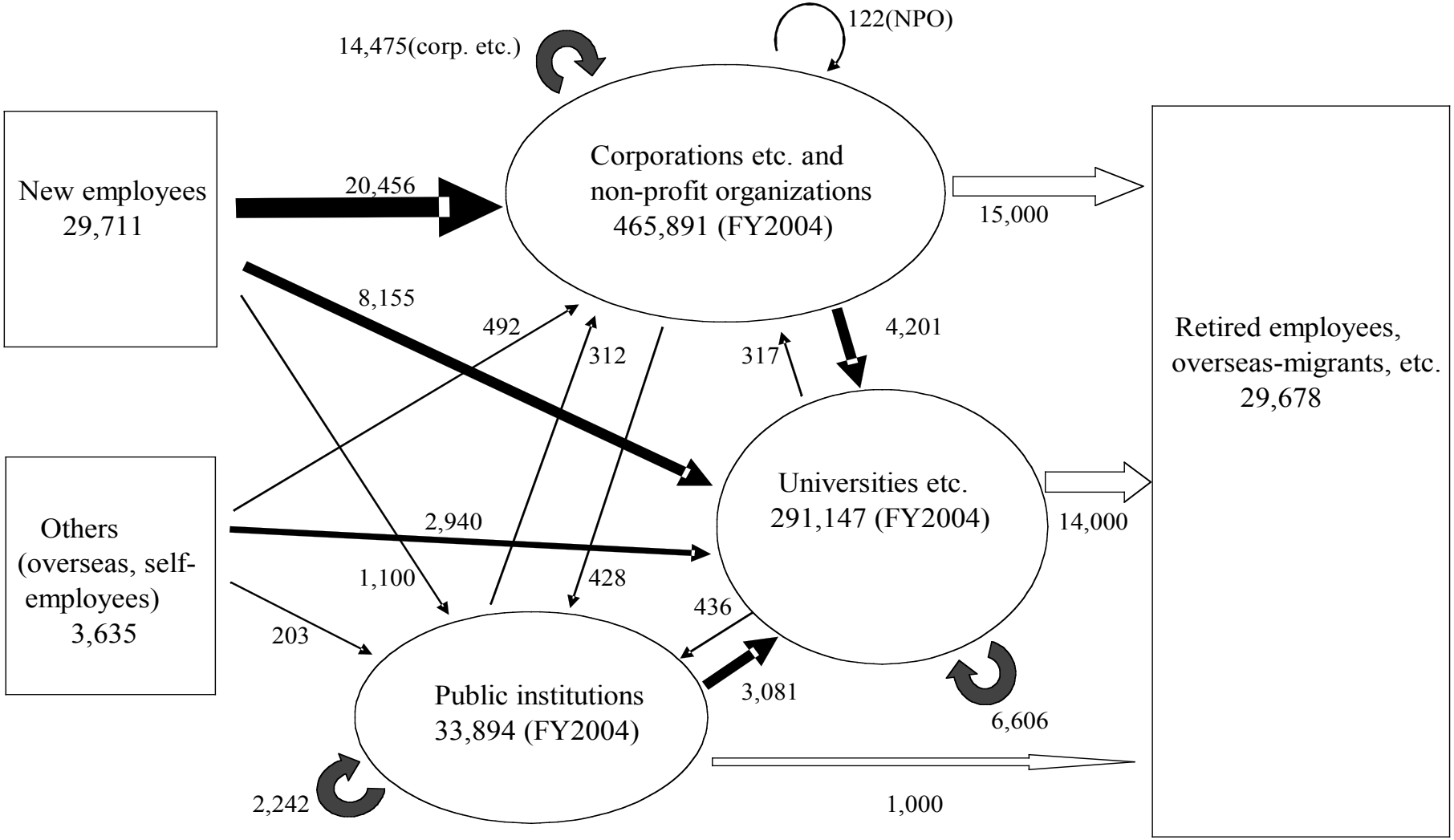
- The commercialization of government / university research would be hampered because of their commitment to create and sustain "*intellectual commons*" (Argyres and Liebeskind 1998) for the public at large.

- Informal free flow of knowledge between public and private sectors may be an important source of social benefit. Patenting may thereby inhibit diffusion of scientific knowledge, which has been christened the "*tragedy of anti-commons*" by Heller and Eisenberg (1998).

4. Low Mobility of Japanese Researchers

- There are almost 0.8 million researchers in Japan.
- one of salient characteristics of the Japanese researchers is their very inflexible career paths.
- There would be a lot of reasons for this rigidity, such as inflexible employment contract, immobile pension scheme, and seniority-based wage system.

Figure 5 Mobility of Researchers in Japan (FY2004)



New recruitments, 65,566; Retirants and out-migrants, 29,678
Total number of researchers, 790,932 (FY2004)

Data source: Bureau of Statistics, Ministry of Internal Affairs and Communications (complied by METI)

Source: *New Economic Growth Strategies 2006* (METI)

4. Mobility of Japanese Researchers

- The low mobility of researchers has possibly caused serious misunderstanding between public and private sectors regarding institutional missions, organizational features, and researchers' incentives.

- Furthermore, the Japanese public sector researchers are crusted with rigid office regulations and restrictive dual employment rules. Contrary to the US, Japanese university researchers have to abide by strict office regulations which are virtually similar to those for civil servants.

6. Concluding Remarks

- Producing and transmitting scientific knowledge can take a wide variety of forms depending on research areas, organizations, participants, and many other factors.

- Efficient public funding scheme, well-designed pro-patent policy, and high mobility of researchers are keys to improve public-private linkage in Japan.