Changing National Innovation System of Japan?
From Large Firms to Network System

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Outline of Presentation

• What is National Innovation System? Characterizing Japanese System
• Growing external collaboration of R&D and econometric analysis
• Policy implications for network innovation model
National Innovation System?

IT infrastructure (internet etc.)
Labor market institutions
IPR policy

**KNOWLEDGE GENERATION AND DIFFUSION**

High Education Sector (universities, etc.)
Non-profit Research Institutions

Firm’s innovative capability and networks

Product market competition
Financial Market condition

*Innovation country performance*
Business Expenditure of R&D in Japan

- Toyota: 6%
- Matsushita: 5%
- Nissan: 3%
- Hitachi: 3%
- Toshiba: 3%
- NEC: 3%
- NTT: 3%
- Honda: 5%
- Sony: 4%
- Other top 30 firms: 19%
- Rest of firms: 44%
Japan’s national innovation system

**Compartment system by large company: Japan**

- **Internal R&D**
  - In-house technology development

- **Fixed compensation packages**
  - Flexible internal labor market

- **Introduction of foreign technology**
- **Establishment of intended product image**

- **R&D sector**
  - Personnel rotation
  - Manufacturing sector

- **Affiliates and other subcontracting companies**
  - Focus on manufacturing technology application development and establishment of information-sharing infrastructure within corporate group

- **Investors**
- **Labor market problems**
- **Finance market problems**
- **Venture companies**
- **Universities and national research institutes**
- **Technology market problems**
Changes in Large Firm Dominated System?: Possible Factors

- Intense innovation competition: globalization and catching up of Korea, Taiwan and China
- Necessity of innovation speed in order to appropriate rents from R&D
- Importance of scientific knowledge for industrial innovation: particularly the case for bio-pharmaceuticals
- Institutional changes in science sector: PRIs and national university reforms
RIETI’s Survey on R&D Collaboration

- Firm level survey on external R&D collaboration: business to business networks and university and industry linkages
- Data for 2003, 556 samples
- Survey items
  - Recent trend of external R&D collaboration and IPR licensing
  - Factors behind R&D collaboration decision
  - Managing the boundary of firm in R&D, internal R&D vs outsourcing
- Detail results are found as the following site
Japanese system is changing?
From RIETI survey

Collaboration with Large firms

Collaboration with small firms

Collaboration with universities
Factors behind R&D outsourcing

Reasons why increasing R&D collaboration

- Respond to intense R&D competition
- Upgrade own basic technology capability
- Cost reduction of R&D
- Needs to access to basic science
- Industry-science linkage
- Policy push for industry-science linkage
- Shortage of R&D fund by own
- Upgrading technology level of counterparts
- Success in past collaboration projects
- Important for technology standard
- Easy to access counterpart information
- Large firms
- Small firms
- Universities
- PRIs
Management of firm’s boundary in R&D
Motivation and underlining hypotheses for econometric analysis

• Factors behing external R&D collaboration
  – Intense innovation competition?
  – Increasing complexity of innovation and the role of scientific knowledge
  – Selection and concentration of R&D projects, but it needs wider technological scope

• UIC’s impacts on research and production productivity: greater impact for small firms
  – Less Not-Invented-Here Syndrome
  – Focusing on more concrete project (short term benefit) and greater pressure for commercialization
## Collaboration and R&D strategy

<table>
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<tr>
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<th>Large firms</th>
<th>SME and startups</th>
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<td></td>
<td>SME</td>
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<td>Shorter development lead time</td>
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<td>Reduce R&amp;D cost</td>
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<td>Reduce R&amp;D staffs</td>
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<td>Explore new technology seeds</td>
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<td>more R&amp;D for application and development project</td>
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<td>Improving basic technology capability</td>
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<td>Commercialization of tech seeds</td>
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## Research Productivity by Firm Age

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Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%
Implications for J-NIS

- Commercialization of new product
  - Large firm
    - Product development
  - Research Lab.
  - Scope of UIC

- Systemic barriers

- Scientific knowledge and fundamental science at universities and PRI's

- SMEs
- Start-ups

- Scope of UIC

- Close to the market
Synthesis and policy implications

- Growing trend of R&D external collaboration
- Reflecting firms’ R&D strategy for innovation speed and wider technological scope
- Research productivity is higher for young and small firms as compared to old and large firms
- The role of SMEs and start-ups for Japan’s NIS reform toward network type system
- SMEs and start-ups: facilitates system’s transformation. In addition, it may be beneficial for large firms to have strong high-tech startups
- Policies for facilitating network type NIS system are important, such as IPR, labor mobility, VC finance