

# RIETI-NISTEP Policy Symposium

## Open Innovation as a Key Driver of Japan's Industrial Competitiveness

Handout



### **NAGAOKA Sadao**

Program Director and Faculty Fellow, RIETI  
Visiting Research Fellow, NISTEP  
Professor, Tokyo Keizai University

August 21, 2015

Research Institute of Economy, Trade and Industry (RIETI)

<http://www.rieti.go.jp/en/index.html>

RIETI-NISTEP policy symposium

# Comments: from a US and Japan comparative perspective

Sadao Nagaoka

August 2015

Program Director for Technology and Innovation,  
RIETI

Visiting Research Fellow, NISTEP  
Professor, Tokyo Keizai University

# Innovation as combination

- Innovation as combination
  - knowledge creates knowledge
  - team production of knowledge
  - combinations between the technology and complementary assets (including risk capital)
- Market failures for combination?
  - high-externality from the new combinations
  - Human resources infrastructure
  - Coordination failure (e.g critical mass for start-up system)

# 1. Knowledge sources

- External knowledge sources are very important for suggesting R&D in both the US and Japan.

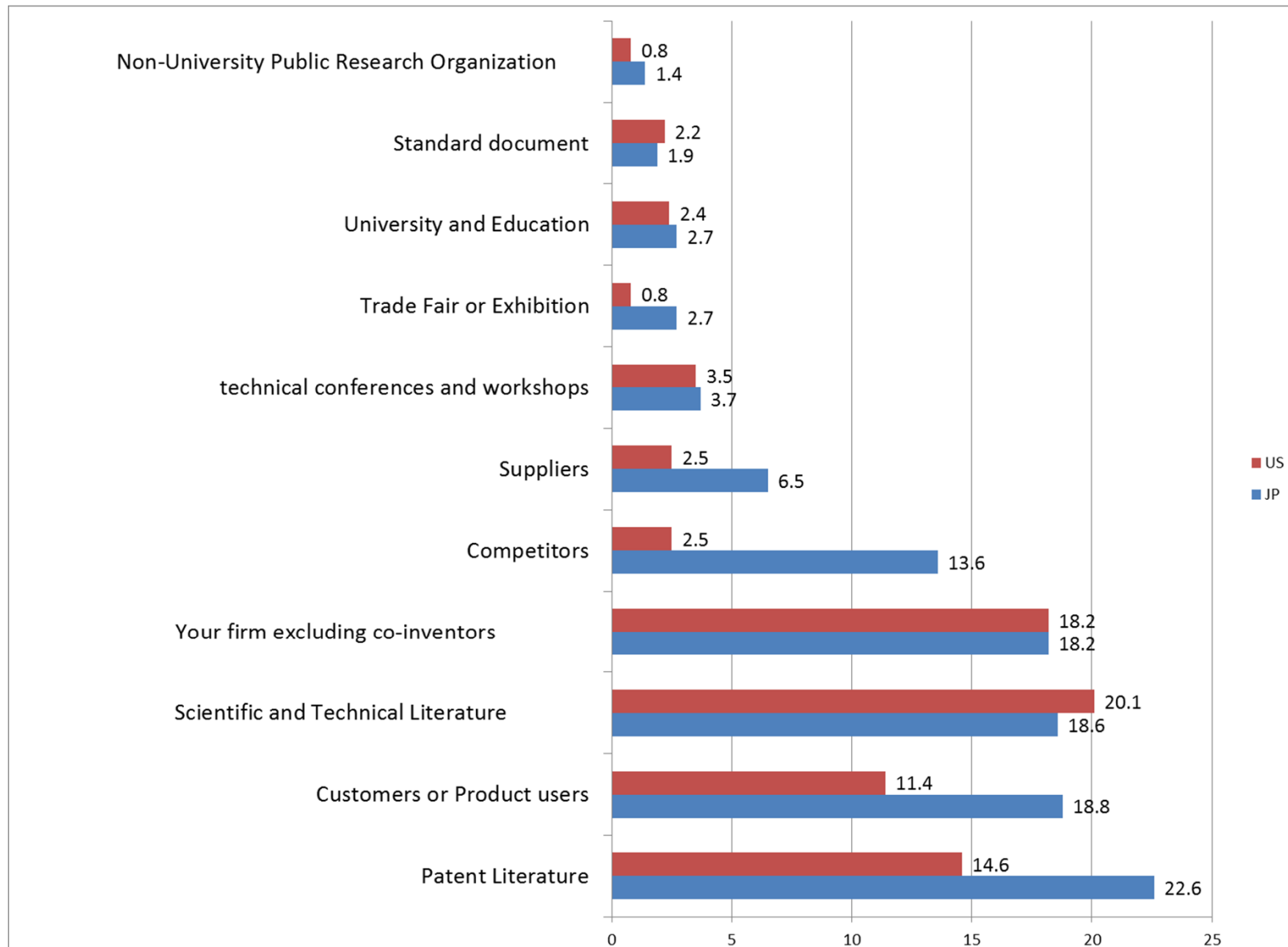
- Overall similar

four most important sources: science and technical literature, patent literature, users and internal

- Differences

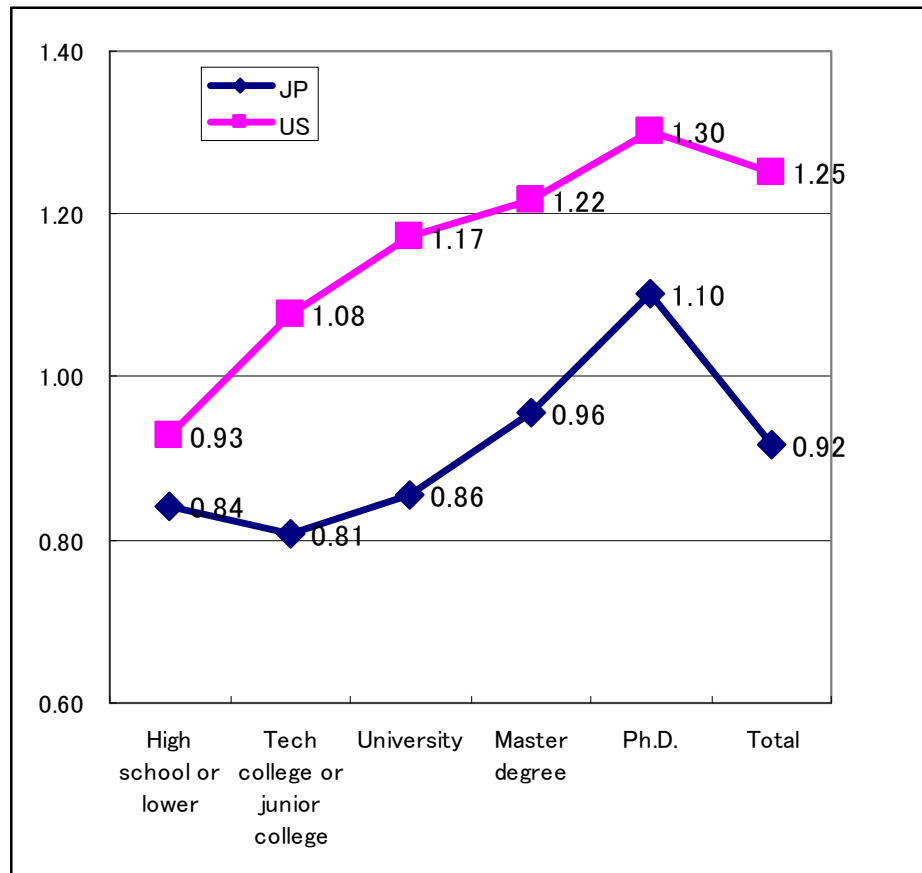
- US inventions are relatively more science based.
- Absorptive capability

Figure 1. Sources of knowledge for suggesting a R&D project (% , “very important”, US-JP common weight) )



(Source) Walsh and Nagaoka [2009a]

Figure 2. Relative importance of science literature as the knowledge source of an R&D yielding the patent (base: the importance of patent)



(Source )Walsh and Nagaoka [2009b]

# Table 1 Basic profiles of the surveyed inventors and their organizational affiliations

		trilateral patents		Europe
		Japan	US	
	Sample size	3,658	1,912	9,017
Academic background	University graduate (%)	85.9	93.7	76.9
	Doctorate (%)	12.4	45.3	26
	Female (%)	1.5	5.4	2.8
	Age (years old)	39.5	52.7	45.4
Organizational affiliation	Employed at large corporation (251 or more employees) (%)	87.8	81.1	70.6
	Employed at small or medium-sized corporation(%)	8.7	14.0	22.6
	Institutions of higher education(%)	2.3	2.2	3.2
	National research institutes or other government organs (%)	0.7	0.1	2.2
	Foundations and other organizations (%)	0.5	2.1	1.4
	self-employed and students	2.0		

Source: RIETI Inventor Survey (2007) for Japan, Europe's PatVal for EU (covering six countries: Germany, France, England, Italy, Spain, and the Netherlands). See Nagaoka and Walsh [2009a],

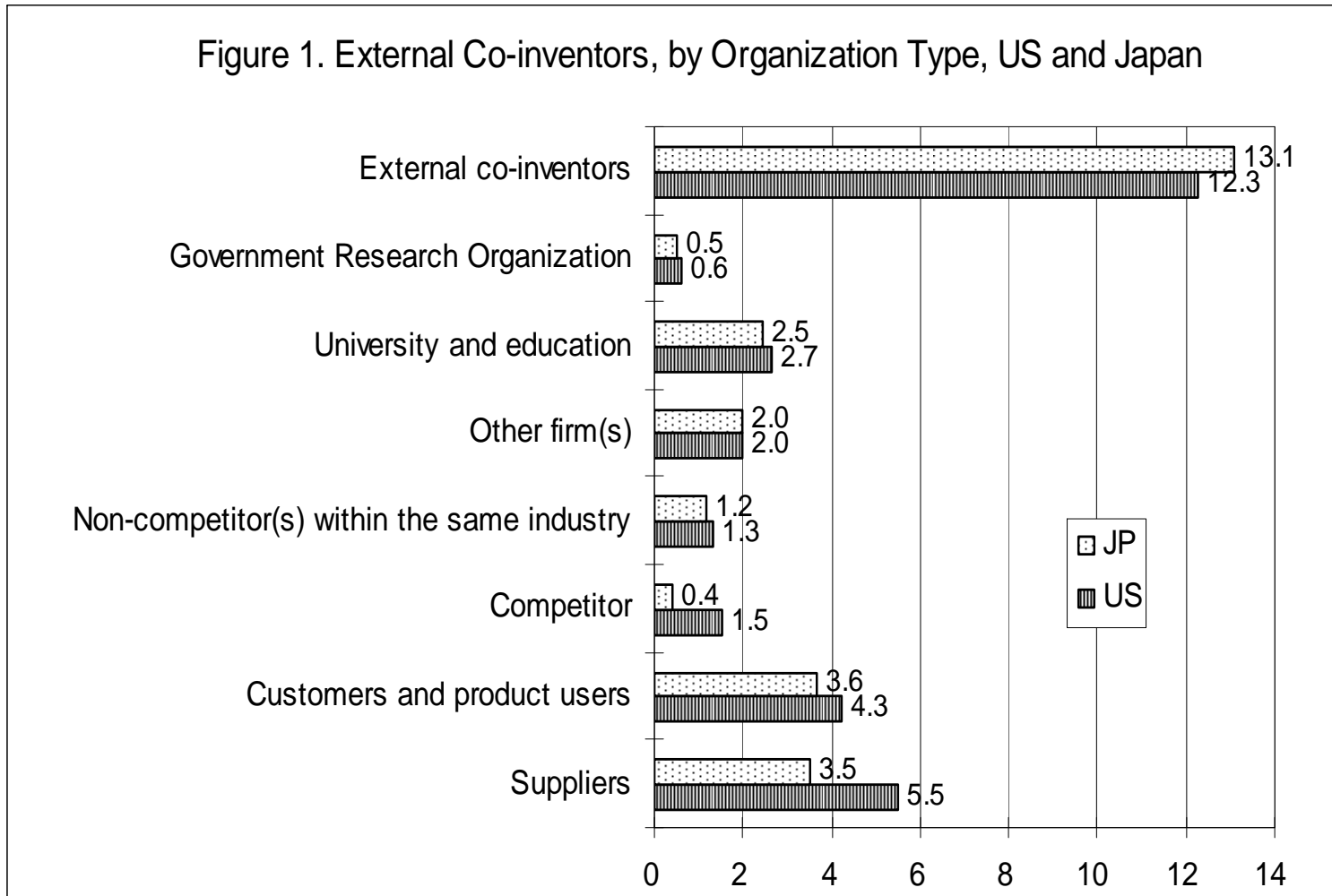
Note: Self-employed individuals can be affiliated with organizations.

## 2.Co-inventions and the collaborations

- Research collaborations across organizations are substantial in both countries:
  - Co-inventions with external co-inventors are significant (around 12%)
  - The other collaborations 20 to 30%.
- Similar level and structure in terms of the type of the partners
  - Co-inventions with a researcher in the University or PROs (3% +) and the other collaborations ( around 6% )exist at similar level for the two countries.
  - Vertical co-inventions with a supplier or with a customer are also similarly important.
- Major difference: Co-inventions across borders and with foreign born

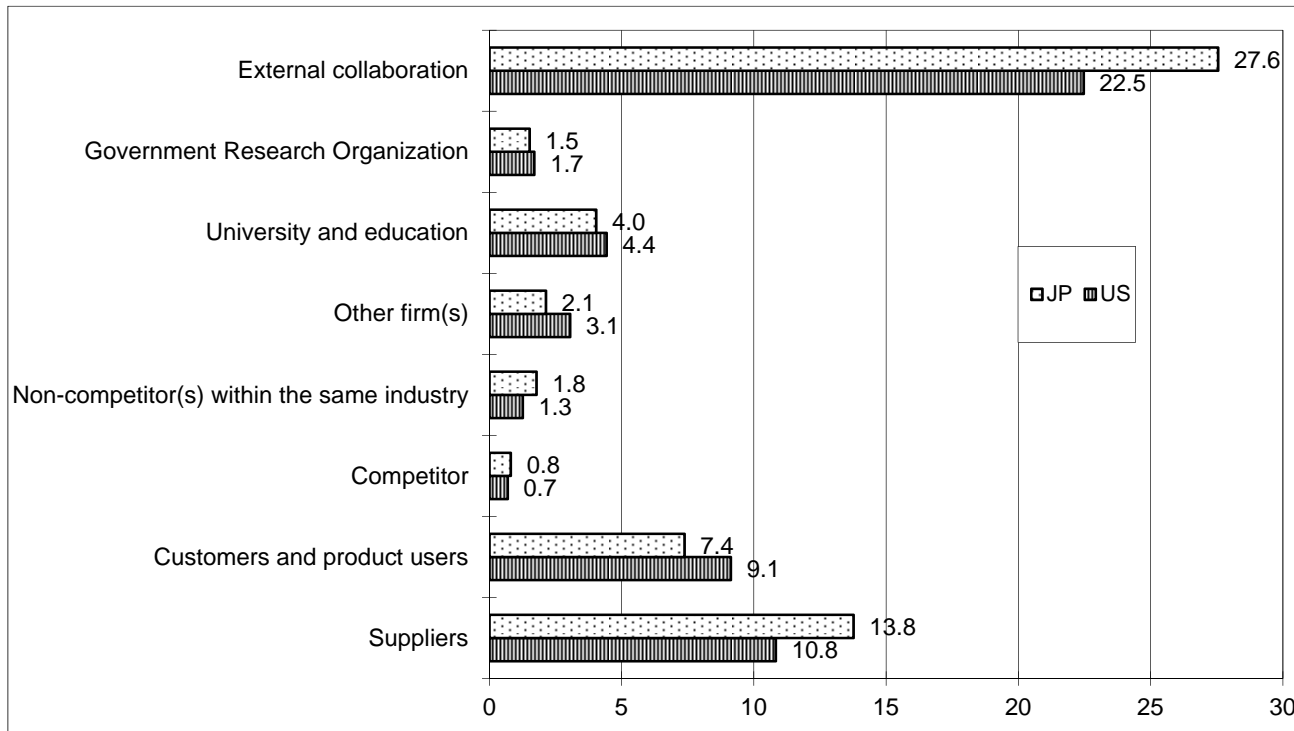


Figure 3. External Co-inventors by organization type, US and Japan (NBER weights)



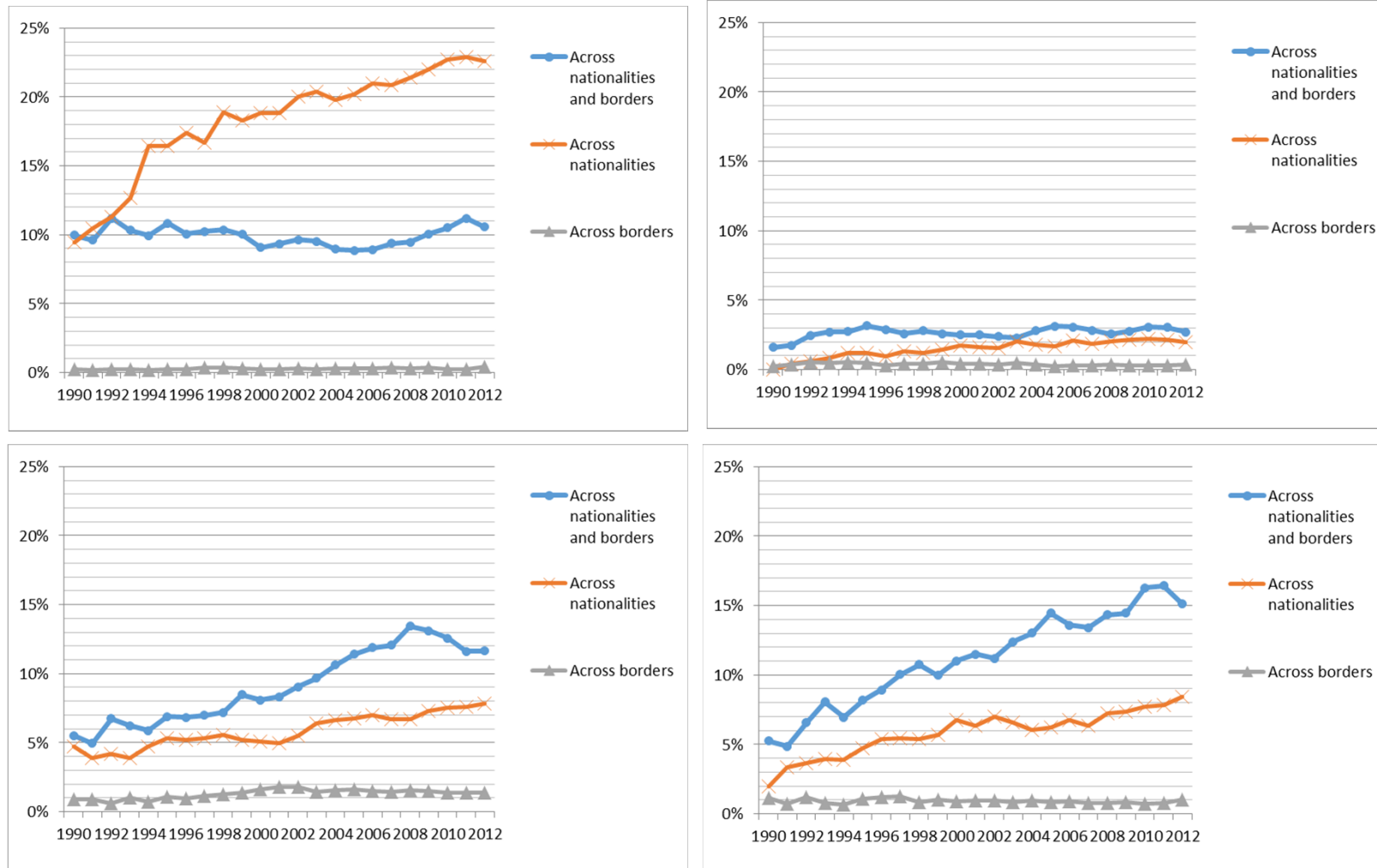
(Source) Walsh and Nagaoka [2009a]

Figure 4. Formal or Informal Collaboration with Outside Organizations, by Organization Type, US and Japan (NBER weight)



(Source) Walsh and Nagaoka [2009a]

# Figure 5. Co-inventions with foreign born and those with foreign residency (US, JP; DE, GB)

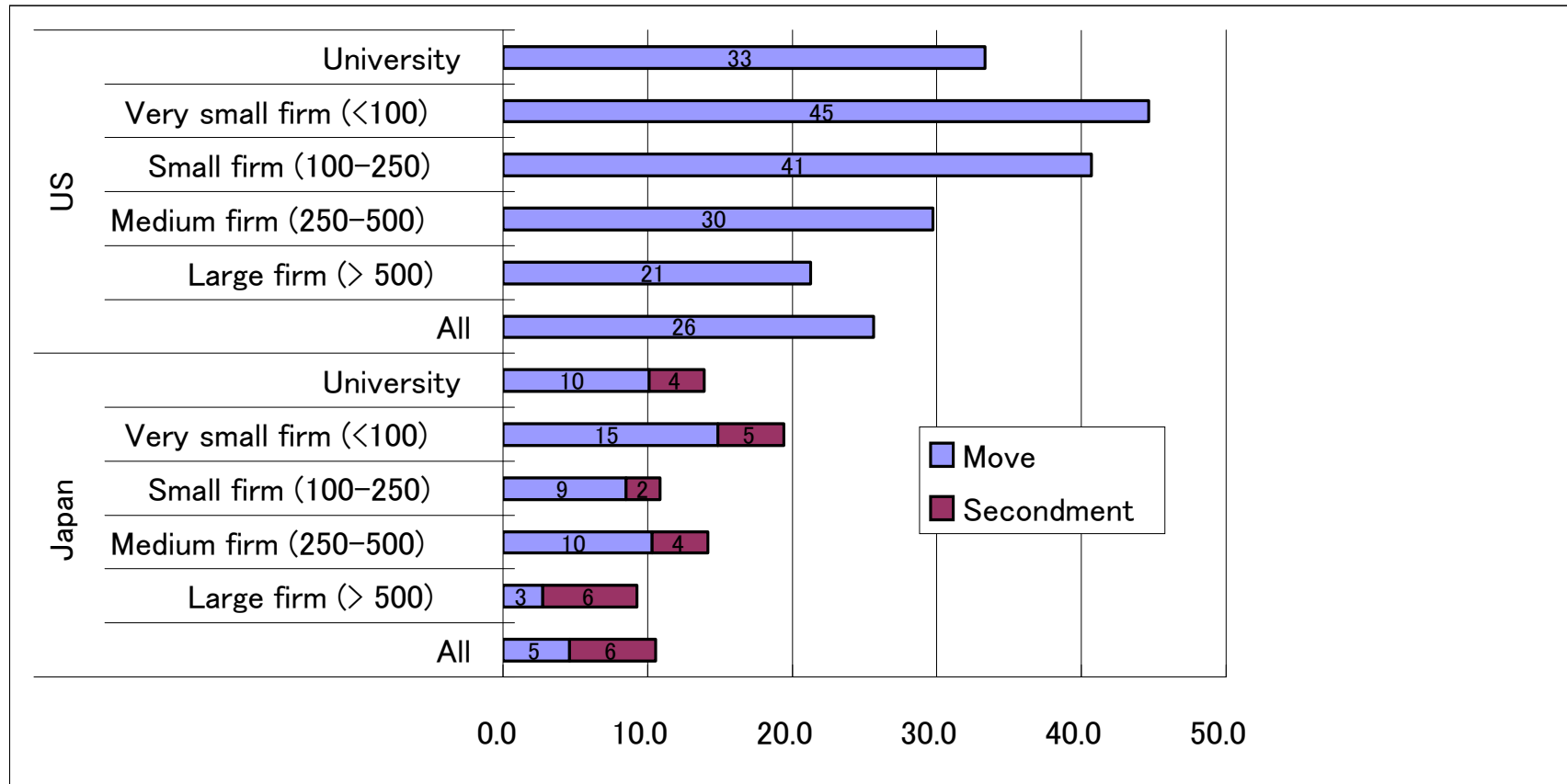


Tsukada and Nagaoka(2015)

# 3. Mobility and start-ups

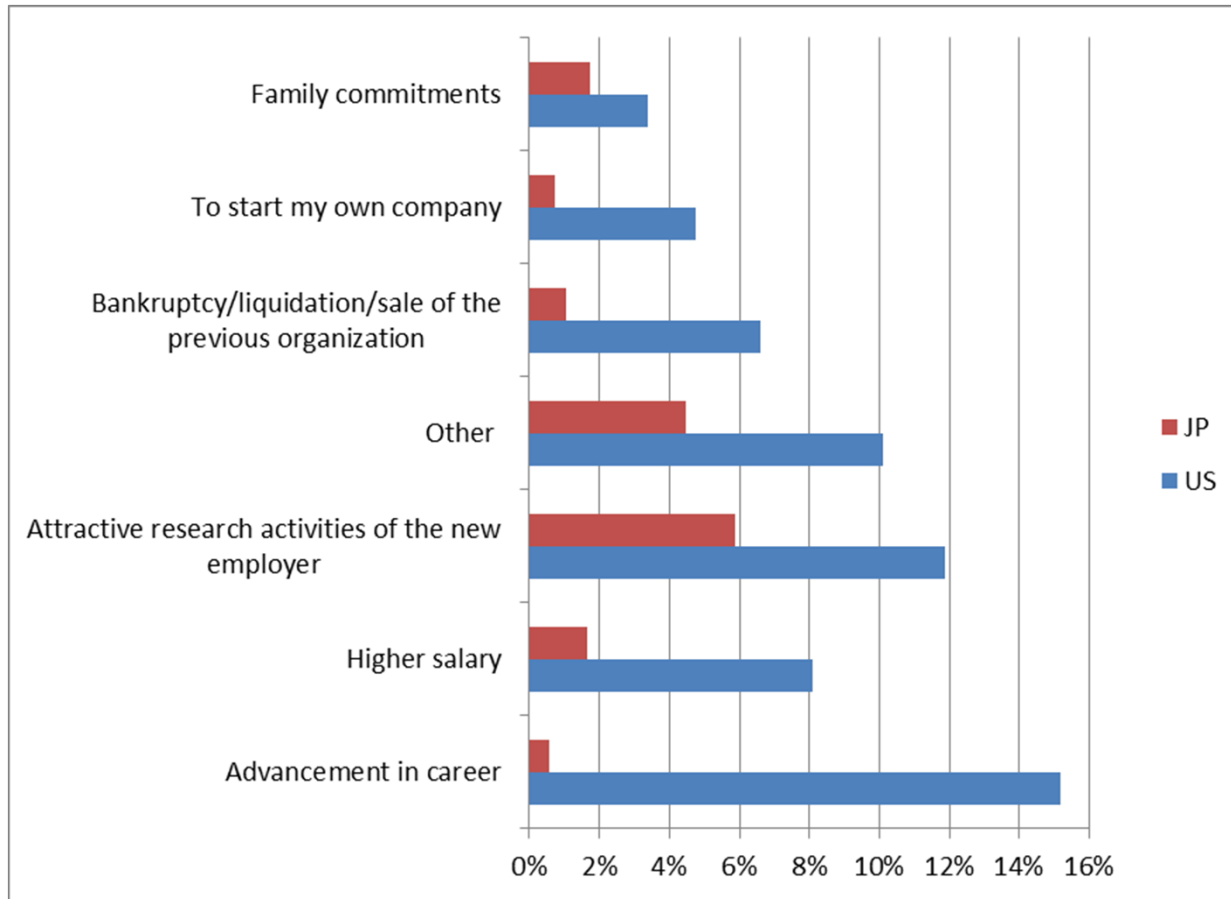
- Mobility as a mechanism for new combinations
  - University startups for assessing new technologies
  - Disagreements in a firm as sources of startups (Klepper).
- Significantly lower mobility in Japan.
  - In Japan, very limited mobility for the reason of promotion or higher salary (In the US they are the most important)
  - Mobility due to job loss is also small in Japan.
  - Startup/Move for attractive research environment more frequent in the US.
- Majority of movement in large Japanese firms is secondment.

# Figure 6 Inventor Inbound Mobility, US and Japan



(Source )Walsh and Nagaoka [2009b]

# Figure 7. Reasons for the change of employer



Based on PATVAL-2 survey (Source)Nagaoka, Tsukada, Onishi and Nishimura (2012)

Table 2 Funding sources: share (%) of funding for the research by organization type

	Own(including debt)		Government		User		Supplier		Other firms		Venture capital and angels		No. of sample	
	Japan	USA	Japan	USA	Japan	USA	Japan	USA	Japan	USA	Japan	USA	Japan	USA
Large firm	96.4	92.2	0.9	2.0	0.8	2.0	0.5	0.5	0.9	0.3	0.0	0.2	2,865	1,389
Medium-sized firm	94.3	86.6	0.9	5.1	3.2	4.0	0.8	0.0	0.8	0.0	0.0	0.0	198	74
Small firm	92.8	84.1	1.2	1.7	4.4	3.2	0.2	0.0	0.6	2.0	0.1	1.7	127	60
Smallest firm	85.6	70.0	2.9	3.1	3.9	3.9	0.5	1.3	2.7	1.7	0.7	16.5	176	216
University or college	44.1	40.4	26.1	40.6	0.8	1.0	3.5	0.0	15.1	8.7	0.0	2.8	79	42
Other	69.8	66.8	17.4	19.6	2.4	2.7	0.0	0.0	2.3	0.0	0.0	0.0	42	12
All	94.1	87.5	1.7	3.3	1.3	2.4	0.6	0.6	1.3	0.7	0.1	2.3	3,487	1,801

Note. Large firm has 501 or more employees, Medium-sized firm has 251- 500 (250-500 in the US) employees, Small firm has 101-250 (100-249) employees, Smallest firm has 100 (99) or less employees

(Source) Walsh and Nagaoka [2009a]

# Conclusions

- Strengthen the absorptive capability for science
- Strengthen the collaborative capability across borders
  - employment practices and language capability
- Startup system
  - critical mass of the startup system



## References

- Walsh John and Sadao Nagaoka [2009a], “How “open” is innovation in the US and Japan? :evidence from the RIETI–Georgia Tech inventor survey,” RIETI Discussion Papers, 09–E–022.
- Walsh P. John and Sadao Nagaoka [2009b], “Who Invents?: Findings from the US–Japan Inventor Survey,” RIETI Discussion Papers Series, 09–E–034.
- Nagaoka Sadao, Naotoshi Tsukada, Koichiro Onishi and Yoichiro Nishimura, 2012, “Innovation process in Japan during 2000s as seen from inventors, “ RIETI Disucssion paper,
- Tsukada Naotoshi and Sadao Nagaoka, “Combining knowledge and capabilities across borders and nationalities : Evidence from the inventions applied through PCT”, forthcoming as a RIETI discussion paper