What are the Determinants of Inbound and Outbound Open Innovation Performance?

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Research Purposes

- **Research background**
  - Chesbrough (2003)
- **Open innovation has the following two aspects (Chesbrough and Crowther 2006)**
  - Inbound Open Innovation(OI)
  - Outbound OI

- **Research purposes**
  - To develop a theoretical framework to understand the performance of inbound and outbound OI.
  - To understand OI through a questionnaire based survey.
  - To test the proposed theoretical model through a questionnaire based survey.

Theoretical Framework
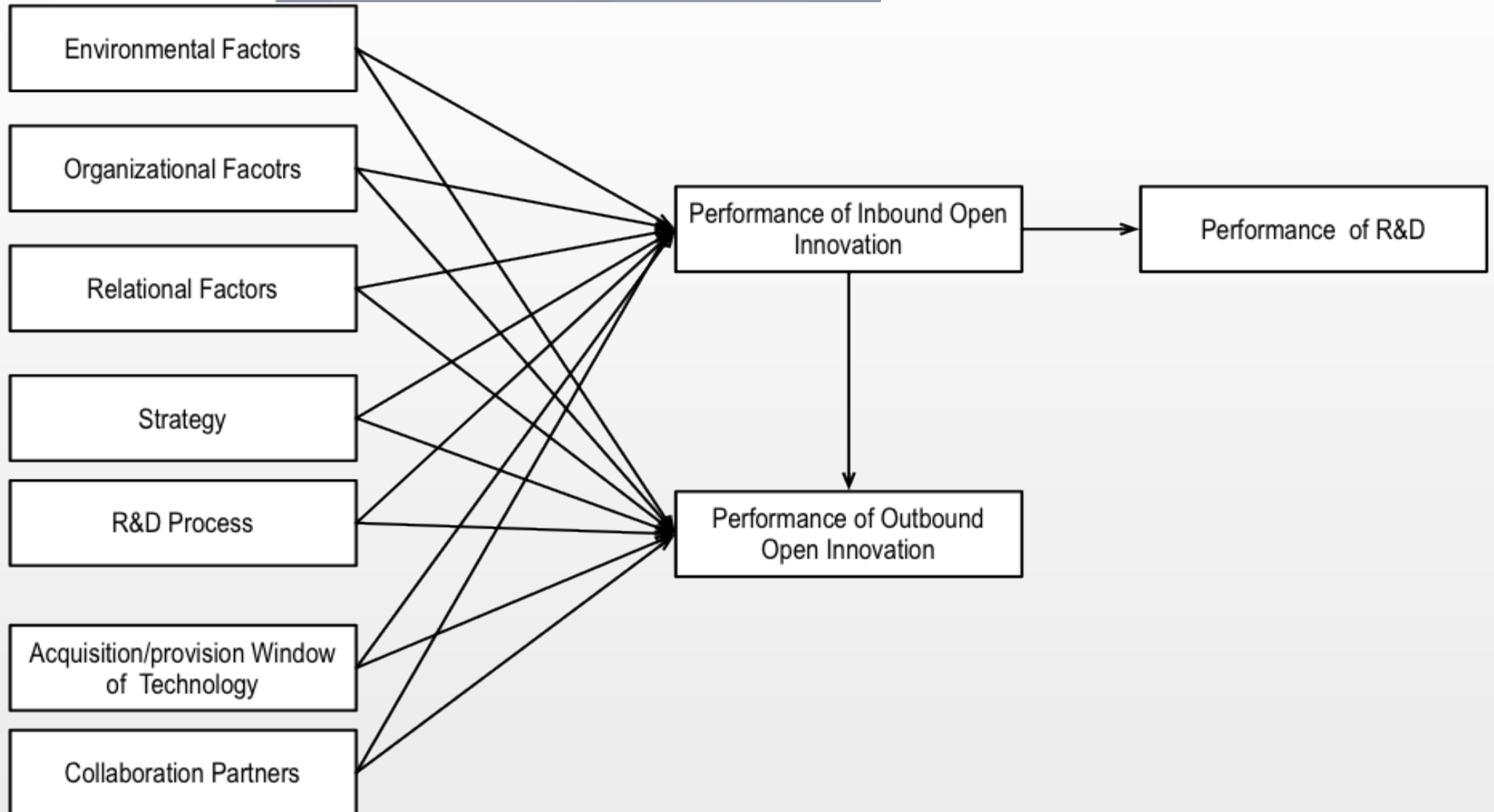
Determinants of Inbound and Outbound Open Innovation Performance

- Literature review
  - Transaction cost theory (Coase 1937; Williamson 1975)
  - Resource based view/capability theory (Wernerfelt 1984; Langlois and Robertson 1995)
  - Trust theory (Granovetter, 1985)
- Determinants of OI performance
  - Environmental factors
  - Organizational factors
  - Relational factors
  - Strategy
  - R&D process
  - Acquisition/provision window of technology
  - Collaboration partners

Data

- Method
  - Mail survey of Japanese manufacturers (2007-2011)
- Measurement Scale development
  - The constructs were measured with subjective judgment scales.
    - For each construct, a few questionnaire items were developed. The reliability of the scales was confirmed with Cronbach's alpha.
  - Performance of inbound OI (Cronbach's alpha = 0.872)
    - Introduction of external technology has accelerated the firm's R&D speed.
    - Introduction of external technology has enabled the development of innovative products in the firm.
    - The products of the firm that incorporate external technology have succeeded in the market.
  - Performance of outbound OI (Cronbach's alpha = 0.784)
    - The firm's technology is licensed to other firms, which enables them to develop innovative products.
    - The products of other firms that have licensed the firm's technology have succeeded in the market.
    - The firm's revenue from licensing has increased.

Data

- Sampling frame
  - Manufacturers listed in the Japanese stock exchange market and having an R&D laboratory.
- Sample/response/response rate for each year is shown below.
  - 2007: 450/122/27.1%
  - 2008: 419/132/31.5%
  - 2009: 485/127/28.2%
  - 2010: 434/134/30.9%
  - 2011: 451/136/30.2%
  - Total: 2239/651/29.1%
- Multiple year responses
  - For multi-year response firms, the latest response was employed.
  - N=390 firms(B2C=105, B2B=285)
- "No response bias" was not found
  - It was confirmed that there was no difference between the firms that responded and those that did not, in terms of sales and the distribution of industrial classification.
- Yearly trend was found for certain items.
  - "Year of survey" was introduced for analysis

Situation of OI in Japan

Acquisition/Provision Window
Mean = 5.11 (2 items)

Inbound OI Performance
Mean = 9.40 (3 items)

Outbound OI Performance
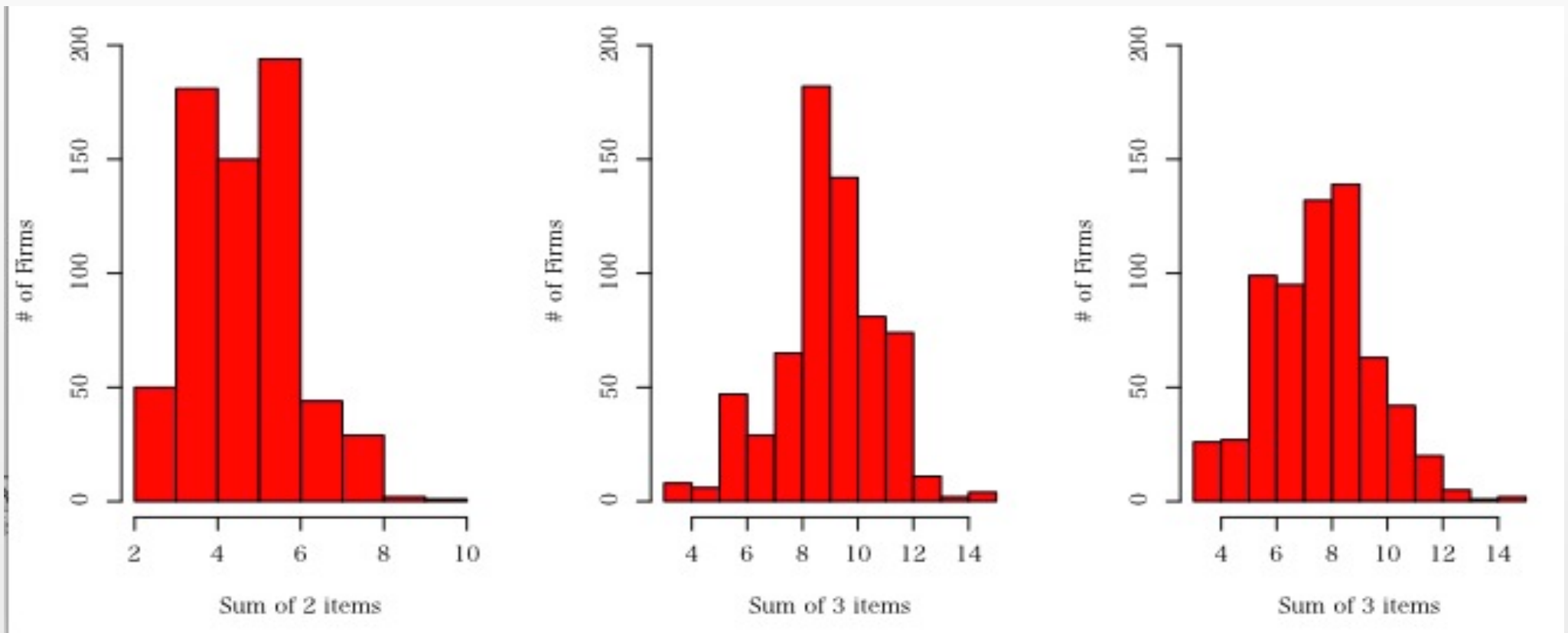Mean = 8.02 (3 items)

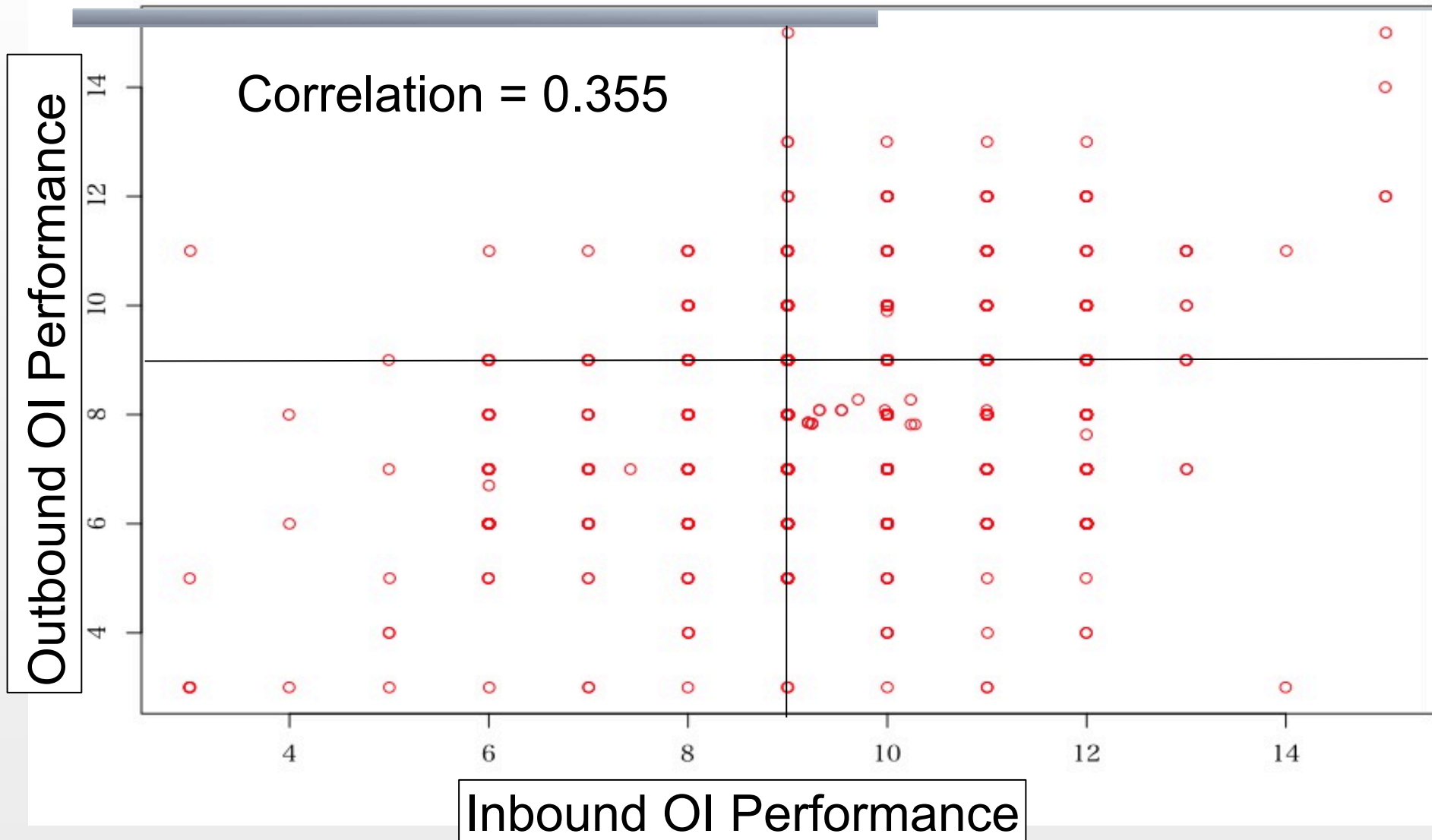Figure: Histogram of Open Innovation related Factors

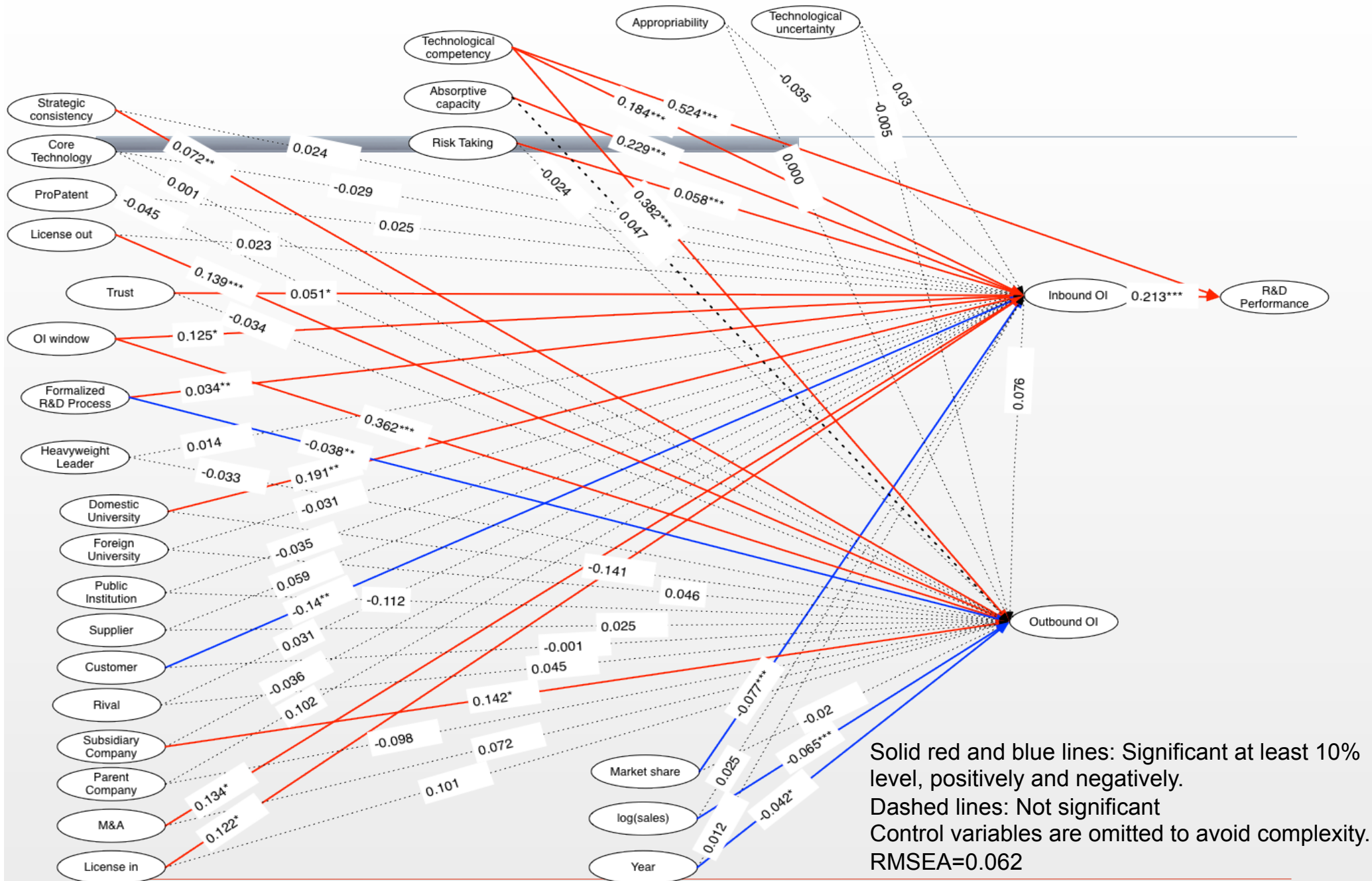Figure: Relationship Between Inbound and Outbound OI Performance

Figure Results of Structural Equation Modeling

Table Estimates of Structural Equations

Category	Factors	Performance of Inbound OI	Performance of Outbound OI	R&D Performance
Environmental Factors	Appropriability	-0.035	0.000	
	Technological uncertainty	0.03	-0.005	
Organizational Factors	Absorptive capacity	0.229***	0.047	
	Technological competency	0.184***	0.382***	0.524***
	Risk taking	0.058***	-0.024	
Relational Factor	Trust in a firm	0.051*	-0.034	
Strategy	Strategic integration	0.024	0.072**	
	Core technology	-0.029	0.001	
	Pro-Patent	0.025	-0.045	
	License-out	0.023	0.139***	
R&D process	Heavyweight leader	0.014	-0.033	
	Formalized R&D process	0.034**	-0.038**	
	Acquisition/ provision window	0.125*	0.362***	
Collaboration Partners	Domestic University	0.191**	-0.141	
	Foreign University	-0.031	0.046	
	Public Institution	-0.035	-0.112	
	Rival	0.031	0.045	
	Customer	-0.140**	-0.001	
	Supplier	0.059	0.025	
	Subsidiary Company	-0.036	0.142*	
	Parent Company	0.102	-0.098	
	License-in	0.122*	0.101	
Other variables	Market position (share)	-0.077***	-0.02	
	Log (sales)	0.025	-0.065***	
	Year	0.012	-0.042*	
	Performance of Inbound OI	-	0.076	0.213***

Note) Significant levels   ***: 1%   **: 5%   *:10%

Summary

- Theoretical framework to understand OI that integrate transaction cost theory, competence theory, and trust theory was proposed.
- Situation of OI in Japan is described with a questionnaire survey.
    - Outbound OI is less developed.
    - Inbound and Outbound OI have different aspects.
- Testing the proposed model resulted in the following findings:
    - Inbound OI improves R&D performance.
    - Among many variables, acquisition/provision window of technology and technological competency positively affect both inbound and outbound OI performance. This result indicates that, in Japan, performance of OI is determined by capability and internal system of firms rather than transaction cost related variables.
    - Japanese manufacturers also utilize the market to acquire external knowledge, as in the US. We also confirm that trust in the firm positively affects inbound OI. Hence, relationship based collaboration is also beneficial for Japanese firms.
    - Outbound OI performance is positively affected by integration of marketing-technology and licence-out strategy that are insignificant to inbound OI performance. Establishing a technological strategy is necessary to improve outbound OI.
    - We confirm that our findings are stable across various industries.