

# Antecedents and Consequences of Open Innovation

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# Agenda

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- Purpose of Research
  - Model and Hypotheses
    - Data
  - Results and Discussion
    - Conclusion
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## Background of Research

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- “Closed innovation”[Chesbrough(2003)]”
    - “In closed innovation, a company generates, develops and commercializes its own ideas.
  - Eroding factors of closed innovation:Shifts in the Research Environment
    - Increasingly mobile trained workers
    - Enormous increase in Venture Capital
    - More capable Universities etc.
  - “Open Innovation”
    - ”Open Innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and extend external use of innovation, respectively. [Chesbrough(2006)]”
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## Limitation of Research on “open innovation”

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- Research methodology
    - Henkel(2006) Embedded Linux
    - West et al. (2006) Open-source software
    - Christensen et al. (2005) Consumer electronics: sound amplification
    - Chesbrough and Crowther (2006) Interview to non high-tech companies
      - Most of the past researches are based upon case studies or interviews.
      - Large scale survey is necessary[Chesbrough et al.(2006)]
  - Theory
    - No theoretical framework is developed.
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## Purposes of Study

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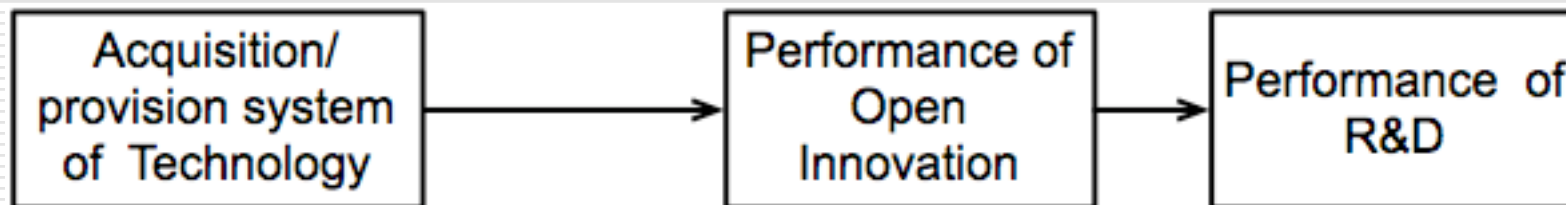
- To propose theoretical framework and testable hypotheses
  
  - To test hypotheses
    - We conducted mail survey to Japanese manufacturers
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## Model and Hypotheses

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- To harness Open Innovation, formal system to acquire external knowledge and to provide internal knowledge is necessary.
  - $H_s$  Institutionalization of acquisition / provision system of technology is *positively* related to performance of open innovation.
  
- Open innovation is expected to improve R&D performance.
  - $H_r$  Performance of open innovation is *positively* related to performance of R&D.



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Figure Central Process of Open innovation



## Factors/variables that affect open innovation Process

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- External (environmental) factors
    - (+)Technological change[Chesbrough (2003)]
    - Availability of external source of knowledge
      - (+)Univeristy[Chesbrough (2003)]
      - (+)Technological start-ups[Chesbrough (2003)]
      - (+)Venture capitals[Chesbrough (2003)]
      - (+)User [von Hippel (1988, 2005)]
  - Availability of quasi-external source
    - (-)Keiretsu: research subsidies
  - Internal(organizational) facotrs
    - (+)Absorptive capacity[Cohen and Levinthal (1990)]
    - (-)Resistance to external tecnology/knowledge:Not Invented Here(NIH syndrome)[Katz and Allen (1982)]
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## Factors/variables that affect open innovation Process

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- Resource and Strategy
    - (+:Directly, Indirectly)Technological resource
    - (+:Directly, Indirectly)Integrated R&D - marketing strategy[Based on lansiti(1998)]
  
  - Relationship with external actors
    - (+)Trust in a firm [Sako(1988)]
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## Example of Hypotheses

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### □ External Factors

#### ■ Available external source of knowledge

- $H_{O1}$  *Availavility of external technological resources(start-ups, venture-capitals, universities) will promote institutionalization of acquisition and provision system.*
- $H_{O2}$  *Availavility of external technological resources(start-ups, venture-capitals, universities) is positively related to performance of open innovation.*

### □ Internal Factors

#### ■ Absorptive capacity[Cohen and Levinthal (1990)]

- $H_{a1}$  *Absorptive capacity is positively related to institutionalization of OI system.*
- $H_{a2}$  *Absorptive capacity is positively related to performance of OI.*
- $H_{a3}$  *Absorptive capacity is negatively related to NIH.*

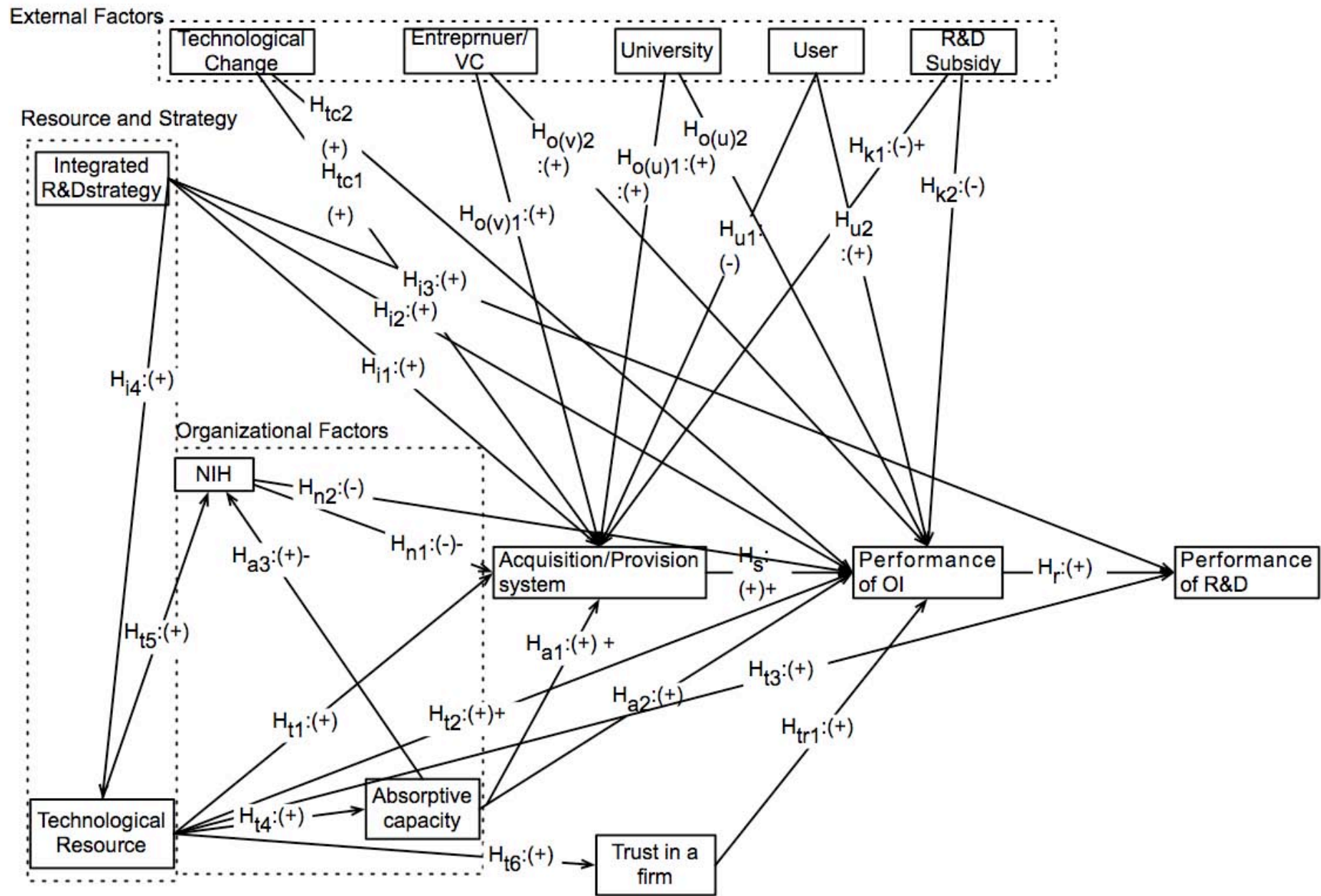


Figure Hypotheses on Antecedents and Consequences of Open Innovation

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## Data

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### □ Method

- To test hypotheses, we conducted mail survey to Japanese manufactures.
- A few items were developed to measure each constructs. Likert-type five point scale was employed.

### □ Sampling frame

- 1970 manufacturers were randomly selected from listed at Japanese stock exchange market.

### □ Date

- 2006/10/20-2006/11/10
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- Response

- 71 firms (Response rate= 3.5%)

- Low response rate was due to too many questions.

- No “no response bias” was found

- We confirmed no difference between responded and not responded firms in terms of sales and distribution of industrial classification.

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## Key Figure: Acquisition & Provision System

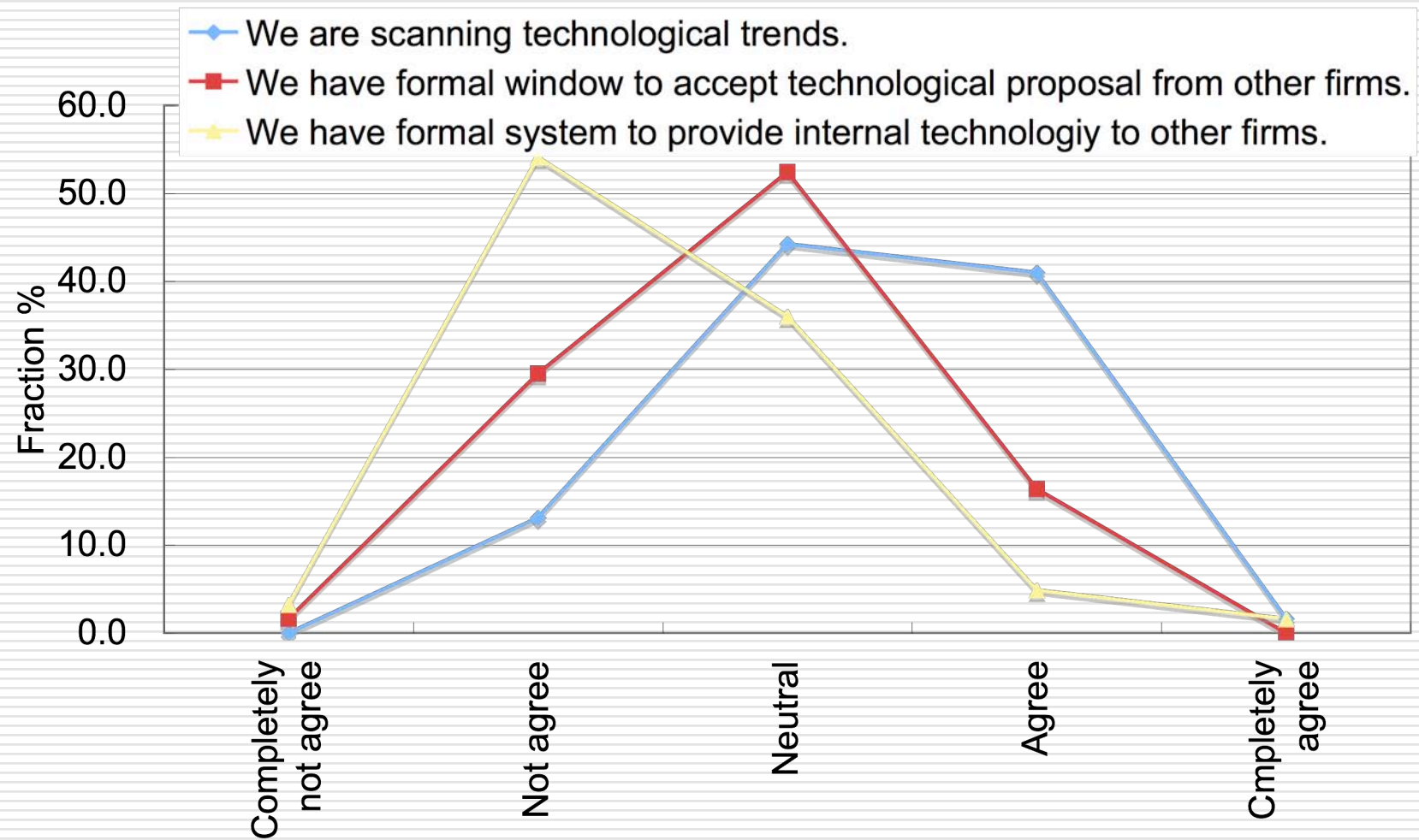


Figure Institutionalization of Acquisition/provision system



## Key Figure: Performance of Open Innovation

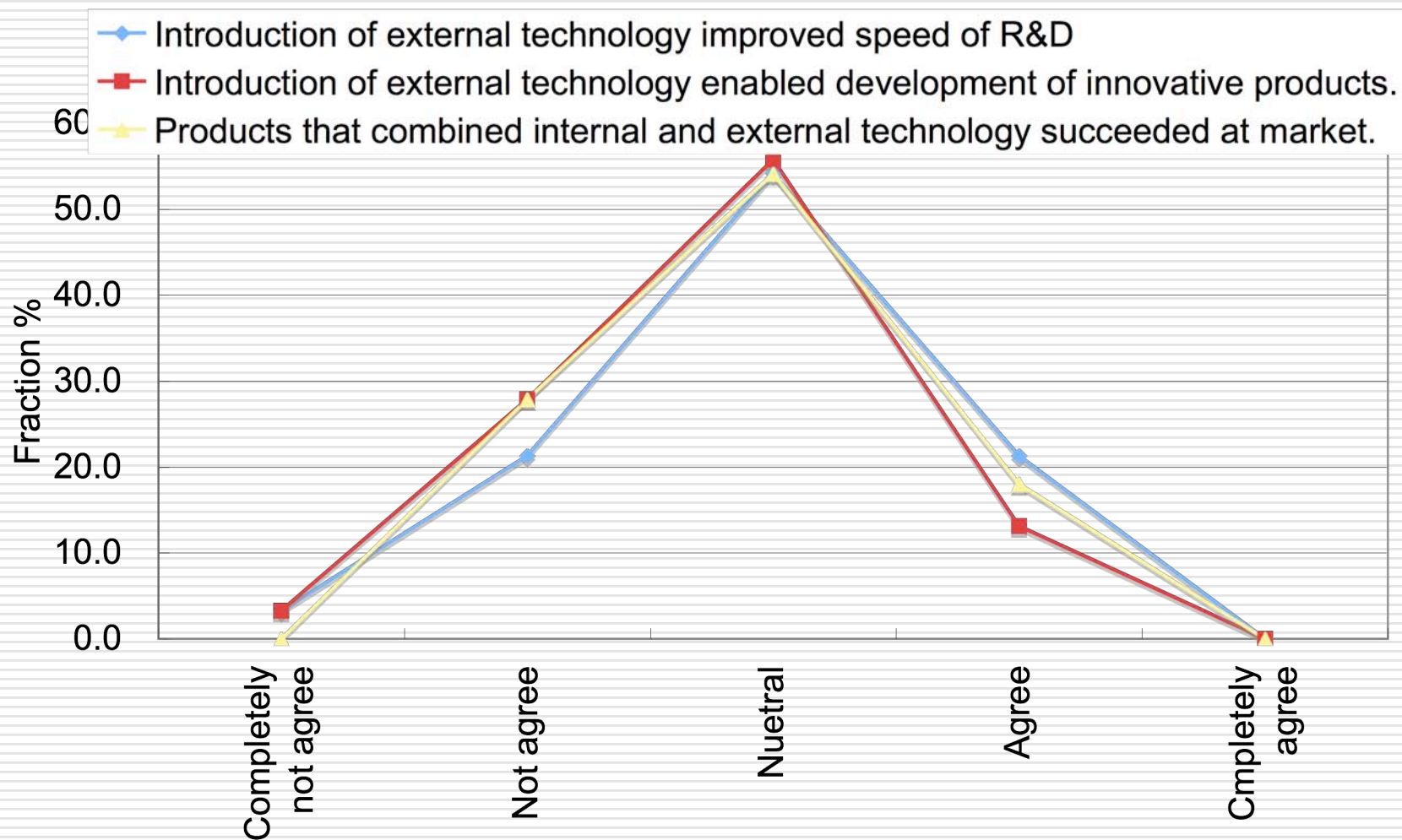


Figure Performance of open innovation

## Analysis

### □ Path analysis

Table Over all Model Fit Indexes of Two Models

	Model 1	Model2
	Hypotheses and control	Hypotheses, control, and modification indexed variables
$\chi^2$	73.8 (df=52,p= 0.03)	49.0 (df=48,p= 0.43)
GFI	0.866	0.906
AGFI	0.730	0.794
RMSEA	0.084	0.019
BIC	-139.96	-148.34

\*Four paths were added based on modification index.

Trust->Performance of R&D, User ->Technological resource

Venture->NIH, Integrated R&D strategy->NIH

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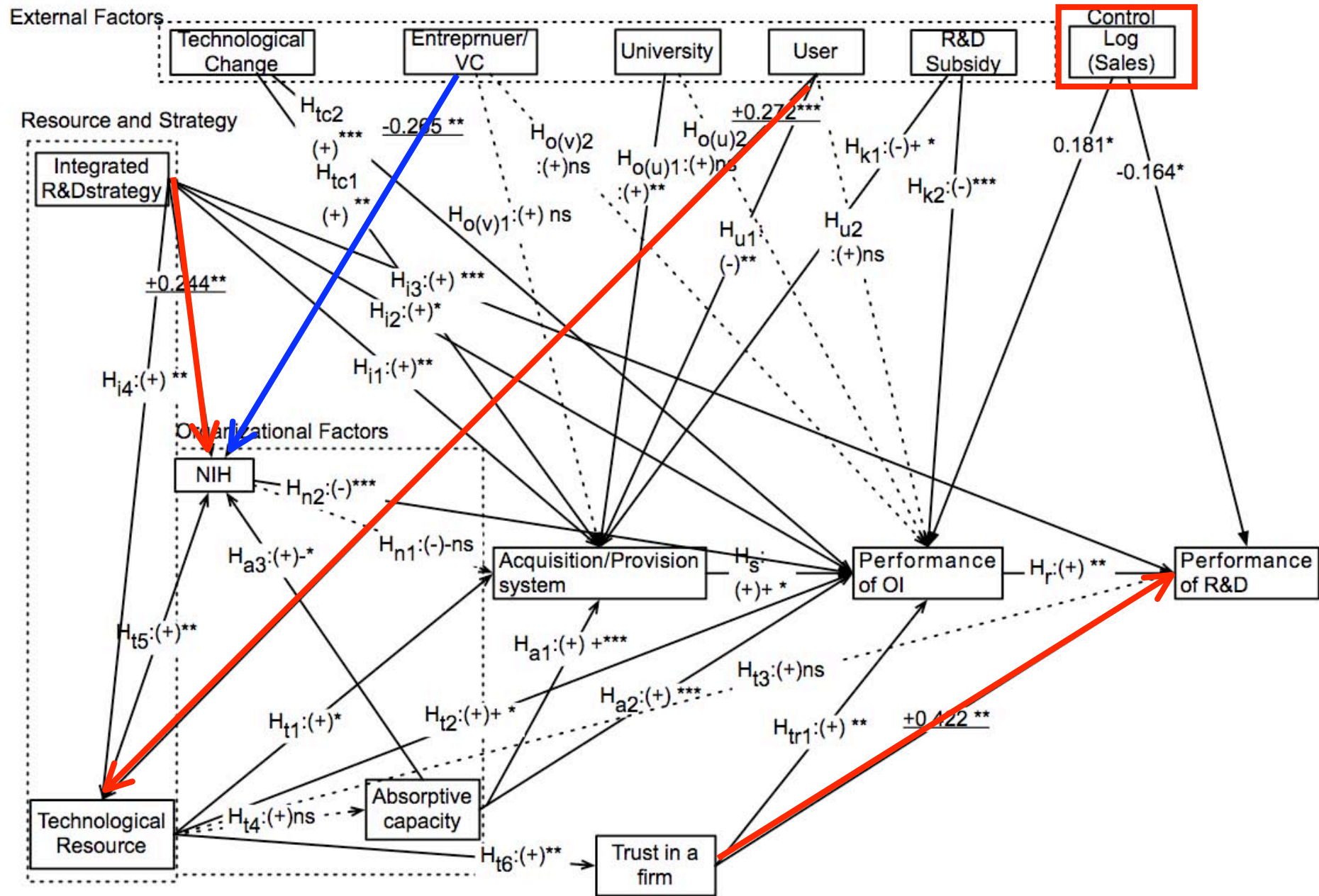


Figure Results of Estimation

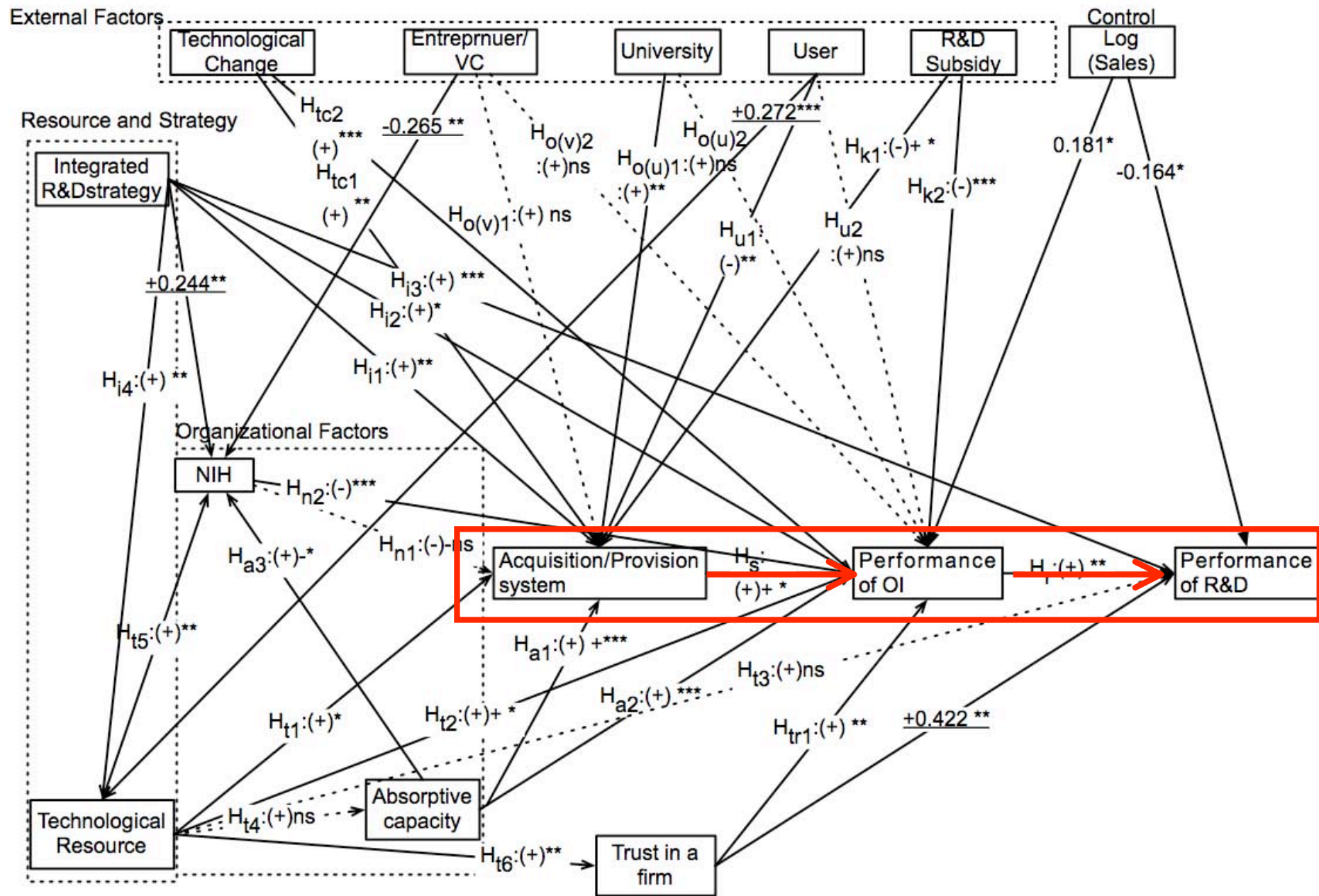


Figure Results of Estimation



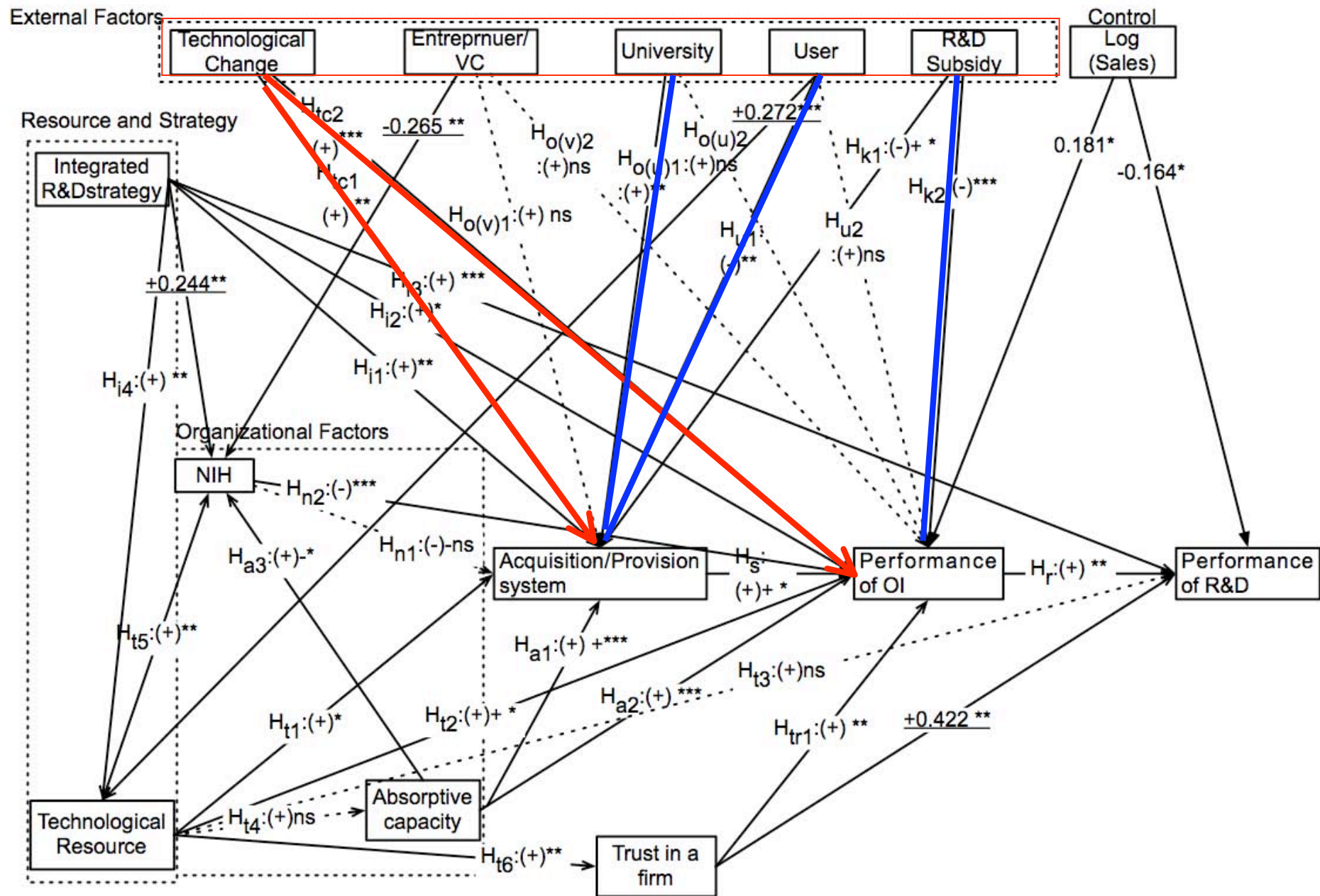


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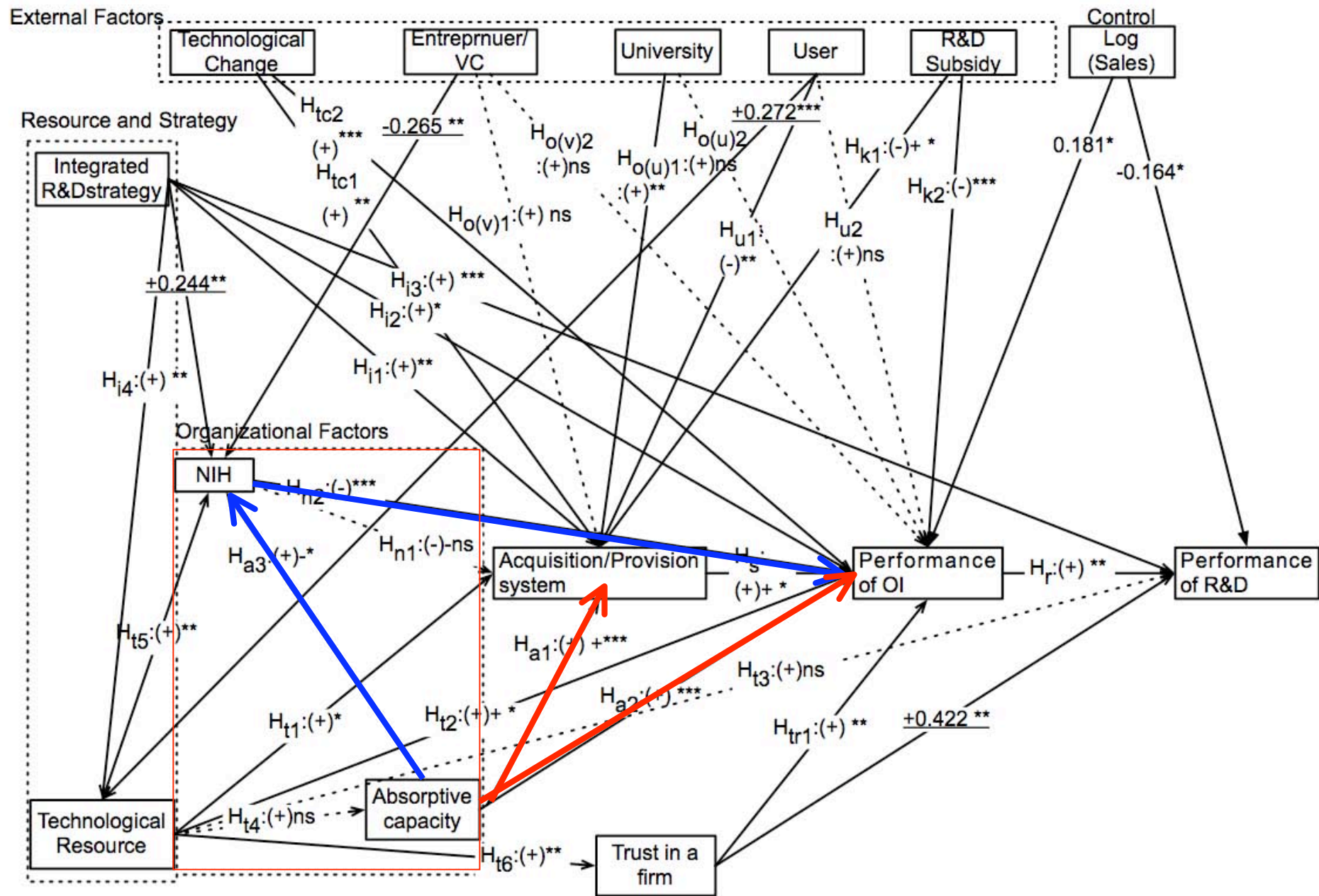


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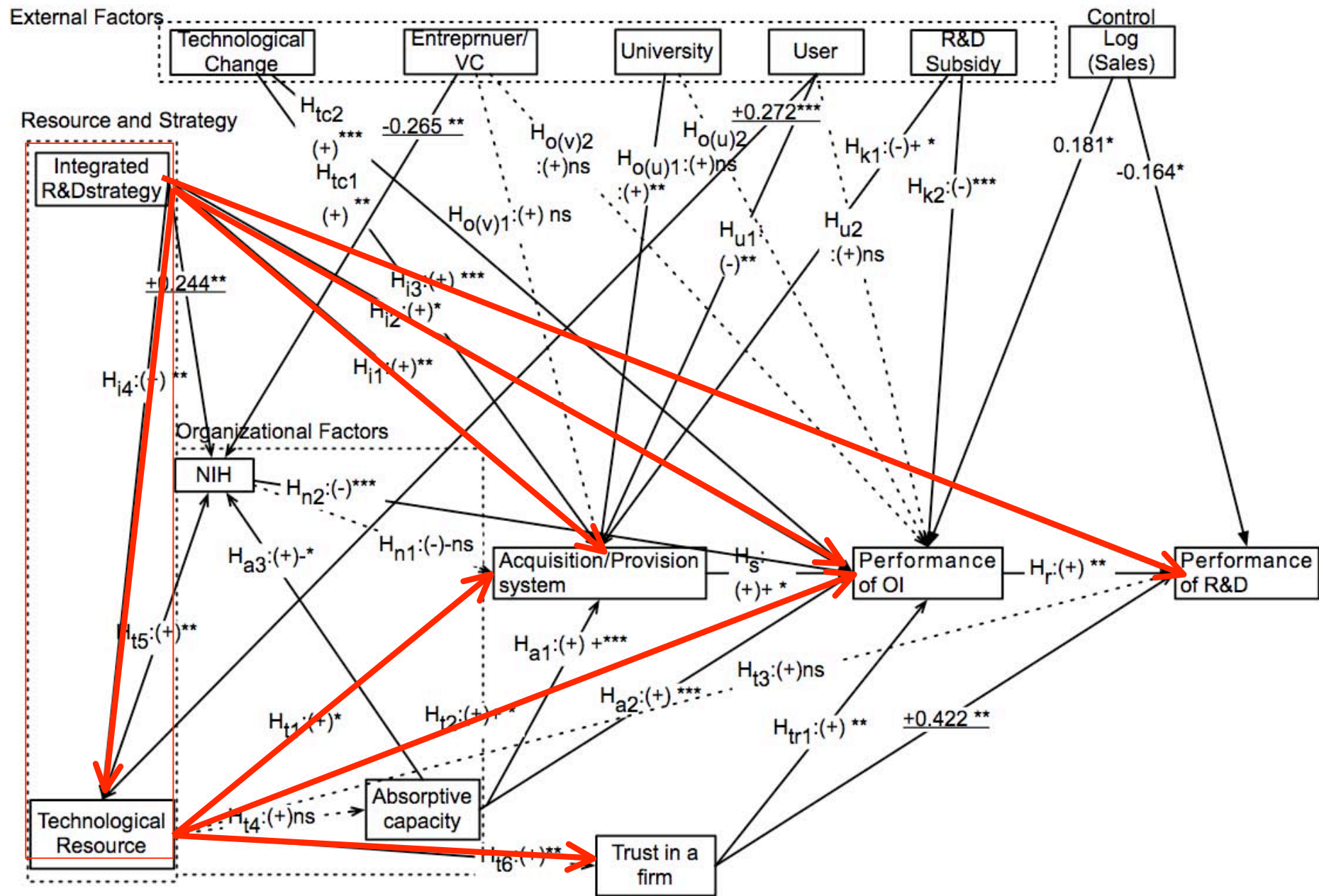


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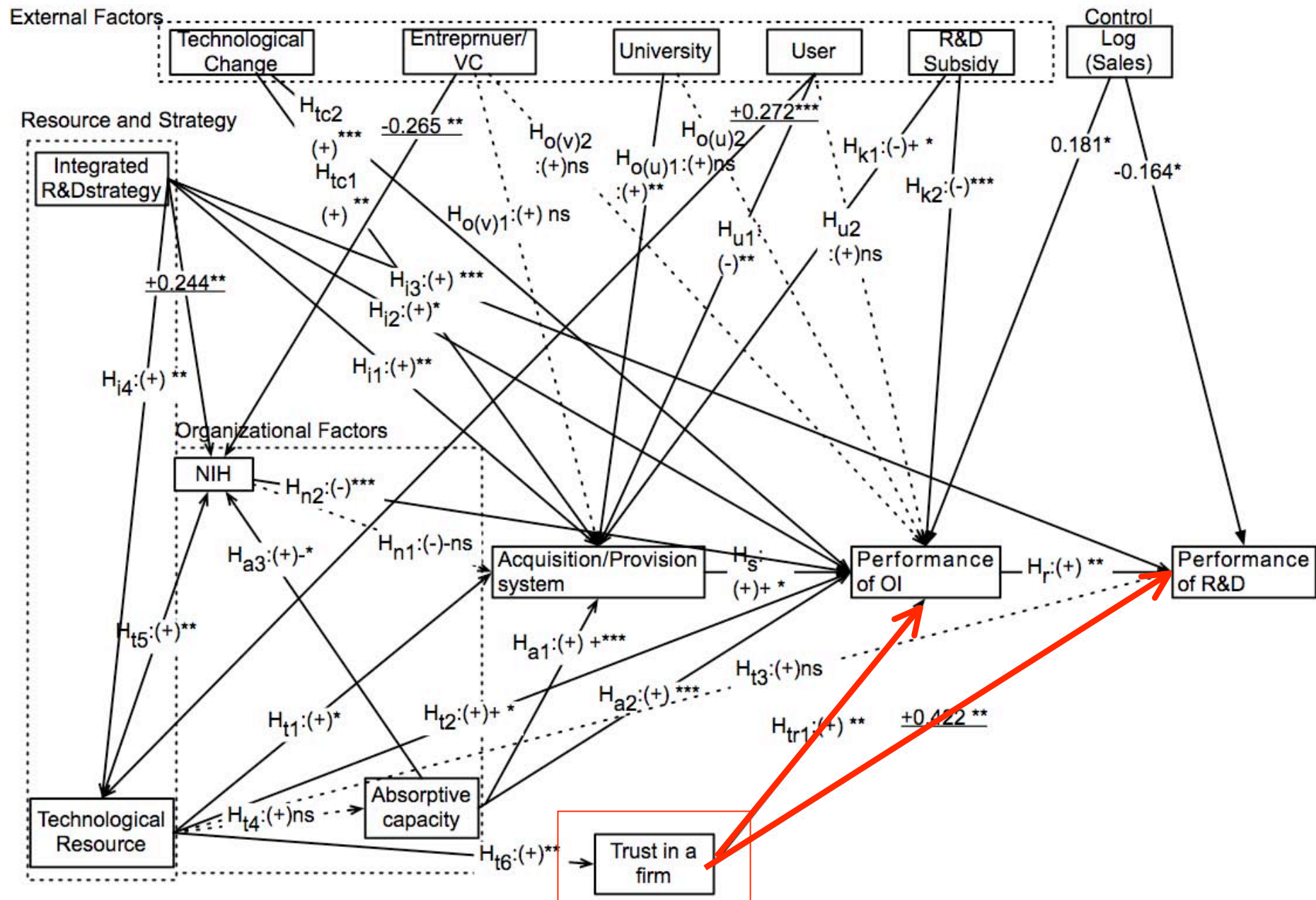


Figure Results of Estimation

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## Contribution

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- A comprehensive theoretical framework for understanding Open Innovation(OI) was proposed. Unlike previous research, our model identifies, external factors (technological change and available resources), internal factors (absorptive capacity, NIH syndrome), resource and strategy, and relational factors (trust).
  - The model was empirically tested through mail survey collected from Japanese firms.
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## Limitation and Future Research

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- Hypothesized as “causality”, but data is cross-sectional.
    - We are planning 2nd wave survey to examine causality.
  
  - Low response rate
    - Better sampling framework and improvement of questionnaire are necessary.
  
  - Research target was Japanese companies.
    - International comparison will be necessary to confirm generalizability of our findings.
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