

# The relationship between intellectual property rights and FDI in food industry

– A case study of Japanese Food industry –

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# 1. Introduction

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## ■ Back ground

- There are many papers study the number of Foreign Direct Investment (FDI) by Japanese food manufacturing industry, which increase in current.
- Few studies for the relationship between FDI and Intellectual Property Rights (IPR) protection based on related theories, which include R&D activities of food manufacturing industry and technology export.

## ■ Objects of this study

- Overview **the current situation of R&D activities in Japanese Food Industry**. Food manufacturing industry is focused in particular.
- Revealing **the relationship between FDI and IPR protection** in targeted nations.

## 2. Impact of IPR protection to FDI

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### ■ Insists of Markusen (1995) and other studies

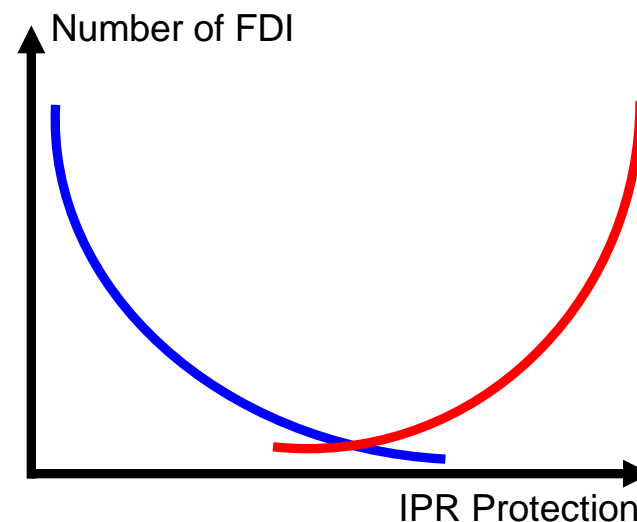
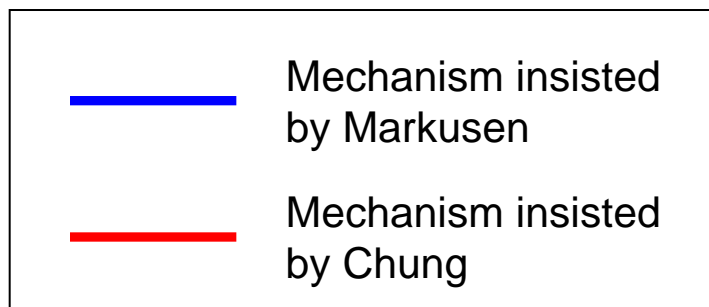
- Licensing is preferred to FDI in case that high IPR protection including contractual enforcement is high.
  - A technology exporting company has to face **transaction costs** which means asymmetric information, searching cost for transaction partner and so on.
    - ❖ **High transaction cost**: internalization of the transaction partner by **FDI is preferred**
    - ❖ Low transaction cost: licensing is preferred
    - ❖ **High IPR protection** including contractual protection enforcement **leads licensing**
- The relationship between FDI and IPR protection is **negative**.

## ■ Insists of Chung (1999) and other studies

- The transaction partner in targeted nation has to customize the technology provided by technology export company into the country.
- The customization is considered as “**specific investments** (Grossman and Hart (1986))” if sector peer companies are not able to use it.
- The specific investment lead underinvestment in that case. Grossman and Hart insists that “**residual rights**” should be allocated to the transaction partner in advance.
  - **Low IPR protection**: A technology export company provides **license** to transaction partner to implement specific investment since the exporting technology is easy to duplicate.
  - **High IPR protection**: A technology export company prefer vertical integration or technology transfer within company by **FDI**
- The relationship between FDI and IPR protection is **positive**.

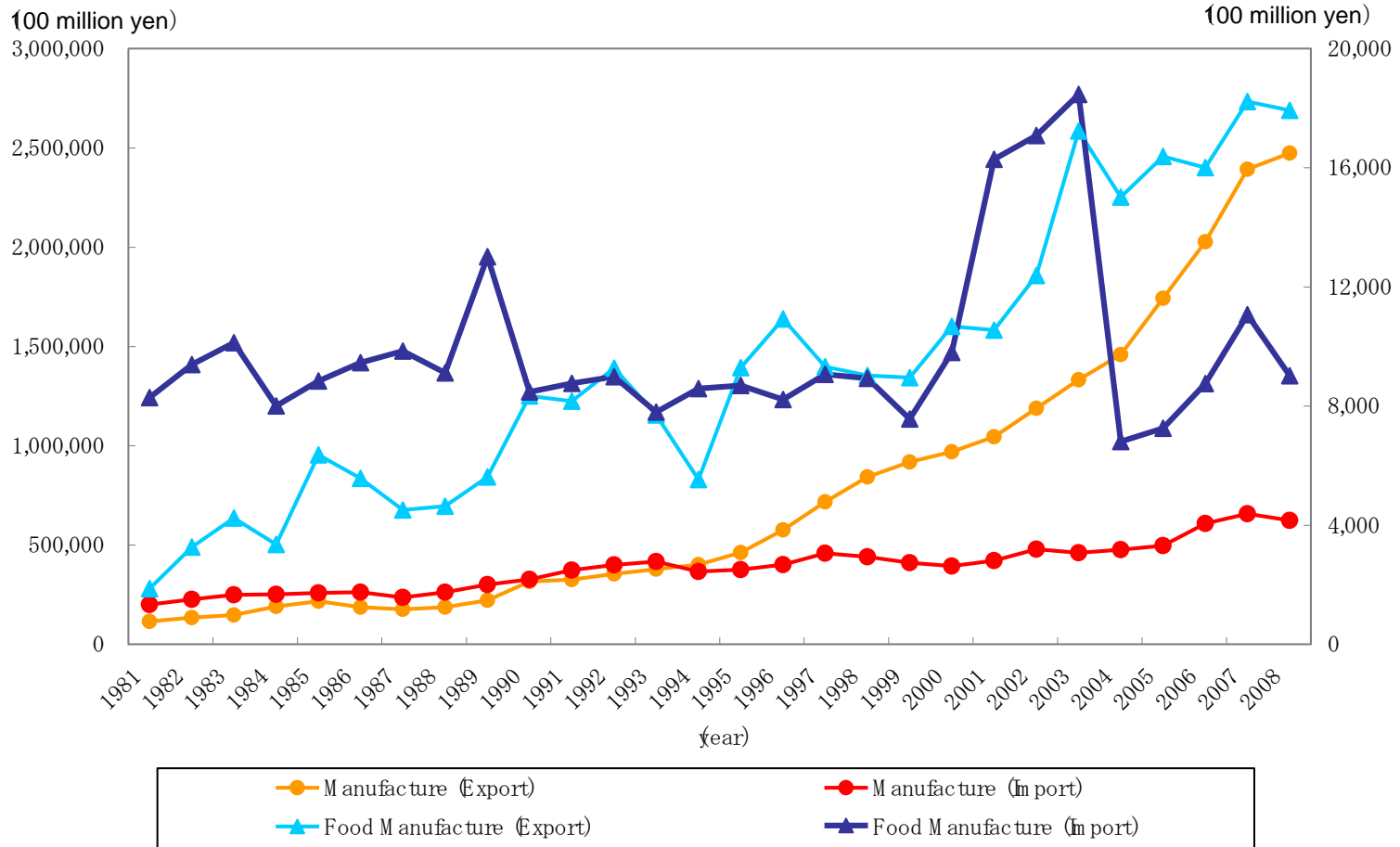
## ■ Insists of McCalman (2004)

- “While the predictions of Markusen (1995) and Chung (1999) differ, they are **not necessarily in conflict**.
  - Mechanism given by Markusen (1995) is emphasized/worked in low IPR protection
  - Mechanism given by Chung (1999) is emphasized/worked in high IPR protection
- The relationship between IPR protection and FDI is expected to be **U-shaped**.



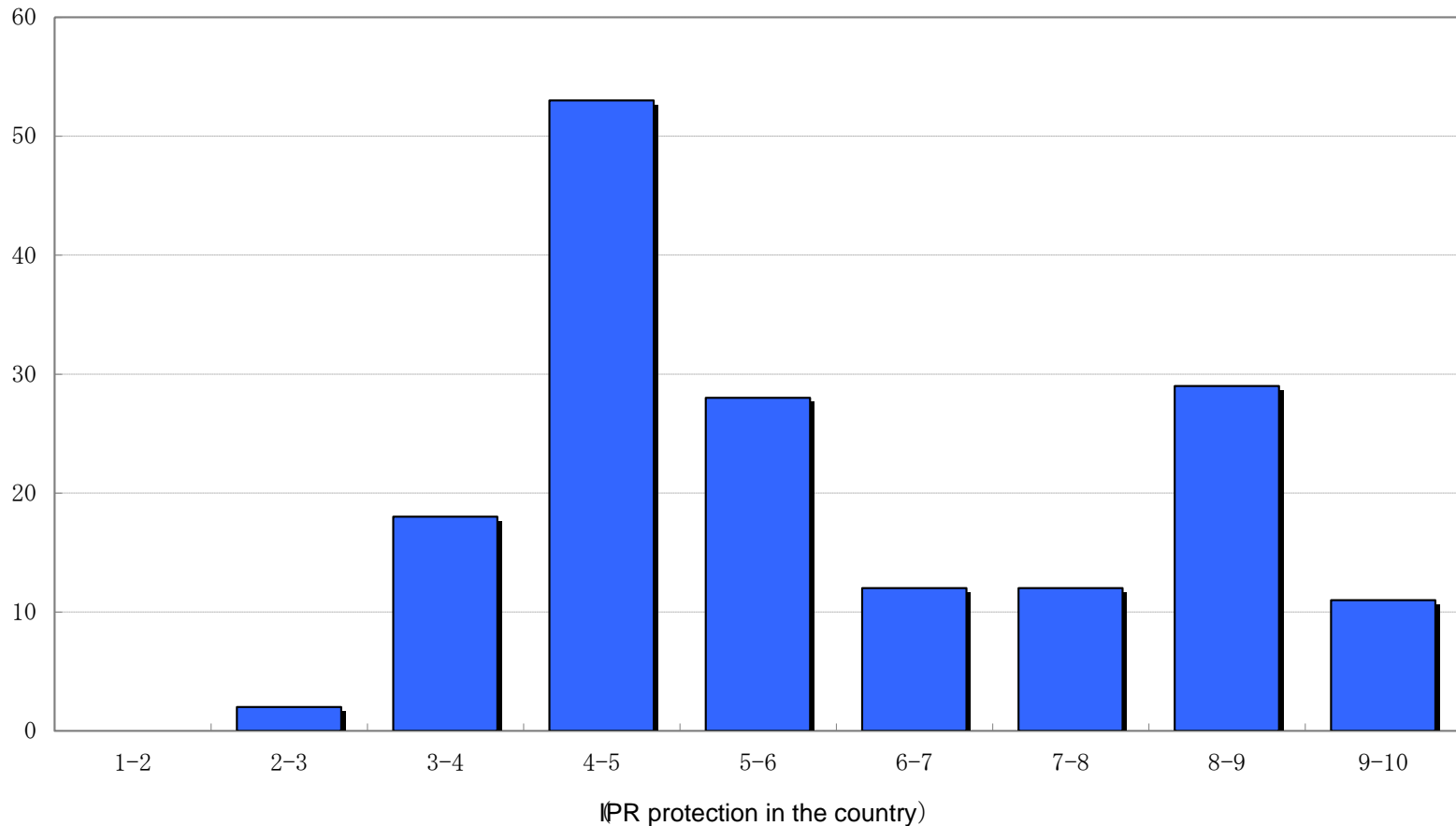
### 3. Overview of R&D in Japanese Food Industry

#### ■ Technology trade of Japanese Food Industry



## ■ Number of overseas Japanese food industry and IPR protection in targeted countries

Number of overseas Japanese food industry)



## 4. Estimating the relationship between IPR protection and FDI

### ■ Estimation strategy

- FDI by Japanese Food Industry in the country follows Poisson distribution.

$$p(Y) = f(Y) = \frac{\lambda^Y e^{-\lambda}}{Y!}$$

$$E[Y] = \lambda = \exp[\beta]$$

- Log likelihood estimation is used to estimate
- Since overdispersion problem is expected, Negative Binomial model (NB) and Zero Inflated Poisson model (ZIP) are also used.
- Estimation period is from 2000 to 2007.
- Estimation countries: Australia, Austria, Brazil, Canada, Chile, China, Denmark, England, France, Germany, Guatemala, Holland, Hungary, India, Indonesia, Italy, Korea, Malaysia, Mexico, New Zealand, Portugal, Russia, Singapore, South Africa, Switzerland, Thailand, USA and Vietnam, 28 countries, 223 samples.

## ■ Definition of Variable

- Dependent Variable
  - **Number of Companies** conducting FDI in the country
- Independent Variable
  - **MKT (+)** : Market Size-real GDP in the country (US\$, 2005=100)
  - **Wage (-)**: Real Wage Ratio-ratio of manufacturing industry wage in the country to that in Japan (both wages are in US\$, 2005=100)
  - **RAI (+)** : Resource Amount Index-Number of agricultural products in the country
  - **Export (+)** : Export Ration-Ratio of export to real GDP in the country (both are in US\$, 2005=100)
  - **PPP (-)** (**PPP<sup>2</sup> (+)**): Index of IPR protection from Economic Freedom of the World

## Results of estimation

	<i>Poisson</i>	<i>Negative Binominal (NB)</i>	<i>Zero Inflated Poisson (ZIP)</i>
<i>constant</i>	-2.41173 *** (0.86729)	-2.62207 * (1.85894)	-1.74016 * (1.05833)
<i>MKT</i>	-3.78e-06 * (1.94e-06)	-4.28e-06 (2.92e-06)	9.13e-07 (2.93e-06)
<i>Wage</i>	-0.58945 * (0.42846)	-0.29271 (0.65684)	-0.34778 (0.40818)
<i>RAI</i>	0.04212 *** (0.00307)	0.02809 *** (0.00486)	0.03612 (0.00367)
<i>Export</i>	0.00021 (0.00092)	-0.00191 (0.00176)	1.75707 (0.48478)
<i>PPP</i>	-0.65547 ** (0.29924)	-0.01211 (0.60568)	-0.38528 (0.33884)
<i>PPP<sup>2</sup></i>	0.06305 ** (0.00263)	0.05542 (0.05087)	0.03650 (0.02927)
<i>Overdispersion Parameter</i>		2.50904 *** (0.60660)	
<i>Log-Likelihood</i>	-283.20129	-214.85715	-223.7446
<i>Vuong Test</i>			Z=3.15 ***

1) standard errors are in parenthesis. \*\*\*, \*\* and \* mean statistically significant at 1%, 5% and 10% respectively.

2) Overdispersion is evaluated by log likelihood ratio test and statistically significant at 1%.

- Although overdispersion is inferred from overdispersion test and the result of Vuong test shows ZIP model is appropriate, **the result of Poisson model is better.**
- **Almost all variables except *MKT* and *Export* are statistically significant with expected sign.**
- Indicators of **the U-shaped relationship** between IPR protection and FDI, PPP and PPP2 show the expected relationship is found.

## ■ Robustness test for IPR protection

- First Test
  - Checking the coefficients of PPP and PPP<sup>2</sup> after **omitting some variables** which are indicators of the country.
    - ❖ MKT: Market Size-real GDP in the country (US\$, 2005=100)
    - ❖ Wage: Real Wage Ratio
    - ❖ Export: Export Ration
- Second Test
  - Checking the coefficients of PPP and PPP<sup>2</sup> after **including other institutional variables**.
    - ❖ Legal System & Property Rights
    - ❖ Judiciary independence
    - ❖ Impartial courts
    - ❖ Integrity of the legal system

## ■ Results robustness test

	<i>coeficient of PPP</i>	<i>coeficient of PPP<sup>2</sup></i>
<i>Omitted variables</i>		
<i>MKT</i>	-0.76479 *** (0.29591)	0.07092 *** (0.2608)
<i>Wage</i>	-0.37407 (0.26482)	0.03338 (0.02201)
<i>Export</i>	-0.72831 ** (0.29329)	0.06893 ** (0.02573)
<i>Additional Variables</i>		
<i>Legal System &amp; Property Rights</i>	-0.95771 ** (0.31523)	0.06221 ** (0.02731)
<i>Judiciary independence</i>	-0.61275 **** (0.30884)	0.05740 ** (0.02724)
<i>Impartial courts</i>	-0.32087 (0.33280)	0.02113 (0.02993)
<i>Integrity of the legal system</i>	-0.67321 ** (0.32012)	0.00944 * (0.02807)

- Almost all result of both test shows the U-shaped relationship between IPR protection and FDI is stable.

note: standard error are in parenthesis. \*\*\*, \*\* and \* mean statistically signific. at 1%, 5% and 10% respectively.

## 5. Conclusion

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- Technology export from R&D by Japanese Food Industry has balanced with technology import since 1990's
- Technological export by Japanese Food Industry has exceeded technology import in 2000s
- The U-shaped relationship between IPR protection and FDI in Japanese Food Industry is revealed by estimating poisson model.
- FDI is considered it has potential to transfer technologies from developed country to developing country through spill over effect.
- The relationship between IPR protection and FDI should be examined in terms of behavioral theory of the firm to establish the effective trade agreement such as TRIPS in WTO.

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**Thank you for your attention!**

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