



Make or Buy, and/or Cooperate? The Property Right Approach to Auto-Parts Procurement in Japan



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Abstract

We perform a micro-data analysis on auto parts procurement in Japan. Asanuma(1989; 1992) classified Japanese auto parts subcontractors according to the degree of **initiative** for product and process designs. The initiative results in **relation-specific skills** acquired by the suppliers within the **technology cooperation associations** led by the auto manufacturers. This paper addresses the relationships in a property rights theory of Whinston(2003), where participation in the associations is considered as non-contractible investments for the relation-specific skills. Some specified models imply effects on a **vertical integration** likelihood of both **importance** of buyers' or sellers' non-contractible investments and **specificity** in the acquired relation-specific skills. Estimating the degree of vertical integration with some proxies for importance (the association participation) and specificity (mutual dependence of sales or purchase), we found that it is not likely in the manufacturers' but **suppliers'** initiative which their own relation-specific skills are created through the association activities, as Asanuma suggested.

Introduction

The property right approach to the Coasian firm's boundaries, pioneered by Hart and Moore(1990) has been developed in many applied fields(Segal and Whinston, 2013). Despite of the explosive popularity in the theoretical development, empirical analyses on the approach itself have been surprisingly rare(Lafontaine and Slade, 2013). This paper aims at filling in the gap, extracting information on the auto-parts associations for technology cooperation as non-contractible investments for relation-specific skills in the Japanese auto parts industry(Asanuma, 1989; 1992). To explore an empirical analysis, we rely upon a general setup of Whinston(2003), where non-contractible investments by a buyer or a seller create the relation-specific skills.

The Japanese Auto-Parts Subcontractors

Asanuma(1989;1992) investigated the Japanese auto-parts suppliers, finding

- The degree of **initiative** in design of the product and the process.
- Relation-specific skills** that become visible in different processes including interactions during development stages.

Whinston(2003) Model

- General setup of the property right approach
 - A bilateral trade setting between a buyer B and a seller S
 - The seller S uses an upstream asset for production
 - Buyer integration:
 - The buyer B owns the asset: Vertical integration $A_B=1$
 - The seller S owns it: Non-integration $A_B=0$
- Timing of decision-making
 - At time 0: Two parties decide who will own the asset, agreeing 'contractible investments'
 - At time 1: Make 'noncontractible investments' i_B and i_S w/ costs $c_B(i_B)$ and $c_S(i_S)$
 - At time 2: Nash bargain over trade, w/ equal bargaining power
- Assuming linear quadratic functions
 - Profits from efficient trade: $\pi(i_B, i_S)=\alpha_0+\alpha_B i_B+\alpha_S i_S$
 - Payoffs to the buyer B in his next-best alternative to trading with S: $\omega_B(i_B, i_S | A_B)=(\beta_0+\beta_{B0} i_B+\beta_{S0} i_S)(1-A_B)+(\beta_1+\beta_{B1} i_B+\beta_{S1} i_S)A_B$
 - Payoffs to the seller in his next-best alternative to trading with B: $\omega_S(i_B, i_S | A_B)=(\sigma_0+\sigma_{S0} i_S+\sigma_{B0} i_B)(1-A_B)+(\sigma_1+\sigma_{S1} i_S+\sigma_{B1} i_B)A_B$
 - $(\alpha_0, \beta_0, \beta_1, \sigma_0, \sigma_1)$: 'Contractible' investment
 - Self-investments, cross(cooperative)-investments
 - Hart(1995) as a special case without cross-investments
 - Costs: $c_B(i_B)=0.5(i_B)^2$ and $c_S(i_S)=0.5(i_S)^2$
- Equilibrium
 - $i_B^*=0.5[\alpha_B+(\beta_{B0}-\sigma_{B0})(1-A_B)+(\beta_{B1}-\sigma_{B1})A_B]$
 $=\arg \max \omega_B(i_B, i_S | A_B)+0.5[\pi(i_B, i_S)-\omega_B(i_B, i_S | A_B)-\omega_S(i_B, i_S | A_B)]-c_B(i_B)$
 - 'Quasi-rents' split half
 - $i_S^*=0.5[\alpha_S+(\sigma_{S0}-\beta_{S0})(1-A_B)+(\sigma_{S1}-\beta_{S1})A_B]$
 - Welfare level $W^*(A_B; \alpha, \beta, \sigma)$

Comparative Statics

- A change in the equilibrium welfare level from asset ownership $\Delta=[W^*(A_B=1; \alpha, \beta, \sigma)-W^*(A_B=0; \alpha, \beta, \sigma)]$
 - Likely to increase prob. of vertical integration
 - 'Contractible' investments: Irrelevant
 - Changes in marginal returns to 'non-contractible'
 - If B (or S, in parallel) invests more under integration (non-integration) $A_B = 1$ ($A_B = 0$), an increase in α_B (α_S) increases the joint return from the B's (S's) investment, resulting in higher (lower) probability of integration.
 - In an underinvestment relative to the first-best $(i_B^{**}, i_S^{**})=(\alpha_B, \alpha_S)=\arg \max \pi(i_B, i_S)-c_B(i_B)-c_S(i_S)$, an increase in investment level under an ownership structure raises the surplus generated under that structure.
- Two concepts on marginal returns to non-contractible investments
 - Importance**
 - Importance of B's investment in improving the upstream asset raises $\alpha_B, \beta_{B1}, \sigma_{B0}$
 - Importance of S's investment in improving the asset raises $\alpha_S, \beta_{S1}, \sigma_{S0}$
 - Specificity** for B: Similarly for S
 - Marginal *people* specificity for B of i_B : Difference $\alpha_B-\beta_{B1}$
 - Marginal *asset* specificity for B of i_B : Difference $\beta_{B1}-\beta_{B0}$
 - An increase in marginal people specificity holding asset specificity fixed: Equal-sized reductions in β_{B1} and β_{B0}
 - An increase in marginal asset specificity holding people specificity fixed: A decrease in β_{B0}

3 Specific Models for Relation-specific Skill

- Model 1:** Relation-specific skill is exogenous and only B makes non-contractible self-investment complementary to S's acquisition of the skill.
- Model 2:** Only B's investments create the relation-specific skill for S.
- Model 3:** Only S's investments create the relation-specific skill for S.

Effect on likelihood of vertical integration	More importance of relation-specific skill		More specificity			
	Buyer	Seller	Buyer		Seller	
			People	Asset	People	Asset
Model 1: Exogenous relation-specific skill	(+)	(0)	(+)	(+)	(0)	(0)
Model 2: B's investments create relation-specific skill for S	(+)	(+)	(0)	(-)	(-)	(-)
Model 3: S's investments create relation-specific skill for S	(-)	(-)	(0)	(-)	(-)	?

Table 1. Comparative Statics of the Specific Models

Estimation

- Data: *Basic Survey of Japanese Business Structure and Activities* (METI, Japan)
 - The Census of Manufactures* (METI, Japan): 5 major components as products
 - Japanese Automotive Parts Industry* (JAPIA): the 9 associations for technology cooperation founded w/ auto-manufacturers
 - 1995-2006, Unbalanced panel data: Sample size 603,505
- Censored data of ownership ratio (voting rights): A parent company w/ a name or none for a subsidiary
 - Tobit, IV Tobit and special regressor probit: Instruments 5 products dummy variables, log of capitals, independent variables.
- Explanatory variables:
 - Specificity: Sales value ratio of trading w/ its parent, Purchase ratio of trading w/ its subsidiary
 - Importance: 9 dummy variables=1 if included in each of the 9 associations: Toyota, Nissan, Mitsubishi, Mazda, Isuzu, Daihatsu, Hino, Honda or Subaru, or =0 otherwise
- Results:
 - Significance of importance variables with negative signs is evident, which suggests **model 3** can be accountable to the relation-specific skill acquired by the Japanese auto-parts suppliers.
 - Positive significance of the proxy variables for specificity indicates **model 1** might be applicable, too.

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