Asanuma classified Japanese auto parts subcontractors according to the degree of initiative in 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.

The property rights 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

1. General setup of the property right approach
   a. A bilateral trade setting between a buyer $B$ and a seller $S$
   b. The seller $S$ uses an upstream asset for production
   c. Buyer integration:
      - The buyer $B$ owns the asset: Vertical integration $A_B = 1$
      - The seller $S$ owns it: Non-integration $A_S = 0$
   2. Timing of decision-making
   a. At time 0: Two parties decide who will own the asset, agreeing ‘contractible investments’.
   b. At time 1: Make ‘noncontractible investments’ $i_p$ and $i_w$ with costs $c_i(i_p)$ and $c_i(i_w)$
   c. At time 2: Nash bargain over trade, $w$ equal bargaining power
   3. Assuming linear quadratic functions
   a. Profits from efficient trade: $\pi_w(i_p, i_w) = \alpha_0 + \alpha_1 i_p + \alpha_2 i_w$
   b. Payoffs to the buyer in his next-best alternative to trading with $S$: $\pi_{wB}(i_p, i_w) = \alpha_0 + \alpha_1 i_p + \alpha_2 i_w + \beta_1 i_p + \beta_2 i_w$
   c. Payoffs to the seller in his next-best alternative to trading with $B$: $\pi_{wS}(i_p, i_w) = \alpha_0 + \alpha_1 i_p + \alpha_2 i_w + \beta_1 i_p + \beta_2 i_w$
   4. Equilibrium
   a. $i_p = 0.5 \frac{\alpha_0}{\alpha_1 + \alpha_2} (\beta_1 - \beta_2) + \beta_2 A_S$
   b. $i_w = 0.5 \frac{\alpha_0}{\alpha_1 + \alpha_2} (\beta_1 - \beta_2) + \beta_2 A_S$
   c. Welfare level $W(i_p, i_w, \beta_1, \beta_2)$

3 Specific Models for Relation-specific Skill

<table>
<thead>
<tr>
<th>Model</th>
<th>Exogenous relation-specific skill</th>
<th>More importance of relation-specific skill</th>
<th>More specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1:</td>
<td>Yes</td>
<td>(1)</td>
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<td>Model 2:</td>
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<tr>
<td>Model 3:</td>
<td>Yes</td>
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</tr>
</tbody>
</table>

1. Data: Basic Survey of Japanese Business Structure and Activities (METI, Japan)
2. The Censuses of Industries (METI, Japan): 5 major components as products
4. 1999-2005, Unbalanced panel data: Sample size 603,505
5. Censored data of ownership ratio (voting rights): A parent company w/ a name or none for a subsidiary
6. Tobit, IV Tobit and special regressor probit: Instruments 5 products dummy variables, log of capitals, independent variables.

3. Explanatory variables:
   a. Specificity: Sales value ratio of trade with its parent, Purchase ratio of trading with its subsidiary
   b. Importance of 9 dummy variables: if included in each of the 9 associations: Toyota, Nissan, Mitsubishi, Mazda, Isuzu, Daihatsu, Hino, Honda or Subaru, or 0 otherwise

4. Results:
   a. 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.
   b. Positive significance of the proxy variables for specificity indicates model 1 might be applicable, too.

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References