Property Rights Approach within Multiple Transactions

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Abstract

We explain by property rights approach with multiple transactions that why the local firm does not merge multinationals if multinationals have many transactions while local company does not.
Hart and Moore [1990] did not consider the effect that does not appear in single transaction. In multiple transactions asset would be owned by third party other than the party involved in the transaction. This causes the reduction of payoff of the parties of the transaction because third party gets the payoff because of the ownership of the asset that is essential for the transaction. Thus hold-up problem of the transaction is worsened.
We also consider the CPEC firm transactions based on the theory and try to derive optimal FDI within CPEC or other trades.

1 Introduction

The hold-up problem occurs whenever verifiability and incomplete contracts matter. The seminal paper of Grossman and Hart [1986] shows that the allocation of property rights is one tool for mitigating the hold-up problem. Hart and Moore [1990] extended the property right theory to multiple assets. However, they did not consider the effect that does not appear in single

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transaction. In multiple transactions asset would be owned third party other than the party involved in the transaction. This causes the reduction of payoff of the parties of the transaction because third party gets the payoff because of the ownership of the asset that is essential for the transaction. Thus hold-up problem of the transaction is worsened. These effects are essential for multinationals. When multinationals develop the market of the foreign countries, they merger or make FDI, or buy or sell the local countries' firm. Former is called intra-firm transaction, while letter inter-firm transaction. Antras several seminal works endogenized such decision within the international trade extending GHM's property rights approach into general equilibrium model.

They assume, however that the local firm does not merge multinationals and do not endogenized that. Our model explains by property rights approach with multiple transactions that it does not happen when multinationals have many transactions while local company does not.

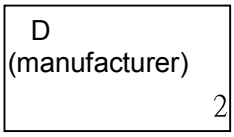
Essence of the model is quite simple. Multinational has many transactions, then one local firm that sell only one bidet. Suppose the local firm merges the multinational in order to improve the relation specific investment of the transaction. It could increase the relation specific investment of the transaction and might improve the quality of the bidet. However, those mergers cause a negative effect to the other transaction by the multinationals because essential asset of the multinational is also important for other transaction and the locals get the ex-post surplus of other transactions by multinationals and other local firms. This cause the hold-up problem within other transaction is more severe. The multinational has more transaction, the hold-up problem getting worse. Thus big company that has many transactions should not be merged by the small firms with less or only one transaction.

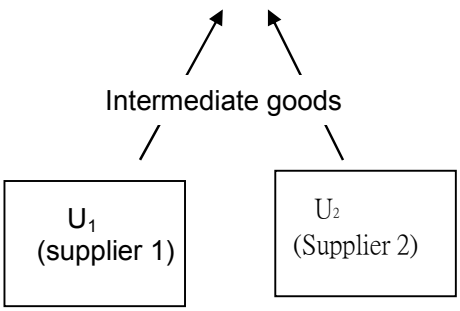
The paper is organized as follows. The simple model is presented in section 2. In section 3 we extend the model with more transaction as is multinationals and show the more transaction the more inefficient when the local firm merge the multinationals. Section 4 is concluding remarks.

2 The simple Three Unit Model

There are three periods, dates 0, 1 and 2 and three risk neutral players, we call it unit, which is either independent firm or division of the firm and it is supposed to behave as if one agent. One player is a downstream unit *D* that buys many kinds of intermediate goods from the upstream firm.

Figure 1





Example of the firm is multinationals buying many intermediate goods from oversea local firm globally[2]. In section 3 we consider the case in which many firms sell intermediate goods to the single firm. But now we simplify the model and only two upstream units U_1 and U_2 is assumed to sell different kinds of intermediate goods from each other to the downstream unit.

At date 0 the downstream unit D and upstream units U_1 and U_2 allocate the property rights. For example, if each units has only own assets, these three unit are all independent firm. if downstream firm have all the assets, on the other hand, there is only one firm that has a two upstream units. we derive optimal allocation of property rights within multi-units transactions, which determines the optimal firm boundaries within the transactions based on the amounts of ex-ante investments as follows.

Then at date 1 all the firms make relation-specific investments. D has a two transactions and makes an two types of investment, one is for U_1 and the other is for U_2. We denote these investment i_1 and i_2 respectively. U_1 and U_2, on the other hand, have one transaction and one kind of investment, denoted e_1 and e_2 respectively.

At the beginning of period 2, after the levels of investment and uncertainty is revealed, renegotiation occurs and binding contracts can be written, after which production and transaction takes place. We summarize the sequence of the events in Figure 2. At date 0 the property rights are allocated. At date 1, all the units make relation-specific investments. At date 2, after the realization of these investments and uncertainty, renegotiation takes place. Then production and trades occur.

Each upstream unit, U_i,(i = 1, 2), produces widget to D with a cost of C_1,C_2 respectively. And this is an decreasing function of ex-ante relation specific

[2] see Antras[2013]

specific investment, e_j , $C_j = C_j(e_j)$, $j=1,2$, $\frac{dC_j}{de_j} < 0$, $\frac{d^2C_j}{de_j^2} > 0$

Downstream Unit D makes an relation specific investment for each U_j,(j =1, 2) and makes two modules R_j, (j = 1, 2).After that final goods are produced by combining the two modules. Price of final goods amounts to

Figure 2 timeline

0 period	1 period	3 period
allocation of property rights	relation specific investment	renegotiation, production and transaction

$P = R_1 + R_2$. These R_j also depends on relation specific investment by The downstream firm D, $R_j = R_j(i_j)$, (j = 1, 2), $\frac{dR_j}{di_j} > 0$, $\frac{d^2R_j}{di_j^2} > 0$ Relation Specific Investment i by down is supposed to be quality enhanced investment and to raise the value of R_j .

At time 2, after the investments, and after uncertainty that is implicit in the model is revealed, renegotiation occurs and the price of the intermediated goods, p_j, (j = 1, 2) are determined.

Default situation of Renegotiation is each unit sell or buy the widgets to or from the outside markets: U_j （j = 1, 2） sell their widget in the outside market with the price of $\overline{p_j}$,(i = 1, 2). And the D buys the same kinds of intermediate goods from the market, with the price is $\overline{p_j}$,(i = 1, 2). In this model we assume that if they buy or sell the market, the value of the module decrease and the cost of widgets increase. And in the default situation, cost and value are depends on the allocation of the property rights to each units, as Grossman and Hart[1986] and Hart and Moore[1990]. Basically, the more assets these units have, more efficiency they achieve.

First, U_j 's cost at the outside market is $c_j = c_j(e, \Psi_j)$ and Ψ_j represents the set of the asset owned by U_i, $\Psi_i \subset \{U_1, U_2, D\}$. Similarly D 's value of the module is $r_j = r_j(i, \Phi)$, and Φ represents the set of the asset owned by $\Phi \subset \{U_1, U_2, D\}$. as mentioned, default situation is less e□cient than first best attained with ex-post binding contracts. It is summed up Proposition 1

Assumption 1 *for all* e_j, $i_j > 0$, Ψ_i, Φ_j,

$$|C_j'(e_j)| > |\frac{\partial c_j(e, \Psi_j)}{\partial e}| \qquad R_j'(i_j) > \frac{\partial r_j(i, \Phi)}{\partial i}$$

We also assume that those investments are cooperative investment. Thus the first-best outcome cannot be implemented by a simple trading contract as in Edlin and Reichelstein[1998]. This is basically the result of Che and Hausch [1999]. A simple contract cannot prevent the hold-up problem and the first-best outcome cannot be achieved. Thus optimal allocation of property rights is the best treatment to mitigate hold-up problem.

We specify the multi-player bargaining process under symmetric information that is conducted after the investment and after uncertainty is revealed. As the complete contract can be achieved ex-post, the players can share the surplus through enforcement of the ex-post binding contract. We assume that they divide the ex-post surplus according to the Shapley Value[3]. And the bargaining is taken place in each transaction with all the stakeholders of the transaction.

The bargaining outcome depends how many assets each unit has. In this case, U_1 and U_2 produce different kinds of widgets. And there is no use to buy opposite upstream unit. First, to make things interesting, we abstract the merger by upstream unit each other and we assume that neither U_1 buys U_2 nor U_2 buy U_1.

These assets are allocated according to achieve more efficiency based on the Coarse theory at 0. And we could ignore the meaningless ineffcient allocation that is Pareto dominated by other allocation. Cross holding, such as U_1 has U_2 unit while U_2 has U_1 are the typical examples. Thus we assume that if each unit has a asset, at least she must have their asset as well as omitting joint ownership.

And we also assume that despite upstream firms excess profit comes from the value of the module, assemble process is also essential and the asset of the downstream firm cannot be divided into two parts.

Assumption 2 ***D can not be hold by multiple party and the asset can not be be divided.***

Consequently, allocation of the asset is only five types. one is all independent, which means each unit only has their own asset. $\Psi_1 = \{U_1\}$, $\Psi_2 = \{U_2\}$, $\Phi = \{D\}$. Second only upstream firm has all the asset: $\Psi_1 = \{\}$, $\Psi_2 = \{\}$, $\Phi = \{D, U_1, U_2\}$. Third are heterogenous holdings by downstream firm, namely, either $\Psi_1 = \{U_1\}$, $\Psi_2 = \{\}$, $\Phi = \{D, U_2\}$ or $\Psi_1 = \{\}$, $\Psi_2 = \{U_2\}$,$\Phi = \{D, U_1\}$. The final allocation is either upstream firm merges the down- stream firm. And we assume that D do not need U_1 to make module R_2 and vise versa. Then we

[3] The non-cooperative bargaining foundation of the Shapley value is developed by Gul [1989] and Hart and Mas-Corell[1995]. It is easily shown that the distribution according to the Shapley Value belongs to the core and is very stable.

sum up to the following Assumption.

Assumption 3 *for* $j = 1, 2$, *and for all* e_j

$$|\frac{\partial c_j(e_j, \{U_1, U_2, D\})}{\partial e_j}| = |\frac{\partial c_j(e_j, \{U_j, D\})}{\partial e_j}| > |\frac{\partial c_j(e_j, \{U_j\})}{\partial e_j}| > |\frac{\partial c_j(e_j, \{\})}{\partial e_j}|$$

and Using the notation of $-j$ *which means not* j

$$\frac{\partial r_j(i_j, \{D, U_j, U_{-j}\})}{\partial i_j} = \frac{\partial r_j(i_j, \{D, U_j\})}{\partial i_j} > \frac{\partial r_j(i_j, \{D\})}{\partial i_j} > \frac{\partial r_j(i_j, \{\})}{\partial i_j}$$

Only in the allocation in which either upstream firm merges the downstream firm, an asset is owned by the third party who is not involved in the transaction. This causes the reduction of payoff of the parties in the trans- action because third party has a right to get the payoff that is brought by the asset he owns.

We call those effects third party ownership effect. If U_1 holds D, U_1 holds an asset that is essential in the transaction between U_2 and D and U_1 can partially get the surplus of the bargaining. We show how the third party ownership effect could be harmful to the transaction. First we define third party ownership as follows:

Definition 1 ***third party ownership*** *if other unit that do not participate the transaction have a asset, we call it third party ownership.*

The effect becomes severe if D has more transactions with more kinds of widget despite the only one upstream firm merge D. In the next section, we show that increasing the number of the transactions by D makes the third party ownership effect stronger and it is not optimal for any upstream firm to own D.

3 Deriving Investment and Optimal Allocation of Property Rights

Then we turn to the bargaining outcome based on the definition 1.

First we derive the outcome without third party ownership as lemma 1.

Lemma 1 *Without third party ownership. allocation by bargaining based on Shapley value amounts to only two units Nash bargaining as 50:50 of the surplus to each party.*

proof *First we define value function to derive the Shapley value without third party ownership. This is asfollows:*

$$v(D, U_j) = R_j - C_j$$
$$v(D) = r_j - \bar{p}_j$$
$$v(U_j) = \bar{p}_j - c_j$$

Thus the surplus of both D, U_j is defined to be π_D, π_{Uj} respectively,

$$\pi_D = \frac{1}{2}(R_j - C_j) + \frac{1}{2}(r_j + c_j) - \bar{p}_j$$

$$\pi_{Uj} = \frac{1}{2}(R_j - C_j) - \frac{1}{2}(r_j + c_j) + \bar{p}_j$$

This amount to be an Nash bargaining of 50 % : 50 % to D, U_j.(q.e.d.)

Next, we consider the bargaining outcome of the case with third party ownership. in this case, without loss of generality, we can specify the case that U_1 owns D and U_1 participates the bargaining of the D and U_2 transaction. And the assets can be sold at the market with value value without no profit. Thus the value function of only U_1 is assumed to be $v(U_1) = 0$. Thus the bargaining outcome of the case with third party ownership is derived as follows

Lemma 2 *Then both profit of D, U_2 are π',π' respectively*

$$\pi'_D = \frac{R_2 - C_2 - c(U_2)_2 - 2r(\phi)_2}{3} - \frac{r(D)_j}{6} - \bar{p}_j$$

$$\pi'_{U2} = \frac{R_2 - C_2 - r_2(D) - 2c(U_1)_j}{3} + \bar{p}_j$$

proof **Value function of D, U_1,U_2 is as follows:**

$$v(D, U_1, U_2) = R_2 - C_2 \ , \ v(D, U_1) = r_2(D) - \overline{p}_2$$
$$v(D, U_2) = r_2(\varphi) - c_2(U_2) \ , \ v(U_1, U_2) = \overline{p}_2 - c_2(U_2)$$
$$v(D) = r_2(\varphi) - \overline{p}_2 \ , \ v(U_2) = p - c_2(U_2) \ , \ v(U_1) = 0$$

Based on the allocation of Shapley value, we derive the ex-post surplus. (q.e.d.)

Then we consider the relations specific investments. First, based on the contract incompleteness, hold-up problem occurs.

Proposition 1 *First best investment cannot be attained because of the con- tract incompleteness. But hold up problem is taken place. Adequate allocation of the property rights can mitigate the hold up problem. Thus optimal allocation of the property rights determines the boundary of the firm.*

proof *First best, $\hat{e}_j$, $\hat{i}_j$ is derived solving the F.O.C.*

$$|C_j{}'(e_j)| - 1 = 0 \ , \ R_j{}'(i_j) - 1 = 0 \ , \ (j = 1, 2)$$

From lemma 1,2 and Assumption 3. relation specific investments are all lower than the optimal $\hat{e}_j$, $\hat{i}_j$. *Assumption 3 shows that the ex-ante investment depends on the allocation of the property rights. Thus the optimal allocation of the property rights exists and that brings second best investment level. (q.e.d.)*

In this model, optimal allocation of the property depends on various aspect of the asset and the investment and any those allocation could be optimal. This is the famous result of Grossman Hart [1986] and Hart Moore [1990] and Hart [1995]. In this paper, our contribution is to show third party ownership make the transaction ine□cient although those integration improve the investment to the other transaction. Thus these types of integration (one upstream firm merges downstream firm) cause an negative externality to the other transaction. Thus we show that.

Proposition 2 *With third party ownership, investment is lower than without that.*

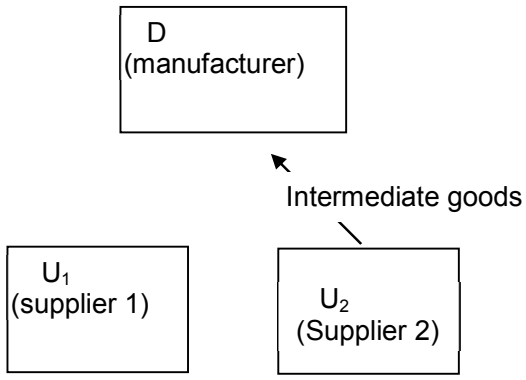
proof *All we must show is that the ex-post surplus of both U_2 and D is decreasing*

because of U_1. U_1's ex post surplus is as follows:

$$\pi'_{U1} = \frac{R_2 - C_2 - r_2(\phi) - c_2(U_1)}{3} + \frac{r_2(U_1) - r_2(\phi)}{6}$$

$\pi'_{U1} > 0$ means $\pi_{U1} > \pi'_{U1}$ and $\pi_D > \pi'_D$. This means that ex-ante investments of both U_2 and D also decreasing. (q.e.d)

Figure 3 Third Party Ownership
If U_1 owns D, U1 gets the surplus of the transaction between D-U_2



Those negative effects of the third party ownership become severe, be- cause third party ownership improve only one transaction but aggravate all the other transactions because that affects all the other transactions because of the merger by the upstream firm. From the following proposition, we show the inefficiency of the third party ownership make such an ownership inefficient if the number of the transactions of downstream firm increases more.

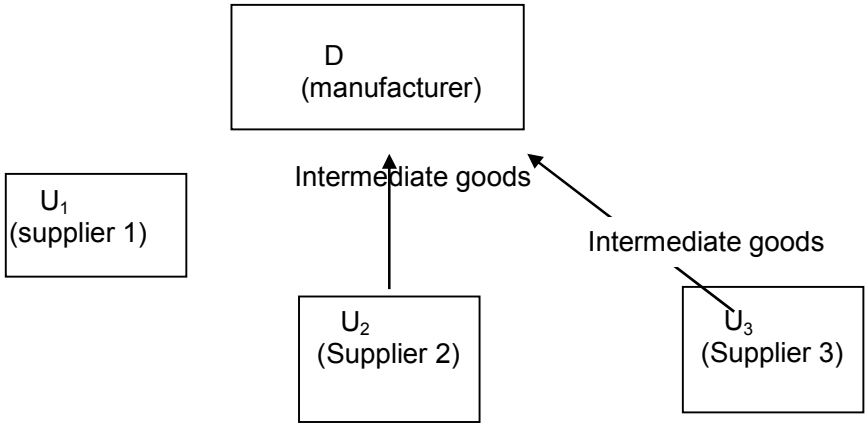
Proposition 3 ***ineffciency of third party ownership when trans- actions increases***
If the number of transaction of D,n increases, third party ownership be- come ine□cient.

proof

$$B_{u1} = \pi_{U1} - n\pi'_{U1}$$

if $n \to \infty$, B_{u1} go to negative.(q.e.d)

Figure 4 Third Party Ownership
If U_1 owns D, Third Party Ownership is harmful if transaction increases



We restrict the model that only one downstream firm has many transactions with upstream firms and show the inefficiency of third party ownership.

But it can be also applied to the case with one upstream firm has many transaction with many downstream firms. And hybrid of them, namely one firm has many transactions both upstream firms and downstream firms. In all the cases, one other firm should not merge the firm with many transactions by other many firms.

3 Concluding Remarks

When multinationals develop the market of the foreign countries, they merger or make FDI, or buy or sell the local countries 'firm. Former is called intra-firm transaction, while letter inter-firm transaction. Antras seminal works endogenize such decision within the international trade general equilibrium model.

In this paper, We show that in multiple transactions asset would be owned third party other than the party involved in the transaction. This causes the reduction of payoff of the parties of the transaction because third party gets the payoff because of the ownership of the asset that is essential for the transaction. Thus hold-up problem of the transaction is worsened.

The property right theory can be simply applicable to the case with multi- national transactions, especially for small country cases. This paper shows that company who has more transaction, such as multinationals should not be merged by the small downstream firm or upstream firms. Multinationals, on the other hand, have two options to merged the local

firm or buy or sell the goods to local firm without mergers.

In Pakistan, multinationals bought some Pakistani companies to get the profits from two or three big mergers in 2016[4]. In these cases, merger should be decided based on the e□ciency. Based on the property rights theory, if the Pakistan firm's skills and effort is important, it should be independent, while multinationals technology or skills are more important, it should be merged by the multinationals. We will check that further.

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[4] See Multinationals Buying Pakistani Companies to Profit From Growth http://southasiainvestor.blogspot.jp/2016/07/multinationals-buying-pakistani.html and Shanghai Electric Power Co. said it plans to buy a controlling stake in the power utility valued at 1.6 billion http://www.bloomberg.com/news/articles/2016-08- 30/pakistan-s-k-electric-rises-after-1-6-billion-shanghai-offer

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