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Abstract

Why do large firms in Japan hold small percentages of stock in trading partners? A firm that holds stock in a trading partner weakens its own bargaining position, for a portion of its own gain from trade then includes a share interest in the partner's gain from trade. But precisely for this reason the firm can at any time penalize the trading partner by divesting its share interest. Cross-shareholding therefore strengthens the penalties for opportunism and this may be its purpose. Opportunism here means substituting products of lower quality than claimed or misrepresenting investments that lower the other party's costs. Econometric analysis of the pattern of cross-shareholding within Japan's keiretsu groups in 1980 reveals evidence that is consistent with this argument. (J.E.L. classifications: D23, G30, L14)

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THE KEIRETSU PUZZLE

1. Introduction.

One of the most puzzling features of Japanese business is the prevalence of small shareholding ties (5% of stock or less) between large firms that are trading partners. These shareholding ties are most prominent in the keiretsu, the six major business groups that include most of the largest companies in Japan.[1] For instance 27.4% of the outstanding shares of the 25 companies that were affiliated with the presidents' club of the Mitsubishi group in 1988 were held inside the same group. The average stockholding of each of the 21 nonfinancial members of the presidents' club in each of the others was about 1% in 1980.[2] Similar statements could be made about the presidents' clubs of the Mitsui, Fuyo, Sumitomo, Sanwa, and Dai-Ichi Kangyo keiretsu. Why do the members of Japan's keiretsu hold small amounts of one another's stock? This is the keiretsu puzzle.

None of the proposed theories of keiretsu cross-shareholding is entirely satisfactory. These include (1) the anti-takeover theory, (2) the externality theory, and (3) the successive monopoly theory. In the anti-takeover theory it is argued that the shareholding interlocks are to make takeovers less likely, either to insulate managers from disciplining by shareholders (Odagiri, 1975; Kobayashi, 1980; Aoki,

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[1]The word "keiretsu" means "affiliates" and is applied to two kinds of business groups in Japan besides the six so-called "financial keiretsu" to which I refer here. There are also "distribution keiretsu" consisting of a manufacturing firm (Matsushita, Shiseido, Nikon) and its family of wholesalers and retailers bound to one another by contractual agreements, and "enterprise keiretsu" which comprise a large manufacturing firm (Nippon Steel Co., Toyota, Mitsubishi Heavy Industries) and its myriad subsidiaries and subcontractors.

[2]Banks and other financial institutions, although limited by Japan's antimonopoly laws from holding more than 10% of the stock in any one company have in fact been the biggest shareholders in the keiretsu (The limit was lowered to 5% for banks as of 1987). The burgeoning literature on the "main bank" system of Japan develops the argument that shareholding by keiretsu financial institutions lowers the costs of their intermediation by resolving agency problems. Flath (1984), Hodder and Tshoegel (1985), Sheard (1989), Prowse (1990), Hoshi, Kashyap, and Scharfstein (1991), and Flath (1993), all emphasize the economic advantages of banks' holding of stock in clients. But these arguments shed almost no light on the shareholding ties that link nonfinancial firms.

1984), or else to prevent hostile stock raiders from abrogating a firm's long-term contracts (Ramseyer, 1987; Aoki, 1987; Sheard, 1991). The anti-takeover theory is a leading theory of keiretsu cross-shareholding largely because of the extreme infrequency in Japan of hostile takeovers. Because takeovers are so rare the notion is widely held that takeover defenses have been effective, and cross-shareholding has appeared to many to be such a defense. But it is far from obvious that cross-shareholding in fact is an effective takeover defense; why should institutional shareholders be any less reluctant than other shareholders to tender their shares in the event of an enriching bid? Perhaps takeovers have been rare in Japan not because defenses are effective but because the potential gains from successful takeovers are small. At the least, validation of the anti-takeover theory of cross-shareholding awaits further empirical investigation, for instance relating the pattern of cross-shareholding to the likelihood of hostile takeover bids and to cross-shareholdings' relative effectiveness as a takeover defense.

In the externality theory, firms affiliate with one another in order to internalize the gains from activities with potential spillover effects. For instance if advertising by one firm benefits other firms that have its same trademark, then this very fact both induces firms to establish common trademarks with other firms and to hold shares in the other firms (Hadley, 1970; pp. 247-8, 253-4). Besides advertising, the activity with spillovers could be research and development or the collection and dissemination of information (Goto, 1982).

In the successive monopoly theory, firms that have market power and are trading partners establish share interlocks to induce one another to set prices or orders for production that are in their common interest as opposed to one's selfish interest (Caves and Uekusa, 1976; Fung, 1991). It is clear that shareholding ties have the potential of aligning the interests of successive monopolists (See Flath (1989) for an algebraic example). But the problem with this as an explanation for the shareholding

interlocks observed in the keiretsu is that the interlocks are quite small. Often as little as 1% of a company's stock is held by any one other company, and the average level of cross-shareholding in fellow group members is also small. If the purpose of the cross-shareholding is the integration of successive monopolies, then why is the cross-shareholding so limited in extent? This is also a problem for the externality theory: How could small shareholdings result in any significant alignment of interests or capture of spillovers?

Perhaps, after all, the keiretsu cross-shareholding is merely symbolic, its point being to signal the existence of an ongoing business relation between companies. If this is so then the size of the shareholding is not important so long as it passes some threshold of observability which may be quite small. For it is not the shareholding itself but the relationship which it signals that alters the calculations of the firm, its rivals, customers, or suppliers. Yamamura (1979) comes close to arguing this. And Imai (1990), in fact uses the very word "symbolic" (p. 172) in describing the keiretsu cross-shareholding. So does Gerlach (1987, p. 131).

It is my contention that cross-shareholding between nonfinancial firms that are trading partners does in fact serve an economic purpose, that it is not merely symbolic. The economic purpose is that it deters opportunistic behavior. Holding stock in a trading partner slants the bargaining over product market variables in favor of the trading partner. Divesting such a stock interest accomplishes the reverse. The firm that holds shares in a trading partner can credibly threaten to divest should the trading partner behave opportunistically, withdrawing from it the bargaining advantage that the equity position had conferred. In this manner a firm may establish a partial equity position in a trading partner to deter opportunism. Gilson and Roe (1993) make rather similar claims to these in passing (See in particular pp. 885-7 and p. 900 of their paper), but they do not develop the argument in detail nor confront it with empirical evidence. In another related paper, Berglöf

and Perotti (1994) develop a model in which a coalition of a firm's trading partner's maintain a controlling share interest and act directly to forestall opportunism. In my argument, one trading partner of a firm deters opportunism towards itself by maintaining a silent financial interest which it threatens to divest if it is ever deceived.

Evidence that I will present supports the view that keiretsu cross-shareholding deters opportunism. Equity links are greater between keiretsu firms that by virtue of the industries to which they belong are likely to be trading partners. Also equity links are greater where opportunism is less deterred by the mere loss of reputation with the trading partner.

In developing my argument I propose a model of share trading and product market choices in a bilateral monopoly. The share trades are made through an efficient stock market, one in which share prices reflect a correct anticipation of product market outcomes. The product market outcomes fulfill the Nash bargaining solution.

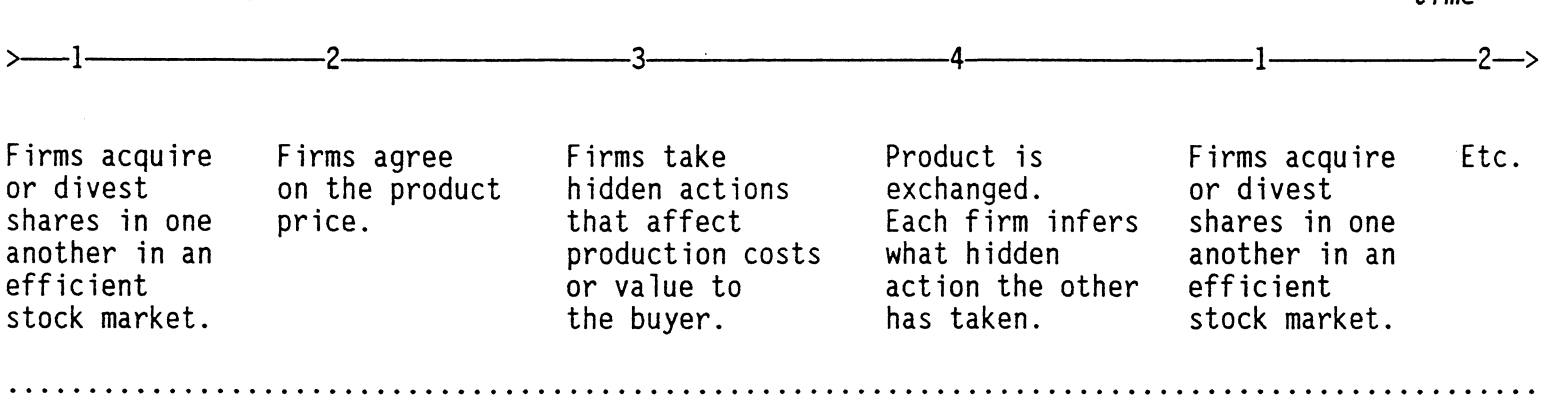
2. Cross-Shareholding, Bargaining, and Opportunism.

2.1. basic framework.

The model envisions a sequence of actions by two firms that are bilateral monopolists. First, each firm either purchases or divests shares in the other in an efficient stock market, or receives shares as a sidepayment from the other. If a firm receives shares as a sidepayment it then either sells the shares, holds them or acquires more shares in an efficient stock market. In the second stage, the firms agree on the product price. In the third stage, each firm takes some action that is hidden from the other but which determines the upstream firm's cost of supplying the downstream firm and determines the quality of the product to be exchanged (about which more, shortly.) Finally, the product is exchanged, and each firm now learns what hidden actions were taken by the other, but these inferences are not verifiable by a

third party. The process just described is repetitive. That is after producing and exchanging output, the firms once again undertake stock market transactions, then agree to a new product price, again take some hidden actions that affect the costs of producing or the quality of the product, consummate the exchange of product and infer the nature of one another's hidden actions, etc. The sequence of events is described in figure 1.

Figure 1. Sequence of events.



The main conclusion I wish to draw from this model is that either firm may continue to hold a partial equity interest in the other, to bond that other to take hidden actions which are Pareto optimal. The shareholding biases the bargaining over product market variables in favor of the firm in which shares are held. The credible threat of divesting such share interest in the event of dissatisfaction with earlier actions deters the firm in which the shares are held from acting opportunistically or in a deceitful manner.

2.2. share trading in an efficient stock market.

In analyzing the model it is useful to first have in mind the general properties of share trading in an efficient stock market. Here "the stock market is efficient" means that the price at which shares are traded reflects a correct anticipation of the

effects of the trader's change in shareholding position on product market outcomes. Let Z_i denote the discounted present value of firm i's operating earnings that depend on its trade with j. So, for example, if trade with another party is an alternative to trade with j then Z_i represents the <u>difference</u> in i's operating earnings if it trades with j rather than with that other party. Denote by $\delta_i \subset (0,1]$, firm i's shareholding in firm j.

If the level of shareholding is unchanging then the present equity value of firm i is

(1) $$U_i=Z_i+m_i+\delta_i U_j,$$

the present value of its own operating earnings that depend on trade with j: (Z_i); plus the present value of assets unrelated to j: (m_i); plus the value of its share interest in firm j: $(\delta_i U_j)$.

Should firm 1 acquire more shareholdings or divest its shareholdings in firm 2 and the stock market is efficient, it would have to expend an amount or would realize an amount that equals the pro-rata ex-post equity value of firm 2. Let superscript "0" denote an ex-ante (pre- share trading) value and superscript "1" an ex-post value. In the simple case in which firm 2 itself owns no shares in firm 1, stock market efficiency would mean that firm 1 must expend an amount $A=(\delta_1^1-\delta_1^0)U_1^1=(\delta_1^1-\delta_1^0)(Z_2^1+m_2^0)$ in altering its share interest from δ_1^0 to δ_1^1 (Here we have $m_2^1=m_2^0$ because share-trading has by definition no bearing on the value of either firm's non-trade-dependent assets m_i, i=1,2). And the ex-post equity value of firm 1 will be $U_1^1=Z_1^1+m_1^0-A$. But $Z_1^1+m_1^0-A=Z_1^1+m_1^0-(\delta_1^1-\delta_1^0)(Z_2^1+m_2^0)$, and so $U_1^1=Z_1^1+\delta_1^0 Z_2^1+(m_1^0+\delta_1^0 m_2^0)$. Stock market transactions only affect the equity value of the firm either by altering the present value of its own trade-dependent operating earnings stream Z_1^1 or by altering the market value of the firm's original shareholding in the other firm's trade-dependent operating earnings $\delta_1^0 Z_2^1$. This remains true in the slightly more general case in which shareholding is reciprocal so that indirect shareholding ties augment direct ones, as

expressed in the following.

Lemma. If the stock market is efficient and if initially firm i holds δ_i^o shares in firm j and firm j holds δ_j^o shares in i, then the equity value of firm i ex-post any permanent change in either firm's shareholdings is

$$U_i^1 = \frac{Z_i^1+\delta_i^o Z_j^1}{(1-\delta_i^o\delta_j^o)} + \frac{m_i^o+\delta_i^o m_j^o}{(1-\delta_i^o\delta_j^o)}, \quad i=1,2;\ j\neq i.$$

Proof. The ex-post equity value of each firm i=1,2 is $U_i^1=Z_i^1+m_i^o-A_i+\delta_i^1 U_j^1$, $j\neq i$, where A_i represents i's cash outlays for shares. Stock market efficiency requires that $A_i=(\delta_i^1-\delta_i^o)U_j^1$. Consequently, $U_i^1=Z_i^1+m_i^o+\delta_i^o U_j^1$, i=1,2; $j\neq i$. Simultaneous solution of this pair of equations yields the lemma.
□

The objective of each firm i with regard to its share trading is to maximize U_i^1 as defined in the lemma.

2.3. product market, Nash bargaining solution.

In considering bargaining between the two firms regarding product price and other product market variables, it is useful to define the portion of each firm's equity value that depends upon its trade with the other. From (1), the expressions defining firm equity values are

(1′) $\quad U_i=Z_i+m_i+\delta_i U_j,\ i=1,2;\ j\neq i.$

If we solve these simultaneously, we obtain

(2) $$U_i = \frac{Z_i+\delta_i Z_j}{(1-\delta_i\delta_j)} + \frac{m_i+\delta_i m_j}{(1-\delta_i\delta_j)}, \quad i=1,2;\ j\neq i.$$

Recall that Z_i is defined as the portion of i's operating earnings that depend on trade with j. Consequently, the first term in the above expression--call it π_i, which consolidates all the terms that include Z_i or Z_j, represents the portion of the equity value of each firm i that depends on trade with the other, whether directly or through

its share interest in the other:

$$(3) \qquad \pi_i = \frac{Z_i+\delta_i Z_j}{(1-\delta_i\delta_j)} = Z_i+\delta_i\pi_j, \quad i=1,2; \; j\neq i,$$

In other words, π_i represents firm i's quasi-rent in it's product market dealings with firm j. The goal of each firm i in its bargaining with the other is to maximize its quasi-rent π_i so that it will have maximized U_i.

I shall maintain that the product market variables fulfill the Nash bargaining solution. Under the Nash cooperative solution, the bargaining payoffs of the two firms are equal to one another $\pi_1=\pi_2$, which from equation (3) requires that

$$(4) \qquad Z_1 = \frac{(1-\delta_1)Z_2}{(1-\delta_2)},$$

and the output is such as to maximize the combined payoffs of the two firms $\pi_1+\pi_2$.

Notice that if $\pi_1=\pi_2$, then from equations (3) and (4) we have

$$(5) \qquad \pi_1+\pi_2 = \frac{2(Z_1+Z_2)}{(2-\delta_1-\delta_2)}.$$

For given cross-shareholding, maximizing $\pi_1+\pi_2$ is thus equivalent to maximizing Z_1+Z_2. And if share trading has no effect on the combined (trade-dependent) operating earnings of the firms Z_1+Z_2, then the firm that has the smaller share stake realizes greater bargaining rent. This implies the following.

Proposition 1. If the present value of the combined trade-dependent earnings of the firms is invariant with the configuration of cross-shareholding, and the product market variables are determined according to the Nash bargaining solution, and if equity shares can be traded in an efficient stock market, then complete divestiture of any cross-shareholding is a dominant strategy for both firms.

Proof. From the lemma and from equation (4), the effect on the equity value of firm 1, say, of changes in its shareholdings of firm 2 is inverse, whatever the value of initial shareholdings δ_1^o *and* δ_2^o*, and whatever the value of ex-post shareholdings* δ_1 *and* δ_2*:*

$$\frac{\partial U_1}{\partial \delta_1} = -\frac{(1-\delta_1^o)(1-\delta_2)}{(1-\delta_1^o\delta_2^o)(2-\delta_1\delta_2)}\cdot(Z_1+Z_2) < 0.$$

□

The basis for this proposition is that by divesting a share interest a firm obtains resources of equal present value to the divested shares and also unburdens itself of an encumbrance on its own earnings.

Now it has been widely asserted that cross-shareholding inflates the combined equity values of firms by a kind of double counting; the value of cross-held shares are counted both towards the equity value of the firm that issues them and towards the equity value of the firm that holds them (McDonald, 1989; French and Poterba, 1991, p. 339; Fedenia, Hodder, and Triantis, 1994, pp. 64-5). But in the present context we can see that such double counting entails no misevaluation. For if the cross-held shares are sold to third parties, the equity value of each firm remains the same as before only now the cross-held shares are replaced on the balance sheets of the respective firms by the proceeds of the divestiture, assets having in each case exactly the same value as the divested shares.

Cross-shareholding can only persist as an outcome of the model under investigation if the premises of Proposition 1 are not fulfilled, that is if cross-shareholding itself in some way enhances the combined trade-dependent earnings of the two firms. I next develop such an example.

2.4. cross-shareholding and opportunism.

As described in equations (3) and (4), stockholding by one of the trading partners in the other biases the Nash bargaining over division of rent in favor of the target firm--the basis for Proposition 1. For the same reason, if the present value of the combined trade-dependent earnings of the firms is invariant with the configuration of cross-shareholding, firm 1's unilateral divestiture of its stock interest δ_1^o imposes a capital loss on firm 2: $\Delta U_2 = \Delta \pi_2$. Such capital loss can be expressed in relation to firm 2's trade-related quasi-rent π_2 using the lemma and using equations (3) and (4):

$$(6) \qquad \frac{\Delta \pi_2}{\pi_2} = - \frac{\delta_1^o (1-\delta_2^o)^2}{(1-\delta_1^o \delta_2^o)(2-\delta_2^o)} \ .$$

This expression is made somewhat complicated by the presence of an indirect effect which is in practice apt to be minute, firm 2's capital gain on it's own holdings of stock in firm 1 should firm 1 divest it's holdings in firm 2. If firm 2 holds no shares ($\delta_2^o = 0$) then this effect is not present at all and the relative capital loss to firm 2 caused by firm 1 divesting its shares is simply:

$$(7) \qquad \frac{\Delta \pi_2}{\pi_2} = \frac{\Delta Z_2}{Z_2} = - \frac{\delta_1^o}{2} \ .$$

In words, divesting a unilateral stock interest in a trading partner but without ending trade, reduces the present value of the partner's future gains from such trade by a percentage equal to half the percentage of original shareholding in the partner.

Because divesting a share interest in a trading partner imposes a capital loss on the trading partner, the credible threat of so divesting can be valuable in deterring opportunism. Here "opportunism" refers to misrepresenting the extent of one's own investment in transaction specific assets. Unless some special measures have been arranged in advance a firm may not have adequate ways of penalizing its trading partner for such behavior. For instance, it may not be able to credibly threaten to

terminate trade altogether, particularly if the opportunism has a relatively small impact on rents. In this case, based on the discussion in the previous paragraphs, the holding of an equity interest in a trading partner, commensurate with the trading partner's net gain from such opportunism, serves a useful purpose. Minor acts of opportunism can be effectively forestalled by small shareholdings in trading partners.

Two separate cases may be identified, one in which the customer holds a partial equity interest in the supplier to bond the supplier to faithfully invest in transaction specific assets, and the reverse instance in which the supplier holds shares in the customer. Consider the first of these.[3] Suppose that the value of the product to the customer depends upon some investment of the supplier $v(I_1)$, $v'>0$, $v''<0$. Suppose further that the investment itself is a hidden action, its level known to the supplier at the time it is undertaken but revealed to the customer only after consummation of the exchange. Then the price of the product p cannot be made to depend on the level of investment except by reliance on the supplier's reputation for truthful reporting. Yet the temptation to misreport may be great. If the price is set in advance at some fixed level $\bar{p}$, and the supplier in choosing his investment focuses myopically on his own gain $\bar{p}-c-I_1$, then he will not invest at all, that is he will set $I_1=0$. Let us denote the present value of the perpetual stream of profits attained under this regime by the supplier $\underline{Z}_1$, and by the customer $\underline{Z}_2$ (which of course vary inversely with the discount rate and positively with the likelihood of trade continuing though I shall not introduce parameters describing these relationships).

Reputation effects will, if strong enough, forestall opportunism and sustain Pareto optimal investment. Cross-shareholding strengthens the reputation effects: It increases the supplier's future losses that attend the customer's expectation that the supplier makes myopic investment choices rather than Pareto optimal ones. The Pareto

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[3]The algebraic treatment of both examples is based on the discussion of Tirole (1988), pp. 24-33.

optimal level of investment maximizes $v-c-I_1$, which we may denote by $\bar{I}_1 \equiv I_1 | v'=1$. Here let us suppose that the customer holds δ_2 shares in the supplier. They agree upon a price $p=\bar{p}$ such that, if the supplier chooses the Pareto optimal investment, the quasirents are divided equally (as in equation (4)). That is $\bar{p}$ solves: $(1-\delta_2)(\bar{p}-c-\bar{I}_1)=(\bar{v}-\bar{p})$, where $\bar{v}=v(\bar{I}_1)$. Will the supplier make the myopic choice $I_1=0$? Or will he instead make the Pareto optimal choice $I_1=\bar{I}_1$? Let us suppose that at the first instance of opportunism (setting $I_1=0$), the customer divests its share interest, a reasonable presumption in light of Proposition 1. Under this assumption one easily calculates the gain to the supplier from choosing $I_1=0$ rather than perpetually maintaining $I_1=\bar{I}_1$ as[4]

$$(8) \quad \bar{I}_1 - \frac{\gamma+\delta_2/2}{2-\delta_2}\cdot(\underline{Z}_1+\underline{Z}_2),$$

where γ is the percent increase in the combined trade-dependent earnings of the two firms when the investment level is $I_1=\bar{I}_1$ rather than $I_1=0$. It is quite apparent that the greater the level of cross-shareholding by the customer the smaller is the gain to the supplier of not investing and lying about it. Of course the gain to cheating might be less than zero even without cross-shareholding by the customer. For instance the gains to cheating are surely negative for some sufficiently low discount rate and high probability of trade continuing, which would inflate $\underline{Z}_1+\underline{Z}_2$, or if growth in trade is expected in the future which would also inflate $\underline{Z}_1+\underline{Z}_2$, the so-called Folk Theorem. But where this is not so, cross-shareholding can be decisive in deterring cheating. If cross-shareholding is in this manner necessary to the fulfillment of the value enhancing stipulation $I_1=\bar{I}_1$, then contrary to the premise of Proposition 1, cross-shareholding does (indirectly) raise the combined operating earnings of the firms and

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[4]According to equation (4), Nash bargaining assures that $Z_1=Z_2+\delta_2 Z_1$, so $Z_1=(Z_1+Z_2)/(2-\delta_2)$. The supplier who cheats, immediately avoids the costs of investing $\bar{I}_1$, but in subsequent transactions realizes earnings having present value $\underline{Z}_1=(\underline{Z}_1+\underline{Z}_2)/2$, whereas not cheating would have conferred earnings having present value $(1+\gamma)(\underline{Z}_1+\underline{Z}_2)/(2-\delta_2)$.

may persist. Here then is a rationale for the customer to hold a partial equity interest in the supplier. Careful application of the lemma and equation (4) demonstrates the following.

Proposition 2. Where the contract enforcing property of the customer's holding of δ_2 shares in the supplier raises the present value of combined trade dependent earnings of the two firms Z_1+Z_2 by at least the percentage $\delta_2(1-\delta_2)/2$, the customer will achieve greater profits by continuing to hold the shares than by divesting them. Otherwise the customer achieves greater profits by divesting.

Proof. Denote firm 2's initial shareholdings by δ_2^o, and its post share-trading holdings by δ_2. From the lemma and equation (3), if firm 1 holds no shares then the portion of the value of firm 2 dependent on trade with 1 is $\pi_2=Z_2+\delta_2^o Z_1$, and from equation (4) Nash bargaining assures that $Z_1=Z_2+\delta_2 Z_1$, so $\pi_2=(Z_1+Z_2)(1-\delta_2+\delta_2^o)/(2-\delta_2)$. Now where $\underline{z}_1$ and $\underline{z}_2$ denote the values of the firms' trade-dependent operating earnings streams when $\delta_2=0$, and $\bar{z}_1$ and $\bar{z}_2$ denote the values of the firms' trade-dependent operating earnings streams when $\delta_2\geq\delta_2^o$, then the difference in the value of firm 2 of its continuing to hold the δ_2^o shares versus completely divesting is $\Delta U_2=\Delta\pi_2 = (\bar{z}_1+\bar{z}_2)/(2-\delta_2^o) - (1+\delta_2^o)(\underline{z}_1+\underline{z}_2)/2$, which is greater than zero only if $(\bar{z}_1+\bar{z}_2)/(\underline{z}_1+\underline{z}_2)>1+\delta_2^o(1-\delta_2^o)/2$.
□

Proposition 2 enables us to characterize the equilibrium level of cross-shareholding in this example. The customer will either (a.) hold a share interest δ_2 that just causes the gain to cheating by the supplier (equation (8)) to be zero, or (b.) a zero share interest if (i.) there does not exist a positive share interest that is just sufficient to deter cheating or if (ii.), as described by Proposition 2, the firm would gain more by divesting such a share interest than by maintaining it. That is,

$$(9)\qquad \delta_2 = \begin{cases} \hat{\delta}_2, & \text{if } \gamma \geq \hat{\delta}_2(1-\hat{\delta}_2)/2 > 0 \\ 0, & \text{if } \gamma < \hat{\delta}_2(1-\hat{\delta}_2)/2, \text{ or } \hat{\delta}_2 < 0, \end{cases}$$

where $\hat{\delta}_2 \equiv \dfrac{2\beta - \gamma/(1+\gamma)}{\beta + 1/2(1+\gamma)}$, and $1+\gamma \equiv \dfrac{\bar{Z}_1+\bar{Z}_2}{\underline{Z}_1+\underline{Z}_2}$, $\beta \equiv \bar{I}_1/(\bar{Z}_1+\bar{Z}_2)$.

As defined, ß represents the one-time myopic gain from opportunism relative to the present value of combined trade-dependent earnings of the two firms, and γ represents the percentage reduction in combined trade-dependent earnings if investment choices are myopic rather than Pareto optimal. If γ is very large relative to ß then the gain to cheating is negative even without cross-shareholding, and so $\delta_2=0$. And if ß is very large relative to γ then the potential gains from any contract-enforcing property of cross-shareholding are insufficient to warrant cross-shareholding. Small levels of cross-shareholding would necessarily have a sort of knife edge character if γ and ß both were large, the threat of divestiture subtracting a relatively small but nevertheless decisive amount from the gains to cheating. Thus we arrive at the conclusion that small levels of cross-shareholding are likely to arise only for commensurately small values of γ and ß. The table 1 identifies the equilibrium level of cross-shareholding for selected illustrative values of these parameters. For example if γ=5% and ß=2%, then δ_2=1.3%.

In the literature on transaction cost economics, underinvestment by the supplier as in the above example is referred to as the quality assurance problem. Klein and Leffler (1981) and Shapiro (1983) have argued that in a competitive market, a price premium can bond the supplier to maintain quality. In a bilateral monopoly, cross-shareholding establishes exactly such a price premium, one contingent on the supplier's maintaining product quality.

The case of the customer's hidden actions affecting the supplier's costs is perfectly symmetric to and is analytically the same as the quality assurance problem.[5]

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[5]Suppose that the cost of supplying the product depends upon some investment made by the customer $c(I_2)$, $c'<0$, $c''>0$. The Pareto optimal level of investment maximizes $v-c-I_2$, or is $\bar{I}_2 \equiv I_2 \mid c'=-1$. If the customer is assured of paying a set price its myopic choice is to not invest at all. As in the previous case, cross-shareholding, in this instance the supplier holding stock in the customer, may be crucial in deterring such opportunistic behavior.

The case in which the value of the product to the customer depends upon investment

3. Keiretsu cross-shareholding.

3.1 analytic approach.

The purpose of this section is to describe the sorts of evidence that might indicate that the keiretsu shareholding links are intended to deter opportunism in the manner detailed above. As the examples developed in the previous section illustrate, a firm may hold a partial equity interest in a trading partner to strengthen its ability to penalize the trading partner for behaving opportunistically, and induce the rational expectation that it will in fact not behave opportunistically. If shareholding links are maintained to deter opportunism then several indications will exist.

First, it is fairly obvious that shareholding which deters opportunism should link trading partners. Perhaps less obviously, simple portfolio investment will exclude equity positions in trading partners, according to Propositions 1 and 2. Persistent share links between trading partners must somehow augment whatever rents that the trade generates.

Second, shareholding that deters opportunism should be greater the larger are the immediate gains from opportunistic behavior. If the trading partner is a supplier, its opportunism would entail substitution of products or services having inferior quality to what is claimed. If the trading partner is a customer, its opportunism would entail misrepresenting its own actions that affect the supplier's costs. In each instance opportunism enables the firm to avoid investing in transaction specific assets. The immediate gain to behaving opportunistically is larger the greater are such investments and the less detectable or verifiable are such investments.

Third, shareholding that deters opportunism should be greater the smaller are the

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by the supplier *and* the supplier's costs also depend upon investment by the customer is only slightly more complex. As in the simpler cases, cross-shareholding by either party lowers the gain of the other from claiming to have made a Pareto optimal investment but in fact making no investment. Deception by either results in complete divestiture by the other.

future penalties for behaving opportunistically that do not depend upon cross-shareholding. The main such penalty is damage to reputation with the trading partner affecting profits on future transactions with it (Malfeasance will not damage reputations with third parties for it is not detectable by them). Where growth in trade is expected or the profit from each trade is larger, the prospect of damage to reputation with the trading partner is itself a larger deterrent to opportunism and cross-shareholding need not be as great. (In terms of the algebraic example, as $\bar{Z}_1+\bar{Z}_2$ is greater, ß becomes smaller, and δ_2 tends to becomes less).

Not one of the various factors related to cross-shareholding that is to deter opportunism is directly observable for keiretsu firms, but serviceable proxies exist for some of them.

3.2 data.

The six financial keiretsu that are the focus of this study are the modern counterparts of the pre-war zaibatsu. The zaibatsu were groups of companies in differing industries linked by shareholding ties, and largely controlled by the wealthy families who held majority interests in the respective zaibatsu holding companies. The American occupation authorities dissolved the zaibatsu shareholding ties and directed the enactment of antimonopoly statutes that have permanently abolished holding companies in Japan. The perhaps misguided purpose of the zaibatsu dissolution was retribution and punishment of the wealthy captains of industry in Japan during the years of fascism, expansion, and war. The principle effect of zaibatsu dissolution was the expropriation and redistribution of wealth, not reallocation of resources. For shortly after the occupation ended and sovereignty was restored to Japan the firms that had once belonged to the respective zaibatsu reformed their old alliances, reestablishing the shareholding ties that the Americans had forcibly dissolved (Hadley, 1970; pp. 205-256). The firms that are members of the

Mitsui keiretsu include many that were core members of the Mitsui zaibatsu. The members of the Mitsubishi, Sumitomo, and Fuyo keiretsu include many that were members of the Mitsubishi, Sumitomo, and Yasuda zaibatsu respectively. The Dai-Ichi Kangyo keiretsu includes firms that once belonged to the Furukawa and Kawasaki zaibatsu. Only the Sanwa keiretsu group has no zaibatsu antecedent. The renewal of group affiliations that had existed before the war is evidence that the firms in question had accumulated transaction specific assets. For had they not accumulated such assets, there would have been no particular advantage in renewing old alliances rather than establishing new ones. Here is one indication that the shareholding ties linking these firms over the years have promoted investment in transaction specific assets. This presumes that the firms have had important trading ties with one another which is indeed the case.

A Japan Fair Trade Commission survey of the trading patterns among presidents' club members in 1981 (Kosei Torihiki Iinkai, 1983, Table 7, p. 24) found that 20% of the sales transactions of manufacturing firms in the respective clubs in excess of one million yen were to fellow members of the same clubs. And 12% of purchase transactions in excess of one million yen by these manufacturing firms were from fellow members. Of course transactions may have been outside the presidents' club but still within the same keiretsu defined more broadly to include affiliates and subsidiaries of the respective presidents' club members. This evidence does indicate that there are significant trading ties among presidents' club members.

To further explore the purposes of keiretsu shareholding ties I have compiled data on these same member firms of the six respective "presidents' clubs" of the major keiretsu: Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, and Dai-Ichi Kangyo. The presidents' clubs are rosters of firms represented at monthly meetings of the senior executives of the largest firms closely affiliated with the six respective keiretsu. In all, these include about 150 nonfinancial companies, most of the largest ones in

Japan. In 1980 all together these companies comprised about a seventh of all nonfinancial corporations' assets in Japan. Keiretsu firms are linked by complex webs of interlocking shareholding. For data on shareholding ties I have relied upon the annual: kigyo keiretsu soran, published by toyo keizai. The average fractions of outstanding shares held within the respective presidents' clubs in 1980 were: Sumitomo (27%), Mitsubishi (29%), Dai-Ichi Kangyo (14%), Sanwa (17%), Mitsui (17%), Fuyo (16%), but about half of these shares were held by financial institutions of the respective groups. Typically the share interest of any one company in another was in a range of 3% or less.

If indeed the purpose of keiretsu share interlocks is to deter opportunism then the share linkages ought to have influenced the pattern of trade among such firms. There is some indication that they have. Among the frequent complaints of foreigners attempting to do business in Japan is that keiretsu firms remain intractably loyal to fellow members of their same keiretsu even when outsiders offer products or services on superior terms. Lawrence (1991) finds that keiretsu sales as a fraction of industry sales are inversely related to the proportion of industry demand that is filled by imports, which is evidence that keiretsu ties between firms, which usually include shareholding ties, dispose firms to purchase from one another rather than from outsiders. In the logic detailed above, keiretsu firms may indeed be paying higher prices when buying from the firms in which they hold small share interests. As argued here, the willingness of a keiretsu firm to pay such an inflated price is based on the superior incentives that the implied profit premium confers on the trading partner. It is not based on naked chauvinism, cultural dispositions, or attenuated profit motives.

To investigate whether keiretsu shareholding ties link firms that are trading partners as my theory would predict I have accumulated further data. The precise transactions between specific keiretsu companies are not publicly reported. Therefore

as proxies for the firm-level structure of transactions I rely on the 28 sector input-output table of the Japanese economy to construct the industry-wide fractions of purchases of intermediate inputs that are from each industry. That is the input-output coefficients--percentages of one industry's purchases that are from each respective industry--proxy the likelihood that any pair of fellow presidents' club members in the corresponding industries are trading partners. In using these data in this way one peculiarity must be noted. The input-output coefficients linking each industry to itself are rather large, which mainly reflects transactions with subcontractors and other smaller firms as opposed to transactions with other large firms such as those likely to be members of a keiretsu presidents' club. In the regression analysis which follows I have controlled for this distortion by introducing a separate variable P_{same} which equals the percentage of an industry's purchases that are from itself for each pair of fellow presidents' club member firms in a same industry, and equals zero if the firms are not in a same industry.

As already described the greater the expected growth in trade the less need be the shareholding ties if the purpose of the shareholding is to deter opportunism. Towards the end of the 1960s the members of the keiretsu significantly deepened their shareholding interlocks which is consistent with this prediction. The growth rate of Japan's economy had for the two decades previous to that been at an unsustainably high level. Expectation of reduced future profits from trading relationships had become rational by 1970. Other commentators have interpreted the deepening of keiretsu shareholding interlocks at this time as an attempt to strengthen takeover defenses in response to the liberalization of regulations pertaining to inward direct foreign investment in Japan (Aoki, 1988, p. 127; Ito, 1992, p. 191-2). The arguments of this paper afford an alternative interpretation of the same event. To further investigate the relation between expected growth in trade and cross-shareholding, I have collected data on the growth rate in each target firm's assets in the three years subsequent to

observation of the cross-shareholding.

Damage to reputation with the trading partner is also likely to be more costly and reliance on cross-shareholding to deter opportunism correspondingly less, the greater the ongoing stream of profits associated with trade. Because of the relation between elasticity of demand and profit margins this means that the less elastic the demand for the final products the less need be the level of cross-shareholding. As a proxy for elasticity of demand I use expenditures on advertising relative to sales. A simple basis for this is the Dorfman-Steiner condition which holds that advertising divided by sales is inversely proportional to price elasticity.[6]

A glossary of variables and their means for the sample firms are to be found in Table 2. The ADV/SALES, and LNSALES variables are averages over the three years 1979-81. GTA_j is averaged over the three years 1981-83. The δ_{ij}, P_{ij}, and P_{ji} variables are observed in the one year 1980. There are 147 different firms in the sample, the nonfinancial members of the presidents' clubs of the six keiretsu in 1980. But the units of observation are ordered pairs of differing firms that are both members of a same club. There are 4216 such observations. For 909 of these ordered pairs, the first firm holds stock in the second. Because our focus is on small shareholding links only we exclude from the sample the instances of cross-shareholding in excess of ten percent; there were 16 such instances. This leaves 4200 observations. There are 296 instances of reciprocal cross-shareholding (accounting for 592 of the 893 instances of cross-shareholding of ten percent or less).

3.3. regression results.

Maximum likelihood estimates of Tobit regression models for explaining shareholding by each firm i in other members of its same keiretsu presidents' club in 1980 are presented in Table 3. The Tobit model is

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[6]See Tirole (1989), p. 103, for a discussion of the Dorfman-Steiner condition.

δ_{ij} = $X'\beta+\epsilon$, if $X'\beta+\epsilon > 0$

= 0 otherwise,

where X is the vector of values of explanatory variables k=1,...K, and $\epsilon \sim N(o,\sigma^2)$. For each variable the table reports estimates of β_k and asymptotic t-statistic for hypothesis $\beta_k=0$.[7] I used the software known as Shazam to compute these estimates. Estimates of the marginal effect of each variable k on the expected level of cross-shareholding evaluated at the sample mean, $\partial E(\delta_{ij}|\bar{\delta}_{ij})/\partial X_k$, may be obtained as $\hat{\beta}_k\bar{\delta}_{ij}/\hat{\sigma}$, the regression coefficient times the mean of the dependent variable divided by the standard error of the estimate. Several results merit comment.

First, the pattern of cross-shareholding within the keiretsu presidents' clubs somewhat mirrors the structure of transactions. That is, fellow presidents' club member firms which by virtue of the industries to which they belong are likely to have trading ties (P_{ij} is large or P_{ji} is large) are more likely to have share linkages. This is consistent with the thesis that the cross-shareholding is to forestall opportunism and is inconsistent with its being exclusively portfolio investment.

Second, presidents' club firms that advertise more intensely, indicating that their production activity is generating a stream of profits, tend to be linked to one another by smaller share interests (as shown by the negative coefficients on $ADV/SALES_i$ and $ADV/SALES_j$). Where trade is generating profits, damage to reputation with the trading partner is likely to itself be a greater deterrent to opportunism and cross-shareholding need not be as great. Alternatively, advertising intensity might be least for firms whose customers are industrial firms rather than consumers, and cross-shareholding be more likely to link such firms, either because they are more likely to have trading ties or their trading ties are more likely to elicit

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[7] If heteroskedasticity is present these estimates are inconsistent. However Arabmazar and Schmidt (1981) argue that the inconsistency may be small and in any case is less in the censored model here than in a truncated model that discards the observations with zero cross-shareholding.

transaction specific investments.

Third, there is perhaps only a slight tendency for firms to hold smaller share interests in fellow presidents' club members that are growing more rapidly (as shown by the negative though insignificant coefficient on GTA_j). Where trade between firms is expected to grow, the future loss of profits resulting from damage to reputation with the trading partner is greater, and other safeguards against opportunism including cross-shareholding need not be as intense. But these results offer weak confirmation only.

Finally, cross-shareholding tends to link the larger firms in the sample, not the smaller ones. I have no ready explanation for this. Perhaps scale effects are present in the data which the statistical model or economic model has done a poor job of capturing.

5. Conclusion

The voluminous literature on Japan's contemporary business groups has produced several theories including the anti-takeover theory, externality theory, and successive monopoly theory. None of the theories is a completely satisfactory explanation for the shareholding interlocks that connect the nonfinancial members of the respective keiretsu. This has led some commentators to describe the shareholding ties between these large firms as "symbolic" only, not rational in the narrow sense. I have proposed an alternate solution to the keiretsu puzzle: The keiretsu shareholding interlocks are to deter opportunism. A firm that holds an equity interest in a trading partner weakens its own bargaining position with regard to the product transactions but precisely for this reason is capable at any time of penalizing the partner by unilaterally divesting. In this manner cross-shareholding can be to strengthen the penalties for behaving opportunistically and induce a rational expectation that the other party will in fact not behave opportunistically.

Opportunism by a supplier would entail substitution of products or services having inferior quality to what is claimed. Opportunism by a customer would entail misrepresenting its own investments that reduce the supplier's costs.

Cross-shareholding that is to deter opportunism in the manner detailed here would link trading partners, and would tend to be smaller if growth in trade is expected or if each trade confers greater rent. The pattern of cross-shareholding among fellow presidents' club members of the six financial keiretsu exhibits all the characteristics just mentioned.

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Table 1. Equilibirum cross-shareholding δ_2, corresponding to selected values of parameters γ and β.

		β=								
		.005	.01	.02	.03	.04	.05	.1	.2	.3
γ=	.005	1.0%	*	*	*	*	*	*	*	*
	.01	-	1.9%	*	*	*	*	*	*	*
	.02	-	-	3.7%	*	*	*	*	*	*
	.03	-	-	1.7%	5.4%	*	*	*	*	*
	.04	-	-	-	3.3%	6.8%	*	*	*	*
	.05	-	-	-	1.3%	4.8%	8.2%	*	*	*
	.1	-	-	-	-	-	-	13.7%	*	*
	.2	-	-	-	-	-	-	-	21.1%	43.2%
	.3	-	-	-	-	-	-	-	12.7%	35.7%
	.4	-	-	-	-	-	-	-	-	-

Source= equation (9).

Symbols "*" mean that $\gamma < \hat{\delta}_2(1-\hat{\delta}_2)/2$; and symbols "-" mean that $\hat{\delta}_2 < 0$.

Table 2. Variables.

variable name	description	fiscal years over which variable is averaged[a]	source[b]	mean (s.d.)
δ_{ij}	Percentage of j's shares held by i	1980	TK	0.2 (0.7)
P_{ij}	Percentage of j's industry's purchases of intermediate inputs that are from i's industry	1980	IO	5.0 (10.5)
P_{ji}	Percentage of i's industry's purchases of intermediate inputs that are from j's industry	1980	IO	5.0 (10.5)
P_{same}	=Percentage of i's industry's purchases of intermediate inputs that are from itself, if i and j are from the same industry; =0, if i and j are from differing industries	1980	IO	2.0 (9.3)
GTA_j	Growth rate in total assets	$\frac{1983-1980}{1980}$	NEEDS	0.17 (0.23)
$ADV/SALES_j$	Advertising expenditures divided by sales	1978, 79, 80	NEEDS	0.006 (0.012)
$ADV/SALES_i$	Advertising expenditures divided by sales	1978, 79, 80	NEEDS	0.006 (0.012)
$LNSALES_j$	Natural logarithm of sales	1978, 79, 80	NEEDS	12.5 (1.3)
$LNSALES_i$	Natural logarithm of sales	1978, 79, 80	NEEDS	12.5 (1.3)

[a] Fiscal year t refers to the first annual statement issued after March 31 in the year t.
[b] TK = Toyo Keizai, kigyo keiretsu soran (general survey of business groupings), 1982 edition.
IO = formed from the "Table on Input Coefficients (1980)" from Japan Bureau of Statistics, Office of the Prime Minister, Japan Statistical Yearbook, 1983 edition, Table 16-13, pp. 571-573.
NEEDS = Nikkei financial data tape.

Table 3. Maximum likelihood estimates of Tobit model:
$\delta_{ij}=X'\beta+\epsilon$, if $X'\beta+\epsilon>0$
$=0$ otherwise,
$\epsilon \sim N(0,\sigma^2)$. For each variable the table reports estimates of β_k and asymptotic t-statistics for hypothesis $\beta_k=0$.

variables	coefficent estimates and asymptotic t-statistics			
intercept	-1.84 (-23.01)	-8.84 (-14.49)	-7.84 (-13.00)	-7.92 (-13.15)
P_{ij}	0.02 (2.99)	0.01 (0.87)	0.00 (0.27)	
P_{ji}	0.02 (2.48)	0.01 (2.19)	0.01 (1.54)	
P_{same}	-0.04 (-4.44)	-0.05 (-4.44)	-0.03 (-2.65)	
GTA_j			-0.17 (-0.91)	-0.18 (-0.95)
$ADV/SALES_j$			-29.06 (-6.06)	-29.65 (-6.18)
$ADV/SALES_i$			-24.47 (-5.29)	-24.77 (-5.38)
$LNSALES_j$		0.12 (3.76)	0.09 (2.98)	0.10 (3.25)
$LNSALES_i$		0.45 (13.80)	0.42 (13.09)	0.42 (13.27)
standard error of estimate, $\hat{\sigma}$	2.05	1.95	1.92	1.92
number of obs.	4200			
frequency of $\delta_{ij}>0$	0.21			