Indirect Shareholding Within
Japan's Business Groups

David Flath

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Professor David Flath
Department of Economics
North Carolina State University, Raleigh, North Carolina

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David Flath

Department of Economics, North Carolina State University, Raleigh, NC 27695-8110. tel.(919)515-3884.

Abstract

A new measure of indirect shareholding is proposed and estimated for Japan's six major keiretsu groups. For these groups indirect shareholding by each firm in each other firm is about one fourth as great as direct shareholding on average. Where there are gains to firms from holding stock in other firms, there are also gains from indirect stockholding. Alignment of the firms into groups maximizes indirect shareholding.

Indirect Shareholding Within Japan's Business Groups

Many of the largest corporations in Japan are affiliated with one or
another of six business groups, the modern counterparts of the pre-war
zaibatsu. The firms affiliated with any one group are linked to one another by
a complicated web of interlocking stockholding. Recent inquiries have
identified economic rationales for one firm to hold shares in another.[1] But
direct shareholding links between pairs of firms need not align the firms into
groups. Perhaps the economic rationale for the groups is in assuring that
whatever bilateral shareholding interlocks are formed will also induce the
greatest possible indirect shareholding among the same set of firms. Indirect
shareholding exists when a company holds stock in a company that itself holds
stock in another company. Whatever advantages reside in direct shareholding
links are apt also to be present in the case of indirect shareholding.

In this short note I propose a new measure of indirect shareholding, and
describe estimates of the measure for Japanese keiretsu affilates using 1980
data.

1. Measuring indirect shareholding

In this section I will propose a measure of indirect shareholding. The
strategy is to characterize hypothetical bilateral shareholding ties between a
pair of firms that, by themselves, would have the same influence on the two
firms' choices of control variables as the more complicated web of indirect as

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[1]Banks in Japan hold stock in the companies to which they lend to reduce
the agency costs of debt (Sheard, 1989; Flath, 1990; Prowse ,1990; and Hoshi,
Kashyap, and Scharfstein, 1991). Also companies acquire stock in rivals to
achieve cartelization (Flath; forthcoming-a, and forthcoming-b). Cross-
shareholding interlocks between trading partners can be to attain vertical
integration (Flath, 1989) or to bond firms to observe contractual stipulations
(Flath, 1991).

well as direct share interlocks linking the two firms. The difference between these hypothetical share links and the actual direct share links between the pair of firms measure the indirect shareholding between them.

Let us adopt the notational convention that vectors and matrices are denoted by underlined symbols and that scalars are denoted by non-underlined symbols. Suppose that there is a set of n firms among which there exist shareholding interlocks represented by the nxn matrix $\underline{D}$ with typical element δ_{ij} = fraction of j's shares held by i, where $0 \leq \delta_{ij} < 1$ if $i \neq j$, and $\delta_{ij} = 0$ if $i = j$. The income of these firms, inclusive of returns from equity interests, may be denoted by the nx1 vector $\underline{\pi}$, and

(1) $\underline{\pi} = \underline{z} + \underline{D}\,\underline{\pi}$,

where $\underline{z}$ is the nx1 vector of operating profits of the firms, having typical element z_i. Write[2]

(1') $\underline{\pi} = \underline{V}\,\underline{z}$,

where $\underline{V} = (\underline{I} - \underline{D})^{-1}$ and $\underline{I}$ is the identity matrix.

The extent of shareholding of any one keiretsu firm in another is typically far less than 10%, too small to confer control. Let us therefore maintain that the cross-shareholding $\underline{D}$ confers silent financial interests only and does not in any way affect the locus of control of the firms, that each firm controls its own product market choices but not those of any other including the ones in which it holds stock. Cross-shareholding will nevertheless affect the choices made by each firm in the real product markets

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[2]Equation (1') indicates the relation beween market capitalization $\underline{\pi}'\underline{\iota}$ and the operating earnings of firms $\underline{z}'\underline{\iota}$. As cross-shareholding becomes more extensive, given the operating earnings of firms, market capitalization increases without bound. Thus market capitalization embodies a form of double counting. This is becoming a widely recognized aspect of Japan's stock market. See for instance McDonald (1989) or Bierman (1990).

according to its effects on the values of the firms' respective objective functions π_i.[3] For instance if firms i and j are either trading partners, or rivals, or creditor and client, then their Nash noncooperative solution values of control variables "x", (e.g. product price, output, investment, terms of credit) solve a system that includes both

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(2) \quad
\begin{aligned}
\lambda_i \left[v_{ii} \frac{\partial z_i}{\partial x_i} + v_{ij} \frac{\partial z_j}{\partial x_i} \right] &= 0, \text{ and} \\
\lambda_j \left[v_{jj} \frac{\partial z_j}{\partial x_j} + v_{ji} \frac{\partial z_i}{\partial x_j} \right] &= 0,
\end{aligned}
$$

where λ_i and λ_j are arbitrary constants and v_{ii}, v_{jj}, v_{ji}, and v_{ij} are elements of the matrix $\underline{V}$. Clearly equations (2) depend upon both direct and indirect shareholding links between firms i and j.

Suitable choice of λ_i and λ_j will establish hypothetical bilateral _direct_ shareholding interlocks between i and j that would by themselves induce the same choices x_i^* and x_j^* as does the complete matrix of direct and indirect interlocks that link the two firms. Specifically, let λ_i, λ_j, t_{ij}, and t_{ji} be the solutions to the matrix equation

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[3]Ellerman (1991) proposes a scheme in which the objectives of the firms are not to maximize the values of π_i. In Ellerman's scheme the decisions of firms linked by cross-shareholding are according to the votes of "external shareholders" only (that is the firms themselves do not vote the shares held by those firms in others), and the votes are weighted in proportion to the respective firms' external shareholders' direct and indirect claims on each firm's assets. Here indirect shareholding by _firms_ has little meaning. Ellerman's elegant model is part of a normative prescription for reconstituting Yugoslovian firms, not a positive analysis of the keiretsu.

$$(3) \quad \begin{bmatrix} \lambda_i & 0 \\ 0 & \lambda_j \end{bmatrix} \cdot \begin{bmatrix} v_{ii} & v_{ij} \\ v_{ji} & v_{jj} \end{bmatrix} = \begin{bmatrix} 1 & -t_{ij} \\ -t_{ji} & 1 \end{bmatrix}^{-1},$$

$$\lambda \underline{V}_{ij} = (\underline{I} - \underline{T}_{ij})^{-1}.$$

Now $\underline{T}_{ij}$ is the matrix of hypothetical bilateral shareholding interlocks between the two firms i and j that would have equivalent influence on their respective choices of control variables x_i and x_j as does the complete matrix of cross-shareholding $\underline{D}$. The difference between the two matrices is a matrix whose off-diagonal elements are measures of indirect shareholding by each firm in the other. From (3) one finds that

$$t_{ij} = \frac{v_{ij}}{v_{ii}}, \text{ and}$$

$$(4)$$

$$t_{ji} = \frac{v_{ji}}{v_{jj}}.$$

Now $t_{ij} - \delta_{ij}$ and $t_{ji} - \delta_{ji}$ measure indirect shareholding by i in j and by j in i respectively.

As an illustrative example let us consider the case of three firms linked by cross-shareholding. Here

$$(5) \quad \underline{V} \equiv (\underline{I} - \underline{D})^{-1} = \frac{1}{(1 - \delta_{12}\delta_{21})(1 - \delta_{13}\delta_{31}) + (\delta_{23} - \delta_{13}\delta_{21})(\delta_{32} - \delta_{12}\delta_{31})} \cdot$$

$$\begin{bmatrix} 1 - \delta_{32}\delta_{23}, & \delta_{12} + \delta_{32}\delta_{13}, & \delta_{13} + \delta_{12}\delta_{23} \\ \delta_{21} + \delta_{23}\delta_{31}, & 1 - \delta_{13}\delta_{31}, & \delta_{23} + \delta_{13}\delta_{21} \\ \delta_{31} + \delta_{21}\delta_{32}, & \delta_{32} + \delta_{12}\delta_{31}, & 1 - \delta_{12}\delta_{21} \end{bmatrix} \cdot$$

Thus find

$$t_{12} = \frac{\delta_{12} + \delta_{32}\delta_{13}}{1 - \delta_{32}\delta_{23}} , \text{ and}$$

(6)

$$t_{21} = \frac{\delta_{21} + \delta_{23}\delta_{31}}{1 - \delta_{13}\delta_{31}} .$$

If firm 1 holds shares in firm 3 and firm 3 holds shares in firm 2, then firm 1's direct shareholding in firm 2 is augmented by indirect shareholding. Algebraically, if $\delta_{13} > 0$ and $\delta_{32} > 0$, then $t_{12} > \delta_{12}$. And $t_{12} - \delta_{12}$ is the precise amount of indirect shareholding by firm 1 in firm 2.[4]

2. Indirect shareholding in the keiretsu groups

The purpose of this section is to describe estimates of indirect shareholding in the six keiretsu groups of Japan using 1980 data. The focal firms are the member firms of the six respective "presidents' councils" of the major keiretsu: Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, and Dai-Ichi Kangyo. There are about 175 companies including most of the largest ones in Japan. In 1980 all together these companies comprised about a fourth of all corporate assets in Japan. 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' councils 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

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[4]Futatsugi (1976), Ch. 4, pp. 137-167, proposed as a measure of the closeness of the relation between keiretsu firms the elements of the matrix $\underline{V}$. The motivation for the measure was strictly ad hoc and seems to have been guided by analogy with some algebraics of input-output analysis. Yet its kinship with my proposed measure of indirect shareholding is clearly evident. Futatsugi's writings on cross-shareholding are extensive and well-known to Japanese economists.

institutions of the respective groups. Typically the direct share interest of any one company in another was in a range of 3% or less.

The table summarizes the direct and indirect shareholding linking pairs of firms within each respective group. The first two columns summarize shareholding by financial firms only, that is banks and insurance companies. The middle columns detail shareholding links between nonfinancial firms and the final columns pertain to the pooled samples which include both nonfinancial and financial firms. Several conclusions can be drawn from these data. First, indirect shareholding is around one fourth as great as direct shareholding for most cells in the table, which seems large enough to matter. Second, indirect share links are greatest on average in the groups having the greatest direct share links, Sumitomo and MItsubishi. Third, indirect and direct shareholding by financial firms are greater on average than shareholding by nonfinancial firms.

3. Conclusion

Firms hold stock in other firms for a variety of reasons including vertical integration, contract enforcement, cartelization, lowering the costs of financial intermediation and more. All have been offered as explanations for cross-shareholding which is prominent in Japan but also observed elsewhere. Where direct shareholding is advantageous so is indirect shareholding.

The greatest extent of cross-shareholding in Japan is that linking firms that are members of a same business group. Alignment of firms into groups maximizes the extent of indirect shareholding that results from any direct shareholding. By proposing and estimating a measure of indirect shareholding I have argued that indirect shareholding in the keiretsu groups, particularly indirect shareholding by keiretsu banks, is indeed large enough to be a plausible motivation for the groups' very existence.

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Table. Indirect shareholding and direct shareholding within "presidents'
councils" of six major keiretsu groups, 1980.

units=percent

name of keiretsu and number of member firms	direct shareholding and indirect shareholding between pairs of firms; means and standard deviations.					
	shareholding by financial firms only		nonfinancial firms only		all firms	
	direct	indirect	direct	indirect	direct	indirect
Mitsui (24)	3.85 (2.23)	0.68 (0.59)	0.36 (1.62)	0.13 (0.18)	0.99 (2.10)	0.22 (0.35)
Mitsubishi (28)	3.96 (2.27)	1.65 (1.44)	1.01 (5.55)	0.18 (0.31)	1.39 (5.02)	0.38 (0.79)
Fuyo (29)	3.32 (2.29)	0.51 (0.37)	0.20 (1.49)	0.09 (0.11)	0.67 (1.90)	0.15 (0.22)
Sumitomo (21)	4.44 (2.23)	1.51 (1.07)	1.31 (4.45)	0.31 (0.34)	1.85 (4.01)	0.52 (0.72)
Sanwa (39)	2.76 (2.50)	0.43 (0.52)	0.24 (2.99)	0.04 (0.06)	0.50 (2.97)	0.08 (0.21)
Dai-Ichi Kangyo (45)	2.38 (3.07)	0.41 (0.67)	0.17 (1.20)	0.04 (0.12)	0.38 (1.60)	0.08 (0.26)
All of the above	3.26 (2.62)	0.77 (0.95)	0.38 (2.89)	0.09 (0.18)	0.74 (2.92)	0.17 (0.43)

"Indirect shareholding" between pairs of firms was computed from the direct
shareholding matrix for each keiretsu as described in the text. Source for
"direct shareholding": Toyo Keizai, kigyo keiretsu soran, 1982 edition,
selected Tables, pp. 29-53.