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THE FABLE OF THE KEIRETSU

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by Yoshiro Miwa & J. Mark Ramseyer*

Abstract: Central to so many accounts of post-war Japan, the keiretsu corporate groups have never had economic substance. Conceived by Marxists committed to locating "domination" by "monopoly capital," they found an early audience among western scholars searching for evidence of culture-specific group behavior in Japan. By the 1990s, they had moved into mainstream economic studies, and keiretsu dummies appeared in virtually all econometric regressions of Japanese industrial or corporate structure. Yet the keiretsu began as a figment of the academic imagination, and they remain that today.

The most commonly used keiretsu roster first groups large financial institutions by their pre-war antecedents. It then assigns firms to a group if the sum of its loans from those institutions exceeds the amount it borrows from the next largest lender. Other rosters start by asking whether firm presidents meet occasionally with other presidents for lunch. Regardless of the definition used, cross-shareholdings were trivial even during the years when keiretsu ties were supposedly strongest, and membership has only badly proxied for "main bank" ties.

Econometric studies basing "keiretsu dummies" on these rosters have produced predictably haphazard results: some are a function of misspecified equations, while others depend on outlying data points and some are specific to one keiretsu roster but not others. The only reliably robust results are the artifacts of the sample biases created by the definitions themselves.

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For many, they are the defining characteristic of the Japanese economy. The keiretsu "have been a key element in Japan's rapid industrial development and transformation since the early 1950s," writes Calder (1993: 142). "In sectors as diverse as petrochemicals, telematics, atomic power, real estate development, and Middle East oil exploration, [they] have taken the strategic initiative for Japan."

Even among those who would not take it quite that far, the keiretsu substantially shape the nature of economic competition. At a macro- level, Caves & Uekusa (1976: 63) call them "a major and conspicuous force in the Japanese economy." On a more micro- level, Hoshi, Kashyap & Scharfstein (1991: 34) claim that each "coordinates the activities of member firms and ... finances much of their investment activity." So crucial are they thought to be, virtually no one anymore runs regressions on Japanese industrial organization or corporate structure without including a keiretsu dummy.

For scholars eager to show the way parsimonious economic models miss real-world behavior -- of whom there has never been a shortage in western Japanological circles -- the keiretsu have promised a particularly rich source. Dore (1987: 178) describes them as "networks of relational contracting" that are:

> a bit like an extended family grouping, where business is kept as much as possible within the family, and a certain degree of give and take is expected to modify the adversarial pursuit of market advantage.

Lincoln, Gerlach & Ahmadjian (1996: 67) claim that:

> These complex inter-firm networks reveal the embeddedness of the Japanese economy: the infusion of market exchange with rich social relations of a noneconomic nature.

More extreme still, two years later they (1998: 318) further assert:

> Firms within a keiretsu are bound to one another in a web of obligation. Some such obligations may derive from assistance the group has rendered in the past. Others stem from a sense of duty to the industry and national economy of which companies are regularly reminded by the ministries and media that monitor their affairs. ... Opting in or out of keiretsu commitments to troubled corporate kindred on the basis of unilateral calculations of advantage is generally not the Japanese way of business, and companies that try it risk a stern lesson in the importance of team play.

In fact, the keiretsu are and do none of this. They neither shape the Japanese economy nor illustrate anything about relational contracting or social embeddedness. For at root, the keiretsu do not exist. Invented by 1960s-vintage Marxist economists and journalists determined to identify domination by "monopoly capital," the keiretsu were a convenient fiction from the start. To identify the keiretsu, modern economists typically rely on the Research on the Keiretsu (ROK; Keiretsu no kenkyu), a roster compiled by the obscure think-tank "Economic Research Institute"

(Keizai chosa kai).[1] In virtually all cases, the ROK merely allocates firms by the principal source of their loans. A few western economists rely on a less complete but English-language roster published occasionally by the Tokyo-based marketing firm Dodwell's.[2] Among the exchange-listed firms, Dodwell's merely reproduces the invitation list of firms whose presidents meet monthly for lunch, and adds others in which they have equity investments.

If either ROK or Dodwell's captured some otherwise unobservable but real group characteristic, it might be helpful. Neither does. The concept of keiretsu captures nothing about Japanese economic organization today, and captured nothing about Japanese economic organization of the 1960s or 70s. The keiretsu are instead a figment of the populist imagination, unwittingly perpetuated as the "keiretsu dummy" in modern econometric studies, but capturing nothing more than the source of some of a firm's debt or the occasional site of its president's lunch.

We begin by placing the keiretsu debate in intellectual context (Section I). We then turn to the two sources on which empiricists rely for their membership lists (ROK, in Section II; Dodwell's and the lunch clubs in Section III). We examine the significance of keiretsu affiliation for both debt finance and shareholding arrangements. We close by re-examining the principal conclusions scholars claim to have reached in keiretsu studies (Section IV). Overwhelmingly, we find that the results are a function of misspecified equations, outlying data points, or peculiarities in certain keiretsu definitions. The few reliably robust results simply recapture arbitrary sample biases created by the definitions themselves.

I. The Keiretsu in Post-war Japan

Talk of the "keiretsu" -- literally, "economic line-ups" -- dates mostly from the early 1960s. Marxists overwhelmingly controlled economics departments and newspapers in Japan, and they brought to their work a need to locate in the "contradictions" of modern "bourgeois capitalism" the "domination" by "monopoly capital." In the 1930s, they had located this domination in the "zaibatsu." Market competition during the preceding decades had left several families very rich. These families -- primarily, the Mitsui, Iwasaki (of the Mitsubishi empire), Sumitomo, and Yasuda -- had then diversified their investments into a variety of industries.

By the 1930s, these successful industrialists faced increasing hostility from populists on both the left and the right. "Zaibatsu" was simply the term muck-raking journalists coined to describe them. The word itself meant "financial clique," but the idiomatic connotations resembled nothing so much as "robber baron."

Apparently believing that these firms had bankrolled the war, the U.S. occupation officials dispossessed their owners (though the war had largely bankrupted the firms anyway) and banned the old trade names. The companies themselves they mostly left intact. When the Japanese government lifted the ban on the trade names in 1952, many of them retrieved their earlier names (Miwa & Ramseyer, 2000a, 2001).

Faced with this visible display of tradition, leftist journalists and academics saw in the firms the "monopoly capital" that Marxist theory taught them would dominate bourgeois capitalism. The compilers of the ROK shared that ideological need to find monopoly capital, as they explained in

[1] Fukuda & Hirota (1996); Hanazaki & Horiuchi (2000); Hoshi, Kashyap & Scharfstein (1990, 1991) (Nakatani variation on ROK); Morck, Nakamura & Shivdasani (2000) (Nakatani); Morck & Nakamura (1999) (union of Nakatani and the lunch club lists); Nakatani (1984); Prowse (1990) (intersection of Nakatani and Dodwell); Sheard (1989);

[2] Branstetter (2000); Kang & Shivdasani (1995, 1996, 1997); Kaplan & Minton (1994); Lincoln, Gerlach & Ahmadjian (1996) (augmented with loan, equity, and trade data); Weinstein & Yafeh (1998). See also Kang & Stultz (2000) (using keiretsu dummy without specifying source).

their description of the havoc the keiretsu were wreaking on the Japanese economy (ROK, 1960: 3-4):

> Monopolistic organizations of giant firms (firms that constitute trusts and industrial-capital combines), the keiretsu have a bank at their apex, and pursue their domination of capital through loans and their consolidation of that domination through equity .... By grasping and controlling points crucial to the circulation of capital ..., these monopolistic organizations place all of capitalism under their influence.

To detail this "monopolistic" domination, the Institute began in 1960 to identify the loans and equity investments of the offending firms. The result became the annual ROK. A roster coupled with basic financial data, by the 1980s it had become the source of the "keiretsu dummy" in econometric research.

II. The Keiretsu in "Research on the Keiretsu"

Begin, then, with the definitions behind the ROK rosters (Section A.). To ask whether the lists capture any group characteristics, consider both debt (Section B.) and equity (Section C.). Note that the ROK obtains its data from securities disclosure statements, and thus details firms listed on Section 1 of the Tokyo Stock Exchange (in 1965, 625 non-financial firms). Because many observers claim keiretsu ties weakened during the capital market liberalization of the 1980s and the recession of the 90s, we focus on two years during the supposed heyday of the keiretsu: 1965 and 1975. Parenthetically, we address both the connection between keiretsu ties and "main bank" relations, and the prevalence of cross-shareholding arrangements.

A. The Definition(s):

1. Introduction. -- Just as none of the "keiretsu" groups has formal members, none has a formal definition. Unfortunately, the ROK does not offer a definition either. Instead, during the period at issue (the 1960s and most of the 1970s), it simultaneously used at least four. Through each, it produced substantially different rosters.

All of these definitions did have two things in common. First, they relied almost exclusively on loans rather than shareholdings, personnel exchanges, commercial ties, or any of the other characteristics routinely attributed to the keiretsu. Note the significance of this: in all of the studies relying directly or indirectly on the ROK rosters, keiretsu membership in itself reflects nothing more than the amount the firm borrowed from several designated financial institutions.

Second, to determine the debt on which it based its rosters, the ROK first allocated the large financial firms among the various keiretsu, and then aggregated all loans made by those firms. To determine the Mitsui keiretsu, in other words, it summed the amounts borrowed from the Mitsui Bank, the Mitsui Trust Bank, the Taisho Marine & Fire Insurance Company, and the Meiji Life Insurance Company. To identify the Mitsubishi keiretsu, it summed the amounts a firm had borrowed from the Mitsubishi Bank, the Mitsubishi Trust Bank, the Tokyo Marine & Fire Insurance Co., and the Meiji Life Insurance Co.

2. Definitions. -- Depending on the purpose for which it wanted a roster, the ROK grouped firms by one of four definitions. For its Table 204 (“General Bank-Firm Affiliations”), it used the simplest:

> *Definition (1): Firms for which keiretsu financial institutions are collectively the largest source of borrowed funds.*

With the Mitsui, this definition generated a group of 82 firms. Of those, 66 had had the Mitsui financial institutions as their largest lender for three years running, and 16 others for only one or two years.

For its Table 206 ("Cross Shareholding Arrangements"), it used a narrower definition:

> *Definition (2): Firms meeting one of three criteria:*
>
> *(a) The firm had keiretsu financial institutions as its largest lending source for three years in a row and had at least 20 percent of its stock held by other members of the keiretsu;*
>
> *(b) The firm obtained at least 40 percent of its debt from keiretsu financial institutions, and that amount "significantly" exceeded the amount it borrowed from the next largest lender; or*
>
> *(c) The firm was in the keiretsu "by tradition."*

For the Mitsui, this generated a group of 48 firms. We include loan data on these firms in Table 1.

For its Table 201 (giving the ratio of keiretsu lending to gross assets), the ROK used a third definition:

> *Definition (3): All firms falling within Definition (2), plus all others for which keiretsu financial institutions were the largest lender for three years in a row, but excluding firms owned at least 30 percent by firms in other keiretsu.*

Under this approach, the Mitsui keiretsu had 71 firms.

Alas, the ROK did not limit itself to these three definitions. Instead, in its roster of firms by industry (Table 203), it used yet another list, but this time without explanation. In this table, it listed 53 non-financial Mitsui firms. Fourteen firms were in the Definition (4) roster but not in the 48-member Definition (2) roster; 9 firms were in the latter but not in the former (53 - 14 + 9 = 48). Because scholars generally focus on one the first three groups, we shall not explore the fourth further.

3. Membership. -- As one might suspect, the group generated by Definition (2) is almost entirely a subset of the first group. Of the 48 Mitsui firms falling under Definition (2), only 3 are not in the first. Apparently, they fall within the "tradition" catch-all of clause (c) (for example, Toyota famously has almost no debt and would not otherwise fit within a keiretsu). Of the 45 other firms, 40 had used the Mitsui financial institutions as their largest lender for at least 3 years, and 5 had used them for 1 or 2.

The group formed by Definition (3) is even closer to the first. Again, take the Mitsui. Obviously, the Definition (3) group includes the 48 firms in the second group. Of those 48, 40 had used Mitsui financial institutions as their largest lender for three years straight. Since 66 firms had used Mitsui institutions as their largest lender for 3 years, that leaves 26 that were not in the second group. All remaining 23 firms in the third group (71 - 48 = 23) came from this group of 26.

The Mitsubishi ownership rosters similarly reflect the way the ROK relied overwhelmingly on loan patterns. By Definition (1), the ROK generated a group of 79 Mitsubishi firms. Of these, 67 had had the Mitsubishi financial institutions as their largest lender for 3 years. The Definition (2) group included 46 firms, all of which came from the Definition (1) group and 45 of which had had Mitsubishi institutions as their principal loan source for 3 years. The group formed by Definition (3) also included 67 firms: all 46 firms in the second group, plus 21 of the 22 firms (67-45 = 22) that had borrowed the most from Mitsubishi institutions for 3 years but were not in the second group.

[See Table 1, from appended file.]

B. Lending Behavior:

1. Loan amounts. -- As all these definitions imply, the firms in the ROK lists generally borrow heavily from keiretsu financial institutions. In Table 2, we detail the loans between keiretsu borrowers (using Definition (3), and focusing on the 6 largest keiretsu) and financial institutions over the course of 1965-90. Note that the Daiichi Kangyo Bank resulted from the merger of the Daiichi and Kangyo banks in the early 1970s.

For many readers, the surprise will lie in how little the keiretsu firms borrowed from keiretsu financial institutions, even in 1965. That year, the Mitsui Bank made 31.0 percent of its loans to Mitsui group borrowers, and the Mitsui Trust Bank lent 24.5 percent to the group. In turn, the Mitsui firms borrowed 14.3 percent of their debt from the Mitsui Bank, and 9.3 percent from the Mitsui Trust Bank. Consistently, keiretsu members seem to have diversified their borrowings broadly, and borrowed from the keiretsu bank only a small minority of the loans they wanted.

Yet if keiretsu loans started low, they fell steadily. Over the period, within each keiretsu the financial institutions reduced the prominence of keiretsu debtors in their loan portfolios. Simultaneously, the firms themselves reduced their reliance on the keiretsu financial institutions for their debt. By 1975, the Mitsui Bank had cut the fraction of funds it loaned to keiretsu firms to 21 percent, and by 1985 to less than 10. Simultaneously, by 1985 the Mitsubishi Bank had cut its keiretsu loans to 7.2 percent, the Sumitomo Bank to 7.3 percent, and the Fuji Bank to 6.9 percent.

Indeed, return to Table 1. In 1965, on average Mitsui firms borrowed more from each of the Japan Development Bank, the Export-Import Bank, the Industrial Bank of Japan, and the Long-Term Credit Bank than they borrowed from either their keiretsu casualty or their keiretsu life insurance company. From the independent Nippon Life they borrowed more than from their own casualty insurance company and about as much as from their life insurance company. Fuji group members borrowed more from each of Nippon Life and Daiichi Life than from their keiretsu life insurance company.

Keiretsu firms did not limit their borrowings from the lead keiretsu banks because the banks could not lend more. They easily could have. In 1965, the Mitsubishi Bank lent its largest borrower, Mitsubishi Heavy Industries, 31 billion yen. It lent its next largest borrower 16 billion yen (Tokyo Electric -- not a keiretsu member), and its third largest debtor 11 million (Mitsubishi Electric). If it could lend Mitsubishi Heavy Industries 31 billion, its own scale did not stop it from lending the other keiretsu firms more.

[See Table 2, from appended file.]

2. Financial coordination. -- (a) Among group firms. In evaluating the ROK listings, an obvious preliminary question is whether it makes sense to pool the loans by the various financial institutions. Presumably, the ROK allocated these financial firms among the groups by their lineage to the pre-war zaibatsu. Yet by 1965 the firms had been independently owned and operated for nearly two decades. Did they still act cohesively?

To study the cohesion among these financial institutions, in Tables 3 and 4 we present the correlation among the loans and equity investments they made. We use the groups generated by Definition (2). Given that this is the most restrictive definition, presumably it is also the one most likely to generate a cohesive group. Among the Mitsubishi firms in 1965, the loans by Meiji Life are significantly positively correlated with those of the Mitsubishi Trust Bank (.344) but significantly negatively correlated with those of the Mitsubishi Bank (-.264). Among the Mitsui, other than the loans by the Mitsui and Mitsui Trust Bank (.471), none of the institutions has loans

significantly correlated with those of any other. Among the Sumitomo, only the loans of the life and casualty insurance firms are significantly correlated, and among the Fuji, none are.

Nor do these institutions seem to have coordinated their equity investments. Among the Mitsubishi firms in 1965, none of the shareholdings are significantly correlated. Among the Mitsui, shareholdings by the Trust Bank are correlated with those of the Mitsui Bank (.772) and Taisho Marine (.517). Among the Sumitomo, the shareholdings of the casualty insurance firm are positively correlated with those of the life insurance firm, but negatively correlated with those of the trust bank. Although the correlation among Fuji financial institutions is high, the actual amounts are low. As we detail in Table 9, the trust bank invests in a mean 0.4 percent of Fuji firm shares, the lowest of the four trust banks. The mean shares held by the casualty insurance firm (1.18%) is lower than that of the Mitsui, and the mean shares held by the life insurance company (1.08%) is the lowest of all four keiretsu life insurance companies.

(b) Among all firms. Even these haphazard correlations overstate the extent keiretsu lenders coordinate. Recall that we examine investments only in those firms where the aggregate loans from group financial institutions collectively constitute the largest source of borrowed funds. Indeed, because we used Definition (2), we examine investments primarily in firms where the aggregate loans from group firms had been the largest source of debt for 3 years, and where group members held at least 20 percent of a firm's stock. Necessarily, a firm that borrows from several such institutions (or whose stock is held by several group members) will more likely fall within the definition than one that borrows from (or issues stock to) only one. Necessarily, the more a group includes firms that borrow from (or issue stock to) multiple group institutions, the more correlated loans (and shareholdings) will appear to be.

Crucially, keiretsu financial institutions make loans and buy stock in a wide variety of firms outside of the groups. Take the Mitsubishi Bank. In 1965, it made less than a fourth of its loans to keiretsu firms (by Definition (3)). Of the 168 firms borrowing more than 100 million yen from the bank that year, 61 were in the keiretsu but 107 were not. Of the firms borrowing 1 billion yen or more, 42 were in the keiretsu but 41 were not. Of the 61 keiretsu firms to which the bank had lent at least 100 million yen, 59 firms were shareholders in the Bank and for 50 firms the Bank was a shareholder. Of the 41 non-keiretsu firms to which the Bank had lent at least 1 billion yen, 28 involved shareholding relations.

Nor is any of this peculiar to the keiretsu. Outside of the keiretsu, firms engage in similar shareholding and loan practices. Take the Industrial Bank Japan, generally not considered part of a keiretsu, and divide its borrowers into those for whom it was the largest borrower and those for whom it was not. Of the 52 firms borrowing at least 100 million yen from the IBJ for whom the IBJ was the largest lender, 51 firms held stock in the IBJ and for 30 such firms the IBJ was a shareholder. Of the 101 firms borrowing at least 1 billion yen from the IBJ for whom the IBJ was not the largest lender, 73 firms owned stock in the IBJ and for 46 firms the IBJ was a shareholder.

3. Main bank affiliation. -- In recent years, prominent scholars have increasingly used keiretsu affiliation to proxy for the strength of a firm's ties to its "main bank."[3] The concept of

[3] Among those using a keiretsu dummy for that purpose: Fukuda & Hirota (1996); Hanazaki & Horiuchi (2000); Hoshi, Kashyap & Scharfstein (1990, 1991); Morck & Nakamura (1999); Weinstein & Yafeh (1998). Prowse (1990) limits his study to keiretsu firms "because of the stronger ties these firms have to banks and other lenders;" Nakatani (1984) observes that each keiretsu "has a major commercial bank ... as the major lender to the member firms;" Sheard (1989: 401) describes the ROK roster as a "classification of listed Japanese firms into main-bank groupings."

"main bank" is every bit as amorphous as the concept of keiretsu, but empiricists usually define a firm's "main bank" as the bank or institution from which it borrows the most funds. Like Gerlach (1992: 119), most scholars in the field apparently assume that "the large city banks associated with the six big intermarket keiretsu are the main banks for virtually all their group companies." And most further seem to assume that keiretsu firms have stronger bank ties than non-keiretsu firms.

Unfortunately for this research, the keiretsu dummy says almost nothing about a firm's ties to its "main bank." As Table 2 shows, even in the supposed heyday of the keiretsu in the mid-1960s, firms borrowed from the principal bank of their keiretsu only 8-15 percent of their debt. Crucially, often they did not even use that bank as their main bank (see Table 5; keiretsu definition (2)). Among the Mitsui firms in 1965, fewer than 40 percent borrowed the most from the Mitsui Bank. Even with the Mitsui Trust Bank added, the figure rises only to 60 percent.[4] Among the Mitsubishi firms, only 52 percent used the Mitsubishi Bank as their lead financial institution. Obviously, membership in the Mitsui keiretsu tells us nothing about the strength of a firm's ties to the Japan Development Bank, the Industrial Bank of Japan, the Long-Term Credit Bank, or the Export-Import Bank.

[4] Note that this is an upper-bound on these estimates. In some cases, firms may have as a main bank a bank from one of the other keiretsu -- but this data is not readily recoverable from the ROK. See note 8, infra.

Trust bank loans will sometimes include amounts lent nominally in the name of the trust bank but in trust for other lenders. Securities filings (on which the ROK relies) only haphazardly detail such arrangements.

Table 3: Investment Correlation Among Keiretsu Financial Institutions, 1965

A. Loans

Mitsubishi (n = 46)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	-.244	1.000		
Cas Ins	-.198	-.049	1.000	
Life Ins	-.264*	.344*	.245	1.000

Mitsui (n = 48)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.471**	1.000		
Cas Ins	.022	.096	1.000	
Life Ins	-.160	.128	.234	1.000

Sumitomo (n = 48)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.043	1.000		
Cas Ins	-.005	-.149	1.000	
Life Ins	-.115	.297*	-.063	1.000

Fuji (n = 45)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	-.020	1.000		
Cas Ins	.071	-.021	1.000	
Life Ins	-.233	.099	.193	1.000

Sanwa (n =36)

	Bank	Tr Bk	Life Ins
Bank	1.000		
Trust Bk	-.039	1.000	
Life Ins	.112		1.000

Daiichi (n = 29)

	Bank	Life Ins
Bank	1.000	
Life Ins	.273	1.000

B. Shareholdings

Mitsubishi (n = 46)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.108	1.000		
Cas Ins	.083	-.022	1.000	
Life Ins	.224	.146	.085	1.000

Mitsui (n = 48)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.772**	1.000		
Cas Ins	-.001	.517**	1.000	
Life Ins	.147	-.040	-.019	1.000

Sumitomo (n = 48)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	-.219	1.000		
Cas Ins	.124	-.266*	1.000	
Life Ins	-.130	-.039	.503**	1.000

Fuji (n = 45)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.447**	1.000		
Cas Ins	.447**	.851**	1.000	
Life Ins	.861**	.512**	.495**	1.000

Sanwa (n =36)

	Bank	Tr Bk	Life Ins
Bank	1.000		
Trust Bk	-.055	1.000	
Life Ins	.152		1.000

Daiichi (n = 29)

	Bank	Life Ins
Bank	1.000	
Life Ins	.356*	1.000

Notes: ** Significant at the 1% level using one-tailed tests; * significant at the 5% level. Correlation between Sanwa trust bank and life insurance company not reported because of extremely small number of observations.

Table 4: Investment Correlation Among Keiretsu Financial Institutions, 1975

A. Loans

Mitsubishi (n = 52)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	-.384**	1.000		
Cas Ins	-.157	.112	1.000	
Life Ins	-.150	.294*	.149	1.000

Mitsui (n = 42)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.136	1.000		
Cas Ins	.049	.152	1.000	
Life Ins	-.197	.037	.245	1.000

Sumitomo (n = 47)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	-.098	1.000		
Cas Ins	.068	-.020	1.000	
Life Ins	-.221	.455**	.195	1.000

Fuji (n = 44)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	-.148	1.000		
Cas Ins	-.179	.096	1.000	
Life Ins	-.208	.029	.399**	1.000

Sanwa (n = 34)

	Bank	Tr Bk	Life Ins
Bank	1.000		
Trust Bk	-.178	1.000	
Life Ins	.265		1.000

DKB (n = 22)

	Bank	Life Ins
Bank	1.000	
Life Ins	-.165	1.000

B. Shareholdings

Mitsubishi (n = 52)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.505**	1.000		
Cas Ins	.223	-.116	1.000	
Life Ins	.381**	.176	-.022	1.000

Mitsui (n = 42)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.779**	1.000		
Cas Ins	.229	.389*	1.000	
Life Ins	.194	.179	.253	1.000

Sumitomo (n = 47)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	-.259*	1.000		
Cas Ins	-.106	-.136	1.000	
Life Ins	.149	-.053	-.276*	1.000

Fuji (n = 44)

	Bank	Tr Bk	Cas Ins	Life Ins
Bank	1.000			
Trust Bk	.512**	1.000		
Cas Ins	.285*	.140	1.000	
Life Ins	.449**	.179	.390**	1.000

Sanwa (n = 34)

	Bank	Tr Bk	Life Ins
Bank	1.000		
Trust Bk	.337*	1.000	
Life Ins	-.112		1.000

DKB (n = 22)

	Bank	Life Ins
Bank	1.000	
Life Ins	.015	1.000

Notes: ** Significant at the 1% level using one-tailed tests; * significant at the 5% level. Correlation between Sanwa trust bank and life insurance company not reported because of extremely small number of observations.

Table 5: Keiretsu Affiliation and Main Bank Status

A. Mitsui	1965	1975
Mitsui Bank	19 (39.6)	19 (45.2)
Mitsui Trust Bank	10 (20.8)	8 (23.8)
Japan Dev Bank	9 (18.7)	4 (9.5)
Indus Bank Japan	4 (8.3)	4 (9.5)
Long-Term Credit B	3 (6.3)	2 (4.8)
Export-Im Bank	2 (4.2)	2 (4.8)
Other fin. inst.	1 (2.1)	2 (4.8)
No subst. debt		1 (2.4)
Total firms	48	42

B. Mitsubishi	1965	1975
Mitsubishi Bank	24 (52.2)	28 (53.8)
Mitsubishi T B	10 (20.8)	8 (23.8)
Japan Dev Bank	4 (8.7)	1 (1.9)
Indus Bank Japan		2 (3.8)
Export-Im Bank	1 (2.2)	2 (3.8)
No subst. debt		2 (3.8)
Total firms	46	52

C. Sumitomo	1965	1975
Sumitomo Bank	28 (58.3)	25 (53.2)
Sumitomo Trust Bank	12 (20.7)	13 (27.7)
Japan Dev Bank	3 (6.3)	3 (6.4)
Indus Bank Japan	3 (6.3)	
Long-Term Credit B	1 (2.1)	1 (2.1)
Export-Im Bank	1 (2.1)	2 (4.3)
Nihon Life		1 (2.1)
Total firms	48	47

D. Fuji	1965	1975
Fuji Bank	30 (66.7)	31 (70.5)
Yasuda Trust Bank	9 (20.0)	9 (20.5)
Japan Dev Bank	1 (2.2)	1 (2.3)
Indus Bank Japan	2 (4.4)	2 (4.5)
Long-Term Crd B	2 (4.4)	
Export-Im Bank	1 (2.2)	
Nihon Life		1 (2.3)
Total firms	45	44

E. Sanwa	1965	1975
Sanwa Bank	26 (72.2)	24 (70.6)
Toyo Trust Bank	5 (13.9)	5 (14.7)
Japan Dev Bank	2 (5.6)	3 (8.8)
Indus Bank Japan	2 (5.6)	1 (2.9)
Export-Im Bank	1 (2.8)	1 (2.9)
Total firms	36	34

D. Daiichi/DKB	1965	1975
Daiichi/DKB	17 (58.6)	20 (87.0)
Japan Dev Bank	1 (3.4)	
Indus Bank Japan	3 (10.3)	1 (4.3)
Long-Term Crd B	2 (6.9)	1 (4.3)
Export-Im Bank	2 (6.9)	
Nihon Life		1 (4.3)
Asahi Life	4 (13.8)	
Total firms	29	23

Notes: The number of firms having a given financial institution as their principal source of borrowed funds, followed by the percentage of such firms among group members.

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C. Shareholding Behavior:

Key to most discussions of the keiretsu are the cross-shareholding arrangements. Indeed, (at the same time that they code their keiretsu dummy through the loan-based ROK roster) Morck & Nakamura (1999: 320) even define the keiretsu by the cross-shareholdings: "a group of companies linked by stable intercorporate shareholdings is called a keiretsu." Bergloef & Perotti (1994: 260) similarly characterize "elaborate cross-holdings of debt and equity" as one of the "main features" of the keiretsu.[5] Scholars have suggested a variety of reasons for the shareholdings. Gilson & Roe (1993), Bergloef & Perotti (1994; see Perotti, 1992), and Flath (1996) each see the shares as Williamsonian "hostage exchanges" that promote promissory credibility. Morck & Nakamura (1999) view them primarily as protection from hostile takeovers.

[5] See also Kang & Shivdasani (1996: 1062) (members "own substantial equity in other keiretsu member firms").

Yet the more basic question is whether cross-shareholding arrangements even exist. In fact, among non-financial firms the intra-group shareholdings (intra-group shareholdings of any sort, much less cross-shareholdings) are trivial. By way of example, take the shareholdings among the Mitsubishi firms. Table 6 gives the identification number of the firm holding stock along the top of the table, and the number of the firm whose stock is being held in the left column. Thus, the number in the row i column j gives the percentage of outstanding stock of the row i firm that is held by the firm in column j. The two right-hand columns give the total outstanding stock of each row firm held either by all other keiretsu members (S1) or by all other non-financial members of the keiretsu (S2). The two rows along the bottom of the table give the fraction of stock held by the firm in that column of the outstanding shares either of all keiretsu firms (T1) or of all non-financial keiretsu firms (T2). The life insurance company (firm (4)) is a mutual, and thus has no outstanding shares.

Overwhelmingly, Table 6 is blank. Far from being the norm, intra-group shareholding is the rare exception. At the Mitsubishi, the non-financial firm with the most group shares is firm (44), Mitsubishi Trading. Of the 28 firms in the group, it holds at least 0.5 percent interests in 24. Yet Mitsubishi Trading invests in a broad range of firms. In a 1969 securities disclosure connected with a stock offering it did list 37 Japanese "related firms" in which it had equity investments. Yet it carried them on its books for 2.68 billion yen, while its entire portfolio of Japanese securities it carried for 33.17 billion. Other than Mitsubishi Trading, Mitsubishi Chemicals (firm 23), Mitsubishi Heavy Industry (firm 14), or Mitsubishi Metals (firm 9), the non-financial firms invest almost nothing in each other.

Nor are other keiretsu very different. Table 7A gives the frequency with which the non-financial keiretsu firms invest in each other. In Table 6, for example, the 46 Mitsubishi non-financial firms could each have invested in 45 other firms -- for a total 2070 investment opportunities. Of these, firms had made investments in 219, or 10.6 percent. They had made at least 1 percent investments in 61, or 3.0 percent. According to Table 7A, in the same year Mitsui firms made 1 percent investments in 2.6 percent of the potential cases, Sumitomo firms in 3.7 percent of the potential cases, and Fuji firms in 1.8 percent.

Or consider the total outstanding shares of keiretsu firms held by group members (Table 7B). In the Mitsubishi keiretsu, non-financial firms on (weighted) average held 4.9 percent of the stock of each firm. All firms (including the financial firms) held 16.5 percent. In the Mitsui, the non-financial firms held an average of 3.5 percent of the stock of member firms, in the Sumitomo they held 6.1 percent, and in the Fuji 2.0 percent.

Cross-shareholding arrangements are even rarer. In 1965, the greatest number of cross-shareholdings involving at least 1 percent occurred among the Sumitomo firms -- with 11 pairs. Among the Mitsui and Sanwa firms there were 6 such pairs, among the Mitsubishi 4 pairs, among the Fuji 3 pairs, and among the Daiichi firms 2.

Note two additional facts. First, the correlation between loans and shareholdings is haphazard. In Table 8, we detail the coefficients of loan-shareholding correlation for each keiretsu financial institution. More often than not, the correlation is insignificant. Second, the low levels of intra-group shareholdings do not reflect legal constraints. During the period in question, the law placed no limit on the shares the non-financial firms could hold. The Antimonopoly Act did impose a 10 percent ceiling on financial institutions. As Table 9 shows, however, the institutions seldom approached it.

[See Table 6, from appended file.]

Table 7: Intra-Group Shareholdings, 1965 and 1975

A. Frequency of Shareholdings by Non-Financial Firms, By Size of Investment

1965	Mitsubishi	Mitsui	Sumitomo	Fuji	Sanwa	Daiichi
Any investment	219 (10.6)	222 (10.7)	216 (9.6)	83 (4.2)	80 (6.4)	97 (11.9)
Investment > 0.5%	94 (4.5)	88 (3.9)	120 (5.3)	40 (2.1)	37 (2.9)	48 (5.9)
Investment > 1 %	61 (3.0)	58 (2.6)	84 (3.7)	35 (1.8)	26 (2.1)	39 (4.8)
Investment > 5 %	11 (0.5)	16 (0.7)	21 (0.9)	11 (0.6)	5 (0.4)	18 (2.2)
Investment > 10 %	8 (0.4)	5 (0.2)	13 (0.6)	5 (0.3)	1 (0.1)	7 (0.9)
Total potential intra-group investments	2070	2256	2256	1980	1260	812

1975	Mitsubishi	Mitsui	Sumitomo	Fuji	Sanwa	DKB
Any investment	362 (13.7)	198 (14.9)	306 (14.2)	192 (10.1)	112 (10.0)	100 (19.8
Investment > 0.5%	155 (5.8)	89 (6.7)	145 (6.7)	83 (4.4)	47 (4.2)	51 (10.1
Investment > 1 %	105 (4.0)	65 (4.9)	105 (4.9)	66 (3.5)	28 (2.5)	37 (7.3
Investment > 5 %	32 (1.3)	15 (1.1)	22 (1.0)	16 (0.8)	6 (0.5)	15 (3.0
Investment > 10 %	14 (0.5)	10 (0.8)	14 (0.6)	7 (0.4)	4 (0.4)	2 (0.4
Total potential intra-group investments	2652	1332	2162	1892	1122	50

Note: Total number of cases in which a member a group has bought stock in another non-financial group member, followed by the number of such investments divided by the total number of potential intra-group investments (in percent).

B. Percentage (Weighted Average) of Non-Financial Keiretsu Shares Held by Other Keiretsu Members

1965

Held by	Mitsubishi	Mitsui	Sumitomo	Fuji	Sanwa	Daiichi
All firms	16.5	8.6	17.6	9.1	7.6	9.4
Non-financial firms	4.9	3.5	6.1	2.0	2.1	4.7

1975

Held by	Mitsubishi	Mitsui	Sumitomo	Fuji	Sanwa	DKB
All firms	25.2	15.3	22.6	17.7	11.0	17.4
Non-financial firms	9.2	5.3	9.5	4.6	3.5	7.9

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Table 8: Correlation Coefficients between Equity and Debt, 1965

	Mitsubishi	Mitsui	Sumitomo	Fuji	Sanwa	Daiichi
Bank	0.294*	0.244*	0.031	0.054	-0.018	-0.188
Trust bank	0.105	0.251*	0.012	-0.098	0.379*	None
Casualty ins.	0.010	0.072	0.157	0.274*	None	None
Life ins.	0.373**	0.690**	0.255*	0.110	0.932**	0.273

Notes: ** Significant at the 1% level using one-tailed tests; * significant at the 5% level. For relevant n, see Table 3.

Table 9: Shareholdings by Financial Institutions, 1965 and 1975

A. 1965:

	Total firms in group	Any Shares	Over 1%	Over 5%	Over 8%	Mean.
Mitsubishi						
Mitsubishi Bank	46	41	41	8	2	2.94
Mitsubishi Tr B	46	37	35	13	3	3.49
Tokyo Mar. & Fire	46	27	26	3	0	2.19
Meiji Life	46	33	33	10	3	3.00
Mitsui						
Mitsui Bank	48	33	31	9	2	2.29
Mitsui Trust Bank	48	17	16	0	0	0.53
Taisho Mar. & Fire	48	28	27	4	1	0.83
Mitsui Life	48	24	24	2	1	1.43
Sumitomo						
Sumitomo Bank	48	38	38	15	6	4.24
Sumitomo Trust B	48	30	30	12	3	3.93
Sumitomo Mar & F	48	22	20	1	0	0.88
Sumitomo Life	48	31	30	11	6	2.38
Fuji						
Fuji Bank	45	45	44	20	7	4.49
Yasuda Trust Bank	45	15	15	1	0	0.40
Yasuda Marine & F	45	24	24	3	2	1.18
Yasuda Life	45	18	17	5	1	1.08
Sanwa						
Sanwa Bank	36	35	35	10	4	3.95
Toyo Trust Bank	36	17	17	5	1	1.42
Daido Life Ins	36	4	3	0	0	0.08
Daiichi						
Daiichi Bank	29	23	20	6	3	2.92
Asahi Life	29	13	12	7	4	1.77

Table 9 (Cont'd)

B. 1975:

	Total firms in group	Any Shares	Over 1%	Over 5%	Over 8%	Mean.
Mitsubishi						
Mitsubishi Bank	52	50	49	32	8	5.41
Mitsubishi Tr B	52	43	39	8	1	2.88
Tokyo Mar. & Fire	52	42	39	9	0	3.23
Meiji Life	52	42	40	20	8	4.51
Mitsui						
Mitsui Bank	42	34	34	14	2	3.50
Mitsui Trust Bank	42	30	30	8	3	2.54
Taisho Mar. & Fire	42	25	25	4	1	1.26
Mitsui Life	42	29	29	7	3	2.61
Sumitomo						
Sumitomo Bank	47	41	41	23	10	5.44
Sumitomo Trust B	47	29	28	7	2	2.24
Sumitomo Mar & F	47	23	23	3	0	1.02
Sumitomo Life	47	40	39	14	8	4.44
Fuji						
Fuji Bank	44	44	44	34	12	6.13
Yasuda Trust Bank	44	34	34	7	1	2.11
Yasuda Marine & F	44	28	27	6	2	2.34
Yasuda Life	44	24	24	4	2	2.53
Sanwa						
Sanwa Bank	34	34	34	24	10	5.71
Toyo Trust Bank	34	19	19	0	0	1.19
Daido Life Ins	34	10	9	2	0	0.56
DKB						
Daiichi Kangyo B	23	22	22	13	8	5.56
Asahi Life	23	11	11	8	7	3.84

Note: For each financial institution, we give the number of firms in each category in which it has made equity investments of the given size, followed by the (simple) mean of the size of the institution's investment.

Table 10: ROK, Dodwell's, and Lunch Club Rosters (TSE Section 1 Firms)

A. ROK and Dodwell's (1975):

	Mitsui	Mi'bishi	Sumitomo	Fuji	Sanwa	DKB .
# firms ROK (Def. (3))	85	107	100	82	60	59
# firms Dodwell's	83	127	102	93	75	62
# firms in both	41	68	55	51	39	33
% ROK in Dodwell's	48.2	63.6	55.0	62.2	65.0	55.9
% Dodwell's in ROK	49.4	53.5	53.9	54.8	52.0	53.2

B. The Lunch Clubs (1975-76)

	Mitsui	Mi'bishi	Sumitomo	Fuji	Sanwa	DKB
Lunch club members	24	27	16	29	37	30

C. Luncheon Club Membership Changes

	1967-76		1976-86		1986-96	
	Add	Drop	Add	Drop	Add	Drop
Mitsui	5	8	1	0	3	2
Mitsubishi	4	3	2	0	3	3
Sumitomo			5	0	1	2
Fuji	4	0	0	0	1	1
Sanwa	17	3	6	0	2	1
Daiichi (DKB)	18	0	18	1	2	1

Notes: Part C gives estimates of the minimum number of changes, based on checks of the members in 1967, 1972, 1976, 1982, 1986, 1991, and 1996. Obviously, additional firms could have entered and left in the intervening years.

IV. The Keiretsu in Dodwell's

A. Dodwell's:

1. Membership. -- At least for the English-speaking audience, Dodwell Marketing Consultants has presented the stiffest competition to the ROK. Every few years since the early 1970s, it has published its own keiretsu roster in the Industrial Groupings in Japan. To this work, it brings an enthusiasm that easily matches the ROK's ideological predispositions -- "[t]he concentration of economic power in large financial and industrial groups," it proclaimed in 1975 (1975: i), "is a unique feature of Japanese commerce and industry." In the discussion below, we focus on that 1975 edition as the earliest we were able to obtain.

Unfortunately, Dodwell's does not explain how it chooses its groups. Apparently, it starts with the invitation list of firms whose presidents meet monthly for lunch. To that list, it adds those firms where lunch group invitees appear prominently among the 10 largest shareholders. Like a Michelin guide to IO, it then assigns group members 1 to 4 stars based on the size of those shareholdings. Where ROK collected information on 8 groups (Mitsui, Mitsubishi, Sumitomo, Fuji, Sanwa, Daiichi, Tokai, and Daiwa), Dodwell's lists the first six of those plus Nippon Steel, Hitachi, Nissan, Toyota, Matsushita, Toshiba, and Tokyu. The latter groups are manufacturer-centered (vertical) groups. As such, they raise different issues and we address them in a separate article (Miwa & Ramseyer, 2000b).

2. ROK and Dodwell's Compared. -- Back when the U.S. Trade Representative claimed the keiretsu blocked American products, Saxonhouse (1991: 37) observed that if keiretsu members were to act collusively, "they do have to know with whom they are supposed to be colluding." "This may not be easy," he warned. Indeed not. If the various keiretsu definitions -- arbitrary as they seem -- proxied for otherwise real but unobservable group characteristics, the ROK and Dodwell definitions should produce roughly the same rosters. They do not. Just as the various ROK definitions produced Mitsui keiretsu ranging from 48 firms to 82, the ROK and Dodwell's produce Mitsui keiretsu in which less than half of the members overlap (Table 10). The fraction of ROK members (TSE Sec. 1 firms in the 6 principal groups; Definition (3)) appearing in Dodwell's (TSE Section 1 firms only) ranges from 48 to 65 percent; the fraction of Dodwell members appearing in the ROK ranges from 49 to 55 percent.[6]

B. The Lunch Clubs:

1. Membership. -- Focus, then, on Dodwell's 4-star firms: the lunch club members. Given that the members themselves decide with whom to dine, the invitations arguably comprise the least ambiguous membership rosters. Indeed, scholars have sometimes used them for just that purpose.[7]

As Table 10 shows, these groups are much smaller than either the Dodwell or ROK groups. Where the Mitsui keiretsu had about 80 members by either Dodwell or ROK (albeit fewer than half in common), only 24 were in the lunch club. Of those 24, by definition all were in Dodwell's (as the 4-star members); 22 (all of the non-financials) were in the ROK group.

Not only are these lunch clubs small, they also change. None of the groups has changed much since the mid-1980s. Yet where the Sanwa group had 23 members in 1967, it added 17 more over the succeeding decade and yet another 6 during the next. Even the putatively stable Mitsui added five firms and dropped 8 from 1967-76 -- this on an original membership of only 27.

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[6] Weinstein & Yafeh (1995: 368) find that the correlation between ROK and Dodwell's rosters is .31.

[7] E.g., Flath (1996); Khanna & Yafeh (2000); Lincoln, et al. (1996). When scholars cite the Kigyo keiretsu soran rosters (see Shukan toyo keizai), they refer to these lunch club lists.

2. Keiretsu loans. -- Lunch club members were no more likely to rely on keiretsu banks than other keiretsu members -- which is to say, they did not rely on them much at all. Where Mitsui keiretsu members (by ROK Definition (3)) in 1965 borrowed 14.3 percent of their loans from the Mitsui Bank (Table 2), the lunch club members borrowed 16.6 (Table 11). Where Mitsubishi keiretsu members borrowed 18.2 percent, the lunch club members borrowed 16.1.

Nor were lunch club members particularly likely to use the lead keiretsu bank as their "main bank." Indeed, in each lunch club, a majority of the firms did not use the lead keiretsu bank as the principal source of their loans (Table 12). Recall that many modern econometric studies use keiretsu affiliation as a proxy for the strength of a firm's ties to its main bank. Unfortunately, this is equally inappropriate for lunch club members as for the ROK keiretsu members. Just as ROK keiretsu membership does not proxy for the use of the keiretsu bank as a main bank (much less for the "strength" of that tie), neither does lunch club membership.[8]

3. Keiretsu shareholdings. -- Although lunch club members are more likely to buy stock in each other than the ROK members, the amounts remain small. Even with the Mitsui and Mitsubishi (1965), the non-financial firms bought stakes larger than 1 percent less than a tenth of the time (Table 13). On (weighted) average, among the Sumitomo firms the non-financial lunch club members collectively did hold 9.1 percent of any member's stock. Among the Mitsubishi, however, they held 4.3 percent, and among the Mitsui 3 percent. Note that we omit shareholdings among the Sanwa, Fuji, and Daiichi groups because not all lunch-club members (6 members each for Fuji and Sanwa, 1 for Daiichi), were in the ROK keiretsu. As a result, the relevant shareholding data were not available for these members. We also omit Hitachi, as it was in both the Fuji and the Sanwa clubs (indeed, it would later join the Daiichi-Kangyo club as well).

Nor did the keiretsu financial institutions often hold large stakes in the lunch club members. In 1965, the Sumitomo Bank held more than 5 percent of 6 firms, the Mitsui Bank of 4 firms, and the Mitsubishi Bank of 1. Cross-shareholding arrangements were rarer still. Among all Sumitomo lunch club members, 11 pairs of non-financial firms held at least 1 percent in each other. Among the Mitsubishi however, only one pair did, and among the Mitsui, none.

4. Membership. In the mid-1960s, the Mitsui, Mitsubishi and Sumitomo presidents (Fuji, Sanwa and Daiichi did not begin meeting until about 1967) primarily invited to their lunches only men from the former zaibatsu firms. Before the war, they had worked in family-owned empires. As such, many knew their peers at the other family firms. Indeed, some were probably friends. With their seniors purged by the U.S.-dominated occupation, by the late 1950s they had climbed to the pinnacle of their firms. Life is lonely at the top, and the monthly lunches now gave them a chance to socialize with men who did not always answer "yes."

As groups of formerly zaibatsu firms, the clubs included many firms that mattered only in history, if they mattered even then. As of 1967 (the earliest date for which we have an invitation list -- Nihon keizai shimbun, Apr. 25, 1967), they included the Hokkaido Colliery & Steamship company (1965 market capitalization of 6.9 billion yen -- the exchange rate was 360 yen/$), for

[8] As discussed in note 4, supra, this is an upper bound. Some lunch-club members use banks in other keiretsu as their main bank, but that information is not readily recoverable from the ROK: e.g., Nissho was in the Sanwa lunch club but borrowed more from the Daiichi bank than the Sanwa Bank, Nihon tsuun was in the Sanwa lunch club but borrowed more from the Kangyo Bank, and Keihin kyuko was in the Fuji lunch club but borrowed more from the Mitsui Trust Bank.

example, and the Toshoku trading firm (3.0 billion), Mitsubishi Steel (2.8 billion), Mitsubishi-Edogawa Chemicals (3.1 billion), Sumitomo Coal (3.2 billion), Mitsubishi Mining (3.5 billion), and Mitsubishi Plastics (3.7 billion).

These clubs could not have dominated the Japanese economy if they had tried. Not only did they include firms that had gone nowhere, they missed many of the most crucial. Predominantly, they included those from industries that had thrived prewar -- e.g., finance, mining, fertilizer, real estate, ocean shipping, warehousing, cement -- and omitted those that were central to growth postwar. As of 1967, giant firms not in any of the six principal lunch clubs included Toyota (1965 market capitalization of 135 billion yen), Toshiba (91 billion), Takeda Pharmaceuticals (61 billion), Kinki Nihon Railway (43 billion), Honda (42 billion), Bridgestone Tire (42 billion), Kajima Construction (37 billion) -- not to mention firms like Matsushita Electric (Panasonic), Sharp, Sony, Kyocera, Suzuki, Cannon, and Nikon. The clubs did not even include Toyo kogyo (Mazda; 1965 capitalization of 71 billion) whose "rescue" by the Sumitomo Bank in the 1970s Pascale & Rohlen (1983) would transform into so famous a tale of keiretsu virtue.

For scholars who stress the lunch clubs -- transformed majesterially through word choice into "President's Councils" -- the clubs do solve a theoretical quandary. Although the ROK gives long rosters, its "members" have no way to coordinate what they do. Posit regular "councils" of firm presidents, and the problem vanishes.

Yet if the theoretical problem disappears, the empirical one compounds itself, for even scholars who stress their importance have yet to produce a lunch club decision that much mattered. From time to time, the clubs have apparently passed on whether to let firms use the old zaibatsu trademark. In the late 1960s, they apparently planned group exhibitions to the 1970 Osaka World's Fair. At one point, the Sumitomo club is said to have tried to stop Sumitomo Metals and Sumitomo Chemicals from expanding their aluminum refining facilities. The Mitsubishi club is said to have tried to stop Mitsubishi Chemicals and Mitsubishi Petrochemicals from expanding ethylene production. In both cases, however, the firms ignored the group pressure and proceeded as planned.

Table 11: Intra-keiretsu Loans, 1965 -- Luncheon Clubs Only

A. As percent of financial institution lending:

	# of members	# firms counted	Bank	Trust bank	Cas. insur.	Life insur.	Total Loans .
Mitsui	27	19	17.1	11.8	20.7	19.0	688,143
Mitsubishi	25	18	16.2	18.3	44.8	19.1	831,943
Sumitomo	17	12	8.9	13.8	0.0	19.8	363,623
Fuji	25	20	14.0	16.0	5.2	5.0	677,431
Daiichi	16	13	6.1	None	None	11.7	307,471
Sanwa	23	19	12.1	16.8	None	6.4	620,922

B. As percent of non-financial firm borrowing:

	# of members	# firms counted	Bank	Trust bank	Cas. insur.	Life insur.	Total Loans .
Mitsui	27	19	16.6	9.2	0.2	1.7	688,143
Mitsubishi	25	18	16.1	11.5	0.3	2.7	831,943
Sumitomo	17	12	18.3	19.0	0.0	6.1	363,623
Fuji	25	20	19.9	8.4	0.0	0.4	677,431
Daiichi	16	13	13.2	None	None	4.9	307,471
Sanwa	23	19	16.3	6.7	None	1.9	620,922

Notes: Loan data are available only for TSE listed firms, and not all lunch club members are listed firms.

Loans are in million yen.

The ROK treats the Daido Life Insurance company as a Sanwa firm, when the lunch club member is the Nihon Life Insurance company. For purposes of this Table 11, we treat Nihon rather than Daido as the Sanwa life insurance firm.

Table 12: Keiretsu Affiliation and Main Bank Status, 1965 -- Luncheon Club Members Only

A. Mitsui		B. Mitsubishi	
Mitsui Bank	4 (30.8)	Mitsubishi Bank	8 (44.4)
Mitsui Trust Bank	3 (23.1)	Mitsubishi Trust Bank	7 (38.9)
Japan Dev Bank	3 (23.1)	Japan Dev Bank	2 (11.1)
Export-Im Bank	1 (7.7)	Export-Im Bank	1 (5.6)
Indus Bank Japan	1 (7.7)		
Long-Term Credit B	1 (7.7)		
Total firms	13		18

C. Sumitomo		D. Fuji	
Sumitomo Bank	6 (50.0)	Fuji Bank	14 (70.0)
Sumitomo Trust Bank	4 (33.3)	Yasuda Trust Bank	3 (15.0)
Japan Dev Bank	1 (8.3)	Japan Dev Bank	1 (5.0)
Indus Bank Japan	1 (8.3)	Indus Bank Japan	2 (10.0)
	12		20

E. Sanwa		F. Daiichi	
Sanwa Bank	9 (45.0)	Daiichi Bank	6 (46.2)
Toyo Trust Bank	3 (15.0)	Asahi Life	2 (15.4)
Japan Dev Bank	2 (10.0)	Japan Dev Bank	1 (7.7)
Indus Bank Japan	2 (10.0)	Indus Bank Japan	1 (7.7)
Export-Im Bank	1 (5.0)	Export-Im Bank	1 (7.7)
Long-Term Credit B	1 (5.0)	Long-Term Credit B	2 (15.4)
Total firms	20		13

Notes: The number of firms having a given financial institution as their principal source of borrowed funds, followed by the percentage of such firms among group members.

Table 13: Intra-Group Shareholdings, 1965 -- Luncheon Clubs Only

A. Frequency of Shareholdings by Non-Fin. Firms, by Size of Investment

	Mitsubishi	Mitsui	Sumitomo
Any investment	119 (38.9)	51 (32.7)	93 (70.5)
Investment > 0.5%	51 (16.7)	24 (15.4)	61 (46.2)
Investment > 1 %	29 (9.5)	12 (7.7)	44 (33.3)
Investment > 5 %	2 (0.7)	3 (1.9)	10 (7.6)
Investment > 10 %	1 (0.3)	1 (0.6)	2 (1.5)
Poten. Investments	306	156	132

Note: Total number of cases in which a member of a group has bought stock in another group member, followed by the number of such investments divided by the total number of potential intra-group investments (in percent). Sanwa, Fuji, and Daiichi groups omitted because the non-financial lunch-club members were not all in the ROK groups -- hence shareholding data was unavailable.

B. % (wgt. aver.) of Non-Financial Keiretsu Shares Held by Keiretsu members

Held by	Mitsubishi	Mitsui	Sumitomo
All firms	16.3	9.8	24.5
Non-fin. firms	4.3	3.0	9.1

C. Shareholdings by Financial Institutions

	Total firms in group	Any Shares	Over 1%	Over 5%	Over 8%	Mean.
Mitsubishi						
Mitsubishi Bank	18	17	17	1	0	2.93
Mitsubishi Tr B	18	16	16	4	1	3.47
Tokyo Mar. & Fire	18	14	13	2	1	2.39
Meiji Life	18	18	18	4	1	3.24
Mitsui						
Mitsui Bank	13	11	10	4	2	2.53
Mitsui Trust Bank	13	9	7	0	0	0.93
Taisho Mar. & Fire	13	9	9	1	0	1.14
Mitsui Life	13	11	11	1	0	2.17
Sumitomo						
Sumitomo Bank	12	12	12	6	2	5.25
Sumitomo Tr B	12	11	11	4	1	5.08
Sumitomo M & F	12	8	8	1	0	1.19
Sumitomo Life	12	12	12	4	2	3.66

Note: For each financial institution, we give the number of firms in each category in which it has made equity investments of the given size, followed by the (simple) mean of the size of the institution's investment.

V. The Keiretsu in Economics

If such are the keiretsu rosters scholars use, what should we make of the results they obtain? The results form a strange melange: some seem to depend on misspecified equations, while others depend on outlying data points and some are simply not robust. Given the absence of any mechanism for coordination in the keiretsu, many depend on theoretical priors economists would never apply outside Japan. Why expect anything to come, after all, of distinguishing between a firm that borrows 15 percent of its debt from one incoherently grouped set of financial institutions rather than another? In the end, the strongest results may be the sample biases created by the definitions themselves.

A. Liquidity:

By far the best-known of the keiretsu studies are a pair of articles by Hoshi, Kashyap & Scharfstein (1990, 1991).[9] In the first, they take 125 financially distressed firms (defined as firms with interest payments larger than operating income for 2 years in a row) from 1978-85. They then regress investment after the onset of financial distress on keiretsu affiliation (defined by the ROK-based roster from Nakatani [1984]) and various controls. They find that keiretsu-affiliated firms invest more than independents. The various ties with the keiretsu bank, they reason, enable group firms to overcome the informational and coordination problems that otherwise plague financially distressed firms.

In fact, however, keiretsu affiliation says nothing about a firm's ties to a main bank (see Section II.B.3., above). Even if it did, basic questions present themselves: If the main bank monitored the firm so carefully, why did it let matters take the turn that they did? Why did it not, most obviously, either withdraw its investments before the distress or lend the firm enough to avoid distress completely?

In the second, Hoshi, Kashyap & Scharfstein use Nakatani's (1984) ROK roster to divide the firms (both distressed and not distressed) into keiretsu firms and independents. They then follow the Fazzari, Hubbard & Petersen (1988) model of financing constraints and investment-cash flow sensitivities. For the two groups of firms, they regress investment on cash flow, Tobin's Q, and various controls, and conclude that keiretsu firms are less liquidity constrained. Again, they conclude that when financially distressed, keiretsu firms invest more than the independents.

Recent work suggests several reasons for doubting the results. On theoretical grounds, Kaplan & Zingales (1997, 2000; contested by Fazzari, et al., 2000) find the Fazzari, Hubbard & Petersen model implausible a priori. The proposition (a) that the sensitivity of corporate investment to cash flow would reflect financing constraints depends entirely, they (2000: 708) show, on the assumption (b) that "investment-cash flow sensitivities increase monotonically in the degree of financing constraints." No reason exists, they then explain, to expect such monotonicity.

On empirical grounds, both Hayashi (2000) and Hall & Weinstein (2000) find the Hoshi, Kashyap & Scharfstein results unstable. Hayashi (2000; contested by Hoshi, 2000) concludes that the results hinge on four outlying firm-years. In turn, Hall & Weinstein (2000) locate no evidence that a firm's lead bank more readily lends to financially distressed keiretsu firms than non-keiretsu firms.[10]

B. Performance Variability:

[9] An analogous result appears in Lincoln, et al. (1996).

[10] A related result appears in Miwa (1996: 108-119).

If keiretsu firms have better access to funds during financial distress, they should exhibit lower profit variability than independents. Nakatani (1984; similarly Khanna & Yafeh, 2000) does find evidence to that effect. Yet for several reasons this result may be no more robust than Hoshi, Kashyap & Scharfstein's.

If independent firms exhibit more variable performance, all else equal they should pay interest at higher rates. They do not. What evidence there is (Caves & Uekusa, 1976; Weinstein & Yafeh, 1998) instead suggests they pay lower rates.[11] Further, Fukuda & Hirota (1996) conclude that higher-variance firms disproportionately borrow from keiretsu banks. And Hall & Weinstein (2000) find no evidence that independent firms face an interest premium on their bond issues.

Perhaps most basic, no one has suggested a plausible mechanism by which keiretsu affiliation would let firms reduce volatility. Equity holdings would not work: shareholdings are too trivial.[12] Trade ties will not work: the ties are simply too haphazard. And debt does not work: while all firms obviously borrow, no one has shown that interest charges move counter-cyclically for keiretsu firms.

C. Trade:

During the trade dispute of the early 1990s, Lawrence (1991, 1993) claimed that keiretsu excluded foreign products. Regressing sectoral trade data on sector-based keiretsu shares and various controls, he argued that the presence of keiretsu firms in an industry depressed imports but did not affect exports. Concluded he, the keiretsu were exclusionary.

When Saxonhouse (1991, 1993) respecified Lawrence's trade model to solve simultaneity problems, however, the effect of keiretsu affiliation on trade disappeared. As he then explained, if U.S. firms could not sell in industries dominated by keiretsu firms, that fact more plausibly showed stiff competition than collusion. When Weinstein & Yafeh (1995) examined the issue more closely, they found exactly that result: keiretsu firms had profit/cost margins if anything lower than those of the independents.

D. Profitability:

The biggest puzzle may involve the claim first made by Caves & Uekusa (1976: 76; Uekusa 1974a, 1974b): keiretsu firms earn lower profits than independents. Although the Caves & Uekusa study itself is suspect on data grounds (it included only 16 non-randomly selected independents), several scholars have since made similar claims with better data sets. Nakatani (1984) found the same result, for example, as did Khanna & Yafeh (2000), Lincoln, et al. (1996), and Weinstein & Yafeh (1998).[13]

By standard economic theory, the inquiry is problematic on its face. After all, firms and banks choose the loan contracts they form by mutual agreement. Many firms did find it

[11] Why independents would pay lower interest rates is itself a mystery. Although Caves & Uekusa (1976) and Weinstein & Yafeh (1998) suggest that keiretsu banks use their bargaining power to extract rents from their borrowers, the point is inconsistent with the way keiretsu firms borrow widely and rely on their lead bank for only 10-15 percent of their total loans.

[12] Weinstein & Yafeh (1995, 1998) produce models in which the shareholdings of the financial institutions allow them to dominate a debtor firm in ways that cause it to skew its objectives in directions advantageous to the lender. Note, however, both that the shareholdings of the financial institutions were generally under 5 percent even before the 5 percent legal limit (Table 9), and that the shareholdings are only loosely correlated with loans -- if at all (Table 8).

[13] In regressing Q and operating income on, inter alia, the Nakatani keiretsu affiliation, Morck, Nakamura & Shivdasani (2000) find no significant effect.

advantageous to borrow their largest sums from the Mitsui Bank. But most did not. Some of the rest chose the Mitsubishi Bank or Sumitomo Bank. Others chose the Industrial Bank of Japan, the Long-Term Credit Bank, or any one of the hundreds of smaller banks and financial institutions. So long as banks and firms equalize on the margin, the observed returns to joining a keiretsu should equal zero (Alchian & Demsetz, 1972; Demsetz & Lehn, 1985).

And zero it may indeed have been, for -- contrary to the many studies -- the apparent cost to joining is both time- and definition-dependent. To explore the question, we conduct a simple experiment. We take Nakatani's firms and regress Tobin's Q (from Hayashi & Inoue, 1991) on keiretsu affiliation and 10 industry dummies for 1977-1986.[14]

Two results surface. First, the negative relationship remains significant only through the 1980s (Table 14.A.). By 1983, 1985 and 1986, the coefficient is no longer statistically significant.[15] Second, the relationship appears to hold only for the ROK-based Nakatani roster. When we measure keiretsu affiliation by lunch-club membership the result disappears completely (Table 14.B.).

Hence the obvious question: why should firms that borrow 15 percent of their loans from the Mitsui Bank and lesser amounts elsewhere have lower profits than firms that borrow 15 percent from the Industrial Bank of Japan and lesser amounts elsewhere (including the Mitsui Bank)? In Table 15, we provide loan data on both independent and keiretsu firms in Nakatani's data base for the machinery industry (the industry with the most independent firms). As the table shows, other than the identity of the lead lending institutions keiretsu and independent firms apparently follow the same borrowing practices. The largest loan tends to be a bigger fraction of total loans among the independents, since a firm does not qualify as an independent unless its largest single loan source exceeds the sum of the loans from the various pooled keiretsu lenders. Otherwise, the loan patterns suggest no reason one group would out-perform the other.[16]

F. Sample Bias:

In a sense, the most robust observations may be the most boring. They are the sample biases created by the definitions themselves. Consider the following question: if keiretsu firms are those that borrow the largest part of their funds from the biggest financial institutions, what would we expect to find among them?

Most obviously, the keiretsu firms should disproportionately be large firms with a comparative advantage in borrowing from banks.[17] To fall within a keiretsu, they must borrow heavily from the largest money-center banks. Most TSE firms do, of course. Disproportionately, those that do not will be those that borrow so little that their largest debt source becomes one of the smaller banks.

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[14] The data set, used in Hayashi (2000), was kindly provided to us by Fumio Hayashi.

[15] Interestingly, when Hanazaki & Horiuchi (2000) regress total factor productivity on an ROK-based keiretsu dummy and various controls, they find the impact of keiretsu affiliation time-dependent, though in the opposite direction: insignificant for 1957-70, and significantly negative for 1981-90.

[16] Contrary to Table 14, Lincoln, et al. (1996) and Weinstein & Yafeh (1998) obtain the lower-profits result with other rosters (lunch-club for the former, Dodwell's for the latter). Both, however, use after-interest profits as the dependent variable (though they do include leverage among their controls). Given that keiretsu firms maintain higher leverage than other firms, this makes their results suspect on that ground. Our own results do not substantially change even if we replace Q with profits after interest.

[17] This analysis does not straightforwardly apply to the Dodwell lists, of course. Yet Dodwell's begins with the lunch clubs, and the lunch club firms -- as successors to the prewar zaibatsu -- are disproportionately concentrated in sectors like heavy industry where firms have high levels of mortgageable assets.

The two most consistent results in the literature follow directly: keiretsu firms are large, and they have high leverage. Hardly exciting, they are nonetheless the most robust. They are also the ones for which the explanation is clearest: sample bias caused by the definition itself.[18]

[18] In fact, the observation is also potentially misleading. Keiretsu studies are overwhelmingly limited to manufacturing, and many of the largest independents are in sectors like utilities, transportation, and distribution.

Table 14: Tobin's Q and Keiretsu Affiliation

A. Keiretsu affiliation based on ROK:

Dependent variable: Tobin's Q

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Keiretsu	-.419	-.447	-.751	-.464	-.462	-.504	-.331	-.677	-.325	-.787
	(3.22)	(3.47)	(4.14)	(3.25)	(2.30)	(2.56)	(1.61)	(2.21)	(0.72)	(1.54)
Adjusted R2	.08	.08	.10	.07	.14	.09	.14	.19	.06	.02

Industry dummies: yes
n = 297

B. Keiretsu affiliation based on lunch-club membership:

Dependent variable: Tobin's Q

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Keiretsu	-.083	-.117	-.275	-.159	-.114	-.040	-.041	-.266	-.570	-.415
	(0.57)	(0.81)	(1.34)	(0.99)	(0.51)	(0.18)	(0.18)	(0.78)	(1.21)	(0.73)
Adjusted R2	.08	.04	.05	.04	.12	.07	.13	.17	.06	.01

Industry dummies: yes
n = 297

Notes: Coefficients, followed by the absolute value of the t-statistics in parentheses. The sample includes 255 keiretsu members by the ROK definition, and 41 members by the lunch-club definition.

Table 15: Debt in the Machinery Industry, 1965

Independent Firms	Lending institutions								Total Debt
	First	(%)	Second	(%)	Third	(%)	Fourth	(%)	(million)
Daido	Hokkoku B	55.16	Sanwa B	11.83	Fuji B	7.61	Smtm TB	6.05	5451
Howa	IBJ	39.77	Mtbshi B	7.52	Tokai B	7.29	Chuo TB	5.71	6992
Okuma	Tokai B	39.44	Taiyo-K B	13.88	Fuji B	12.12	Mtbshi B	9.41	17114
N-Thompsn.	Tokai B	37.96	Gifu K B	14.29	DKB	9.31	Mitsui TB	4.58	5480
Osaka kiko	Daiwa B	37.18	Hyogo K B	6.22	LTCB	5.50	Shiga K B	5.18	14070
Amanda	DKB	34.27	Taiyo-K B	25.82	Saitama B	16.43	Mitsui B	9.39	4260
N-Fujik.	Tokai B	24.35	Hokurik B	21.58	Mitsui TB	9.78	Chuo TB	8.54	24826
Tadano	114th B	24.07	Mitsui TB	15.71	DKB	13.03	Mtbshi B	12.60	6794
Ikegai	IBJ	22.34	Kyowa B	14.35	Nihon L	8.11	Sanwa B	6.84	12285
Diesel kiki	IBJ	16.84	Mtbshi TB	15.10	DKB	8.39	Kyowa B	8.10	24603
Tsugami	Daiwa B	16.38	Ataka S	10.66	Tokai B	8.02	Daiichi L	6.29	3754
Kurita	Tokai B	15.23	Mitsui TB	14.72	Mtbshi TB	13.64	DKB	11.70	14402
Kioritz	Takugin	14.38	DKB	13.64	Toyo TB	10.90	Nochu	10.84	3505
Kato	Saitama B	10.98	Fuji B	7.47	LTCB	7.42	Daiichi L	6.86	29280
Amano									0
Brother									0
Mitsui Firms									
Tsubakimoto	Mitsui B	20.49	Mitsui TB	13.69	Sanwa B	13.32	Kyowa B	13.29	19410
Toshiba T	Mitsui TB	18.65	Mitsui B	16.79	Kyowa B	14.52	Taiyo-K B	11.25	5956
Toshiba M	Mitsui TB	16.73	Mitsui B	16.38	LTCB	16.22	Shizka B	14.28	21886
Toyoda AL	Mitsui B	15.23	Tokai B	11.85	Sanwa B	9.82	Mitsui TB	6.03	31752
Toyoda Mach	J Dev B	15.21	Tokai B	12.52	Mitsui B	12.52	Nenkin J	9.55	2156
Mitsubishi Firms									
Makino Mlg	Mtbshi B	61.08	Mtbshi TB	15.74	Nihon TB	14.06	IBJ	5.11	5386
Chiyoda Chm	Mb Tradg	34.74	Mtbshi TB	12.11	Mtbshi B	7.91	Yokohm B	5.88	68578
Mtbshi kako	Mtbshi B	19.87	Mtbshi TB	16.81	Yokohm B	10.55	Taiyo-K B	8.37	13077
Shinto kogy	Mtbshi B	19.75	IBJ	8.92	Kyowa B	8.37	Tokai B	8.37	4183
Sumitomo Firms									
Smtm Hvy In	Ex-Im B	22.31	Smtm B	15.66	IBJ	6.47	Smtm TB	5.80	147032
Nihon Spndl	Smtm TB	21.83	Smtm L	10.64	Smtm B	9.87	Tokshm B	9.77	4965
Daikin	Smtm B	20.76	Saitm B	12.98	Nochu	10.70	Smtm RE	11.36	31772
Smtm Prec	Smtm Met	18.88	Smtm B	17.43	Smtm TB	12.39	Smtm L	11.36	7947
Komatsu	Smtm TB	17.36	Fuji B	12.20	Kyowa B	8.94	Sanwa B	6.99	192450

Note: The firms are all those listed in Nakatani (1984) as in the machinery industry for the Mitsui, Mitsubishi, and Sumitomo groups, together with those listed as independent firms. We give the name of the lending institution, ranked by the fraction of the debtor's total debt lent by that institution, followed by the percentage of the debtor's total debt loaned by that institution. Total loans are in million yen.

VI. Conclusions

Contrary to the financial press, the keiretsu are not losing economic power, for they had no power to lose. Never cohesive, they are not unraveling. Never significant, they are not in demise. Creatures of the academic and journalistic imagination, from the start they existed only because we collectively willed it thus.

As committed Marxists, Japanese journalists and economists in the 1960s had faced a problem. According to theory, "monopoly capital" should have been "dominating" the "bourgeois capitalist" world in which they found themselves. Yet the domination seemed nowhere to be found.

Enter the Economic Research Institute. It grouped the biggest financial institutions by their pre-war affiliation, and summed the loans they made to listed firms. If the total at any firm exceeded the amount it borrowed from the next largest source, the Institute called it a "keiretsu" member and defined it into one of its monopoly capital empires. In time, other scholars came to focus on groups of presidents who met monthly for lunch. Still others added firms in which these presidents' firms held equity positions.

The Marxists are mostly gone now, but the mischief they do lives after them. Many western Japan-specialists have been all to eager to use what the Marxists began to document culture-specific group behavior in Japan, or the "socially embedded" nature of commercial transactions there. The ROK itself continues to generate revenue for the Economic Research Institute at 43,000 yen (about $400) for the annual paperback volume. Unfortunately, economists now turn to the roster reflexively for what threatens to become an obligatory "keiretsu dummy" in Japan-related regressions.

The result has been a motley econometric corpus. Although the Institute bases its ROK lists almost entirely on the source of a firm's loans, scholars today use them (and their competitors) for entirely unrelated hypotheses. Predictably, some results depend on misspecified equations, some on outlying data points, some on one roster rather than another -- and the few that remain reliably robust are simply artifacts of the sample bias created by the definitions themselves.

There is a lesson here, and it goes to the importance of good theory for good empirics. Although most (not all, to be sure) scholars writing about the keiretsu posit either collusion and cooperation at their base, a little institutional inquiry would have disclosed the complete absence of any mechanism for enforcing either. All the talk of social norms in commercial transactions notwithstanding, absent an enforcement mechanism standard economic theory predicts no collective action. And no collective action there has been. A bit more old-fashioned theoretical rigor -- a bit more "economic imperialism" -- and we might have avoided this morass entirely.

References

Alchian, Armen A., & Harold Demsetz. 1972. "Production, Information Costs, and Economic Organization." **American Economic Review**, __: 777-95.

Bergloef, Erik, & Enrico Perotti. 1994. "The Governance Structure of the Japanese Financial Keiretsu." **Journal of Financial Economics**, 36: 259-84.

Branstetter, Lee. 2000. "Vertical keiretsu and Knowledge Spillovers in Japanese Manufacturing: An Empirical Assessment." **Journal of Japanese & International Economies**, 14: 73-104.

Calder, Kent E. 1993. **Strategic Capitalism: Private Business and Public Purpose in Japanese Industrial Finance**. Princeton: Princeton University Press.

Caves, Richard, & Masu Uekusa. 1976. **Industrial Organization in Japan.** Washington, D.C.: The Brookings Institution.

Demsetz, Harold, & Kenneth Lehn. 1985. "The Structure of Corporate Ownership." **Journal of Political Economy**, 93: 1155-77.

Dodwell Marketing Consultants. Various years. **Industrial Groupings in Japan**. Tokyo: Dodwell Marketing Consultants.

Dore, Ronald. 1987. **Taking Japan Seriously: A Confucian Perspective on Leading Economic Issues**. London: Athlone Press.

Fazzari, Steven R., R. Glenn Hubbard & Bruce Petersen. 1988. "Financing Constraints and Corporate Investment." **Brookings Papers on Economic Activity**, 141-95.

Fazzari, Steven R., R. Glenn Hubbard & Bruce Petersen. 2000. "Investment-Cash Flow Sensitivities Are Useful: A Comment on Kaplan and Zingales." **Quarterly Journal of Economics,** 115: 695-705.

Flath, David. 1996. "The Keiretsu Puzzle." **Journal of the Japanese & International Economies**, 10: 101-21.

Fukuda, Atsuo, & Shin'ichi Hirota. 1996. "Main Bank Relationships and Capital Structure in Japan." **Journal of the Japanese & International Economies**, 10: 250-61.

Gilson, Ronald, & Mark Roe. 1993. "Understanding the Japanese Financial Keiretsu: Overlaps between Corporate Governance and Industrial Organization." **Yale Law Journal**, 102: 871-920 (1993).

Hall, Brian J., & David E. Weinstein. 2000. "Main Banks, Creditor Concentration, and the Resolution of Financial Distress in Japan." In Masahiko Aoki & Gary R. Saxonhouse, eds., **Finance, Governance, and Competitiveness in Japan.** Oxford: Oxford University Press, pp. 64-80.

Hanazaki, Masaharu, & Akiyoshi Horiuchi. 2000. "Is Japan's Financial System Efficient?" **Oxford Review of Economic Policy**, 16(2): 61-73.

Hayashi, Fumio. 2000. "The Main Bank System and Corporate Investment: An Empirical Reassessment." In Masahiko Aoki & Gary R. Saxonhouse, eds., **Finance, Governance, and Competitiveness in Japan**. Oxford: Oxford University Press, pp. 81-97.

Hayashi, Fumio & T. Inoue. 1991. "The Relation between Firm Growth and Q with Multiple Capital Goods: Theory and Evidence from Panel Data on Japanese Firms." **Econometrica**, 59: 731-54.

Hoshi, Takeo, Anil Kashyap & David Scharfstein. 1990. "The Role of Banks in Reducing the Costs of Financial Distress in Japan." **Journal of Financial Economics**, 27: 67-88.

Hoshi, Takeo, Anil Kashyap & David Scharfstein. 1991. "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups." **Quarterly Journal of Economics**, 106: 33-60.

Hoshi, Takeo. 2000. "The Main Bank System and Corporate Investment: Further Robustness Tests." In Masahiko Aoki & Gary R. Saxonhouse, eds., **Finance, Governance, and Competitiveness in Japan.** Oxford: Oxford University Press, pp. 99-104.

Kang, Jun-koo, & Anil Shivdasani. 1995. "Firm Performance, Corporate Governance, and Top Executive Turnover in Japan." **Journal of Financial Economics**, 38: 29-58.

Kang, Jun-koo, & Anil Shivdasani. 1996. "Does the Japanese Governance System Enhance Shareholder Wealth?: Evidence from the Stock-Price Effects of Top Management Turnover." **Review of Financial Studies**, 9: 1061-95.

Kang, Jun-koo, & Anil Shivdasani. 1997. "Corporate Restructuring During Performance Declines in Japan." **Journal of Financial Economics**, 46: 29-65.

Kang, Jun-koo, & Rene M. Stultz. 2000. Do Banking Shocks Affect Borrowing Firm Performance? An Analysis of the Japanese Experience." **Journal of Business**, 73: 1-23.

Kaplan, Steven N, & Bernadette A. Minton. 1994. "Appointments of Outsiders to Japanese Boards: Determinants and Implications for Managers." **Journal of Financial Economics**, 35: 225-258.

Kaplan, Steven N. & Luigi Zingales. 1997. "Do Financing Constraints Explain Why Investment Is Correlated with Cash Flow? **Quarterly Journal of Economics**, 112: 169-215.

Kaplan, Steven N. & Luigi Zingales. 2000. "Investment-Cash Flow Sensitivities Are not Valid Measures of Financing Constraints." **Quarterly Journal of Economics**, 115: 707-712.

Keizai chosa kai, ed. Various years. **Keiretsu no kenkyu [Research on the Keiretsu].** Tokyo: Keizai chosa kai.

Khanna, Tarun, & Yishay Yafeh. 2000. "Business Groups and Risk Sharing around the World." Unpublished manuscript.

Kumon, Shumpei. 1992. "Japan as a Network Society." In Shumpei Kumon & Henry Rosovsky, eds., **The Political Economy of Japan -- Volume 3: Cultural and Social Dynamics**. Stanford: Stanford University Press.

Lawrence, Robert Z. 1991. "Efficient or Exclusionist? The Import Behavior of Japanese Corporate Groups." **Brookings Paper on Economic Activity** (1): 311-341.

Lawrence, Robert Z. 1993. "Japan's Different Trade Regime: An Analysis with Particular Reference to Keiretsu." **Journal of Economic Perspectives**, 7(3): 3-19.

Lincoln, James R., Michael Gerlach, & Christina Ahmadjian. 1998. "Evolving Patterns of Keiretsu Organization and Action in Japan." **Research in Organizational Behavior**, 20: 303-45.

Lincoln, James R., Michael L. Gerlach & Christina L. Ahmadjian. 1996. 'Keiretsu Networks and Corporate Performance in Japan." **American Sociological Review**, 61: 67-88.

Miwa, Yoshiro. 1996. **Firms and Industrial Organization in Japan** Houndmills: Macmillan.

Miwa, Yoshiro, & J. Mark Ramseyer. 2000a. "Banks and Economic Growth: Implications from Japanese History." University of Tokyo Faculty of Economics, Discussion Paper CIRJE-F-87 (July 2000).

Miwa, Yoshiro, & J. Mark Ramseyer. 2000b. "Rethinking Relationship-Specific Investments: Subcontracting in the Japanese Automobile Industry." Michigan Law Review, Michigan Law Review, 98: 2636-2667.

Miwa, Yoshiro, & J. Mark Ramseyer. 2001. "Does Ownership Matter: Evidence from the Zaibatsu Dissolution Program." University of Tokyo Faculty of Economics, Discussion Paper CIRJE-F-105 (Feb. 2001).

Morck, Randall, & Masao Nakamura. 1999. "Banks and Corporate Control in Japan." **Journal of Finance**, 54: 319-39.

Morck, Randall, Masao Nakamura & Anil Shivdasani. 2000. "Banks, Ownership Structure, and Firm Value in Japan." **Journal of Business**, 73: 539-567.

Nakatani, Iwao. 1984. "The Economic Role of Financial Corporate Grouping." In Masahiko Aoki, ed., **The Economic Analysis of the Japanese Firm**. xx: Elsevier Science. Pp. 227-58.

Odagiri, Hiroyuki. 1974. "Kigyo no choki seicho ritsu ni ataeru shudanka no koka ni tsuite [Regarding the Effect of Firm Groupings on the Long-term Firm Growth Rates]." **Osaka daigaku keizai gaku**, 24 (1-2): 89-96.

Pascale, Richard T., & Thomas Rohlen. 1983. "The Mazda Turnaround." **Journal of Japanese Studies**, 9: 219-63.

Perotti, Enrico. 1992. "Cross-Ownership as a Hostage Exchange to Support Collaboration." **Managerial & Decision Economics**, 13: 45-54.

Prowse, Stephen D. 1990. "Institutional Investment Patterns and Corporate Financial Behavior in the United States and Japan." **Journal of Financial Economics**, 27: 43-66.

ROK. See Keizai chosa kai.

Saxonhouse, Gary R. 1991. "Comments and Discussion." **Brookings Papers on Economic Activity,** (1): 331-336.

Saxonhouse, Gary R. 1993. "What Does Japanese Trade Structure Tell Us about Japanese Trade Policy." **Journal of Economic Perspectives**, 7 (Summer): 21-43.

Sheard, Paul. 1989. "The Main Bank System and Corporate Monitoring and Control in Japan." **Journal of Economic Behavior & Organization**, 11: 399-422.

Shukan toyo keizai, ed. Various years. **Kigyo keiretsu soran [Overview of Firm Keiretsus].** Tokyo: Toyo keizai shimpo sha.

Uekusa, Masu. 1974a. "Fusai rishi ritsu kettei no shoyoin [Factors in the Determination of Interest Rates on Debt]." **Keizai hyoron**, Aug. 1974, pp. 66-78.

Uekusa, Masu. 1974b. "Kigyo rijun ritsu no kettei yoin [Factors in the Determination of Firm Profitability." **Mita gakkai zasshi**, 67(10): 984-1001.

Uekusa, Masu. 1982. **Sangyo soshiki ron [The Theory of Industrial Structure**. Tokyo: Chikuma shobo.

Weinstein, David E., & Yishay Yafeh. 1995. "Japan's Corporate Groups: Collusive or Competitive? An Empirical Investigation of Keiretsu Behavior." **Journal of Industrial Economics**, 43: 359-76.

Weinstein, David E., & Yishay Yafeh. 1998. "On the Costs of a Bank-Centered Financial System: Evidence from the Changing Main Bank Relations in Japan." **Journal of Finance**, 53: 635-72.

Table 1: Mitsui Keiretsu Loans, by Source (%)

	Total Loans														
	Total Loans	Mitsui B	Mitsui TB	Taisho MFI	Mitsui LI	Total Mitsui	J Dev B	Ex-Im B	IBJ	LTCB	Nippon LI	Daichi LI	Meiji LI	Sumitomo LI	Total
Mitsui Kozan	47,617.00	9.37	7.18	0.11	0.63	17.29	28.50		3.65	5.40					54.84
Hokutan	20,314.00	6.40	4.60			11.00	32.10		8.76						51.86
Meiji Kogyo	7,441.00	16.57	0.11			16.68	25.88			6.09					48.65
Taiheiyo Tanko	2,331.00	10.42	9.87			20.29	38.01		10.94						69.24
Matsushima Tanko	3,318.00						52.68		15.07						67.75
Mitsui Kinzoku Kogyo	13,571.00	7.32	17.70		4.73	29.75	10.25	5.98	14.38	7.53	3.74	3.86			75.50
Aichi Seiko	9,386.00	9.75	16.44			26.19	4.89		1.81	15.44					48.33
Nihon Seikojo	18,118.00	23.04	13.06	0.35	3.82	40.27	1.67		0.08	0.86			3.07	4.33	50.29
Fujikura Densen	6,189.00	26.50	23.15			49.65			18.58						68.23
Mitsui Zosen	35,465.00	12.00	7.67		0.70	20.38	1.41	58.51	0.42	1.12					81.83
Fujinagata Zosen	6,665.00	24.49	2.87			27.35		57.30		4.40				2.55	91.60
Toyoda Jido Shokki	5,250.00	34.76	7.62			42.38			2.19	0.38				3.81	48.76
Toshiba	133,676.00	14.18	7.34			21.52		0.27	5.61	7.98					35.38
Toyota Motors	25,151.00		9.26			9.26		1.10		34.83	3.98				49.17
Sony	12,798.00	28.98	12.62		3.24	44.84	0.04		6.92	6.63	4.47				62.89
Yuasa Denchi	3,420.00	12.72	25.61			38.33	1.40	0.44		8.19	3.63				51.99
Toyo Koatsu	33,960.00	6.82	8.85		3.86	19.53	12.94		10.73	8.35	3.41	3.25	1.39		59.60
Toa Gosei	7,911.00	12.70	7.80		1.58	22.08	21.38		13.34						56.79
Central Glass	15,177.00	14.96	9.29		5.11	29.37	3.22	0.53	18.52						51.64
Mitsui Kagaku	27,050.00	18.73	15.93	0.26	3.98	38.90	1.09		4.16	10.65	2.59	2.50	3.98		63.86
Mitsui Petrochemicals	44,561.00	15.19	16.24		1.68	33.11	1.53		17.34	17.34	0.83	1.01			71.16
Daiseru	9,183.00	18.70	14.82		4.08	37.60	0.28		8.08		9.72	9.65		3.80	69.14
Kanegafuchi Kagaku	8,445.00	20.44	4.85			25.29	2.05		4.57		1.18		2.78	3.94	39.82
Fuji Shashin Film	11,352.00	16.75	26.36			43.11				9.70	17.52				70.33
Nakataki Seiyaku	1,334.00	7.42	17.99		3.07	28.49							4.87	2.25	35.61
Fujukura Rubber	995.00	6.73	7.54			14.27				6.03			2.31		22.61
Onoda Cement	42,416.00	12.56	9.03		3.61	25.20		0.07	15.65	2.05	5.36	3.66			51.99
Sanki Kogyo	3,019.00	12.16	21.10		10.60	43.86					14.38	4.47	10.20		72.90
Mitsui Kensetsu	5,888.00	21.18	15.61	0.32	12.81	49.92	1.29								51.21
Nihon Seifun	5,524.00	28.06	10.59			38.65			5.43						44.08
Taito	6,100.00	34.43	10.25			44.67				0.98	11.34				57.00
Toyo Rayon	57,132.00	10.89	11.46	0.05	0.99	23.40		1.02	1.40	18.93	0.99	1.03	0.99	0.70	48.45
Naigai Amimono	2,564.00	23.40	21.61		2.22	47.23				4.13			0.86		52.22
Atsugi Nylon	5,047.00	14.11	11.89		1.03	27.03			1.27	9.15	5.23	3.96		0.57	47.22
Jujo Paper	25,722.00	5.63	8.22		1.87	15.71	0.30		14.61			0.95	0.39		31.96
Oji Paper	25,225.00	6.07	17.40			23.47	0.15			16.73					40.35
Honshu Paper	19,872.00	8.33	7.50		1.22	17.05				14.74	1.01	1.66	0.65		35.12
Nihon Kako Seishi	3,121.00	0.32	4.71		18.46	23.49				9.61					33.10
Tosho Innsatsu	1,042.00	20.25	29.56	0.96	11.71	62.48				13.44		7.87			83.78
Mitsui Bussan	200,603.00	17.71	4.25	0.48	1.15	23.58	0.01	8.97	0.82	0.05				0.10	33.52
Toyo Menka	61,886.00	14.52	0.94	0.16		15.62		9.35			0.24	0.82	0.16	0.14	26.34
Toshoku	17,168.00	16.93	2.09			19.02									19.02
General Bussan	14,556.00	19.36	13.64		1.75	34.76				7.44					42.20
Mitsukoshi	4,064.00	50.79	36.91			87.70				12.30					100.00
Mitsui Fudosan	24,304.00	23.08	26.75	0.49	1.53	51.86	0.16		2.00	0.70	2.24			0.41	57.37
Inui Kisen	3,030.00	6.80	2.77	0.07	4.75	14.39	65.31		6.47	5.54					91.72
Meiji Kaiun	6,491.00	7.09	2.56	1.05		10.69	55.11		9.03	8.98					83.81
Mitsui Soko	3,001.00	35.42	27.32			62.75	6.50	0.40			8.10				77.74
Total	1,048,453.00	14.43	9.08	0.14	1.39	25.04	3.92	4.82	4.59	6.11	1.22	0.69	0.35	0.26	47.00

Table 2: Keiretsu Loans, 1965-1990

				as % of fin. Inst. lending				as % of non-fin. Firm borrowings				
		number	borrowings	Bank	T Bank	L I	MFI	Bank	T Bank	L I	MFI	total
Mitsui	1965	71	1224259	31.0	24.5	33.3	18.9	14.3	9.3	1.5	0.1	25.2
	1970	71	2476819	26.6	20.4	32.7	26.4	11.3	9.1	2.1	0.2	22.7
	1975	95	5769301	20.9	18.1	29.3	2.6	10.9	8.2	2.1	0.0	21.2
	1980	104	9649457	15.2	15.0	21.5	14.4	8.2	6.4	2.0	0.2	16.8
	1985	104	9649457	9.9	9.2	13.1	11.2	8.4	5.9	1.5	0.2	16.1
TKM(*)	1990	125	15571343	3.6	6.9	11.9	9.2	8.3	5.9	2.0	0.4	16.5
Mitsubishi	1965	67	1091924	24.0	28.2	24.1	20.7	18.2	13.3	2.4	0.3	34.2
	1970	85	2708868	23.6	24.3	27.4	23.8	12.8	10.6	2.4	0.4	26.2
	1975	117	6321652	19.9	21.1	27.4	24.2	12.9	10.0	2.6	0.7	26.2
	1980	113	7096635	11.9	13.2	15.3	13.2	11.9	8.5	2.5	0.5	23.5
	1985	119	8130014	7.2	7.5	6.4	7.5	12.1	7.6	1.6	0.4	21.7
	1990	130	10996240	4.5	5.2	6.4	1.5	11.9	6.6	2.2	0.2	20.9
Sumitomo	1965	70	1031629	24.6	25.8	31.8	10.5	17.8	12.6	3.5	0.1	34.0
	1970	80	2144086	19.1	10.1	18.4	28.9	13.0	5.4	3.0	0.2	21.6
	1975	115	6352550	18.1	22.0	17.3	24.6	12.2	9.7	2.5	0.3	24.7
	1980	110	6551865	10.8	12.6	9.5	11.0	11.9	8.5	2.8	0.2	23.4
	1985	111	8353332	7.3	8.2	6.2	5.1	12.5	7.8	2.2	0.1	22.6
	1990	112	11147019	4.1	5.2	3.0	2.4	11.2	6.2	1.7	0.1	19.2
Fuji	1965	62	778582	19.6	19.9	11.2	15.6	20.4	8.7	0.6	0.1	29.8
	1970	72	1678260	17.9	18.3	18.3	14.3	16.6	8.7	1.4	0.3	27.0
	1975	88	3960073	13.2	18.8	19.6	30.5	14.5	9.3	1.8	0.4	26.0
	1980	98	5572704	8.7	14.1	13.3	6.7	11.4	8.2	1.8	0.2	21.7
	1985	110	7258167	6.9	8.0	7.7	2.0	13.7	6.8	1.3	0.1	21.9
	1990	118	8766287	3.2	5.4	6.6	1.3	10.8	6.3	1.7	0.2	19.0
Daiichi	1965	40	662720	16.0		15.7		13.9		2.6		16.5
Daiichi	1970	27	1439330	14.5		17.0		9.7		3.2		12.9
DKB	1975	52	3094127	9.6		12.9		15.4		2.6		18.0
	1980	70	5689341	8.7		11.4		13.0		2.5		15.5
	1985	77	7055399	5.7		6.6		13.8		1.7		15.5
	1990	90	7943649	3.6		4.5		14.4		2.0		16.4
Sanwa	1965	45	752186	17.9	20.7	11.5		19.2	7.0	0.3		26.5
	1970	52	1577623	15.2	18.4	14.7		14.1	7.4	0.4		21.9
	1975	56	3699606	13.1	15.6	16.6		14.7	6.7	0.4		21.8
	1980	51	5158696	9.8	12.1	10.5		13.3	6.2	0.5		20.0
	1985	55	6118586	5.9	8.2	3.8		13.6	6.2	0.2		20.0
	1990	60	6393342	2.7	4.0	2.8		12.4	5.3	0.5		18.2

(**) Daiichi Kangyo Bank

Note: Firms are those on Section 1 of the TSE. * Taiyo Kobe Mitsui Bank.

Table 6: Cross-shareholding in the Mitsubishi Group, 1965

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
(1)				4.10	4.85		0.18	0.14	0.09	0.48		0.20	0.05	0.21	4.41	0.45	0.07	0.14	0.45	0.14
(2)		2.00		1.50	8.64	0.30	0.80	0.80	0.32	0.40	0.02	0.72		0.26	3.00		0.16	0.50	0.40	0.05
(3)		3.33	4.41		3.33		0.01	0.01												
(4)																				
(5)			3.60	3.00																
(6)		2.03		2.68	3.38			1.30		0.93							0.06			
(7)		3.82	2.63	7.04			6.94			29.10										
(8)		1.00	1.29	3.38	3.00		0.20											0.12		
(9)		1.85	4.68		6.20		0.54	0.36						0.68			0.04			
(10)										11.35										
(11)		4.36	2.24	1.81	2.95		0.27	0.20							5.07					
(12)		1.80			2.00															
(13)		2.76		2.71	2.31					27.31										
(14)		3.08	4.13	1.38	2.88	0.02	0.09	0.01		0.09		0.12					0.01			
(15)		3.58	2.54																	
(16)		4.17	3.77	2.50	5.00		0.67								3.75					
(17)		2.59	8.69	4.17	2.50				4.06						8.43					
(18)		3.13	5.02	2.08	6.88		0.10			0.10										
(19)		8.13	1.88	2.21	1.78															
(20)		1.32	1.40		1.34		0.07			0.08				0.04					0.10	
(21)		3.50	2.65	2.50	10.00														0.63	
(22)		4.82	0.50							0.50										
(23)		3.54	3.63	3.30	4.89		2.16	0.02		0.20							0.05			
(24)		4.15		3.99	5.90															
(25)		5.00	4.34		5.00															
(26)		1.67	9.23	0.95	1.59		0.24								0.95					
(27)		1.50		3.75	1.50															
(28)		5.10	5.12	2.70	9.44					1.85							0.01	0.01	2.00	
(29)		4.91	6.46	4.51	2.99										0.69					0.13
(30)		5.00	3.72																	
(31)		6.17	9.46	2.00																
(32)		4.75	6.75		2.15															
(33)		5.86	9.14																	
(34)		2.78	1.90		1.46															
(35)		3.13	5.66																	
(36)		2.00	8.00																	
(37)			3.30		2.90															
(38)			4.19																	
(39)			6.23																	
(40)		2.22	1.56		3.47															
(41)		4.44	3.83	2.25	6.59					0.33					2.35				0.19	
(42)		8.20			3.70															
(43)		3.26	6.08	3.70	9.12															0.11
(44)		5.20	4.22	6.95	4.00	0.20	0.70		0.60	0.33		0.03	0.01	0.05	3.48		0.15	0.13		
(45)		4.14	0.93	2.34						2.06										
(46)		4.17			3.00															
(47)		4.04	3.72	4.55	3.64		0.56	0.03	0.06	0.15		0.03			1.01					
(48)		1.48		3.32	1.15		0.25	0.10	0.14			0.05			2.77					
(49)		3.84	6.14	5.11	7.23															
(50)		1.67	1.59	2.22	1.67															
T1		2.78	3.27	2.24	3.18	0.02	0.30	0.06	0.08	0.43	0.00	0.05	0.00	0.04	0.85	0.02	0.02	0.02	0.06	0.02
T2		2.94	3.49	2.19	3.00	0.02	0.30	0.05	0.08	0.53	0.00	0.03	0.00	0.03	0.63	0.00	0.02	0.01	0.03	0.01

0.1

	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	
(1)		1.36	0.32		1.36	0.11	0.27	0.11	0.05	0.24	0.91	0.57	0.25	0.48	0.29	0.11	0.20	0.18	0.57
(2)		1.24	0.35	0.05		0.10	0.48	0.10			0.96	0.10		0.32	0.05	0.10	0.60	0.24	0.60
(3)					0.453333333		0.048888889				1.12		0.004444444						
(4)																			
(5)																			
(6)					4.83														
(7)																			
(8)																			
(9)			0.12							0.07									
(10)																			
(11)			0.09																
(12)																			
(13)																			
(14)		0.12		0.00	0.06			0.01		0.02	0.36								
(15)																			
(16)		1.33			2.17														
(17)																			
(18)			0.31							1.08									
(19)											3.13								
(20)					0.24		0.07			0.05				0.07					
(21)										0.63									
(22)		25.03			0.84					0.25	11.67								
(23)		0.33				0.10	0.25	0.03			0.37			0.05					
(24)					15.76		3.04												
(25)					1.67			0.21			1.67								
(26)					41.41		0.24												
(27)																			
(28)			0.75																
(29)		0.28			0.27	0.06	0.15							0.13					
(30)													0.38	0.58	0.12				
(31)												0.50		0.50	0.25				
(32)												0.38	0.25		0.08				
(33)												0.21	0.36	0.21					
(34)																			
(35)																			
(36)																			
(37)																			
(38)																			
(39)																			
(40)																			
(41)					2.13						0.53								
(42)																			
(43)							0.22												
(44)		1.60			0.80	0.07	0.03		0.01	0.14	0.80			0.02					0.25
(45)																			
(46)																			
(47)		0.56	0.01	0.16	1.09		0.03				2.66					0.00			
(48)																			
(49)											3.71								
(50)																			
T1		0.34	0.03	0.01	0.82	0.02	0.08	0.01	0.00	0.05	0.46	0.04	0.02	0.05	0.02	0.01	0.02	0.01	0.05
T2		0.27	0.01	0.01	0.81	0.01	0.06	0.00	0.00	0.04	0.41	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.02

	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	S1	S2	
(1)		0.18	0.73	0.45	0.73	0.07	0.57	1.04	0.11	0.14	0.45	0.67	0.32	0.03	28.83	19.88
(2)			0.32	1.20	0.82		0.58	3.40	0.28			0.70	0.36		32.82	20.68
(3)							0.12	0.695			0.675555556		0.133333333		14.34166667	3.268333333
(4)																
(5)								2.29					0.57		9.46	2.86
(6)								1.43			1.39	1.00			19.02	10.93
(7)												1.58	0.36		51.46	37.97
(8)								1.05	0.20			0.46	0.08		10.77	2.10
(9)					0.24			0.77	0.30						15.85	3.12
(10)															11.35	11.35
(11)								1.44							18.43	7.07
(12)															3.80	0.00
(13)								1.05							36.13	28.36
(14)		0.02			0.20		0.08	0.56			0.14	0.04	0.05		13.45	1.99
(15)								0.00							6.12	0.00
(16)								4.17							27.52	12.08
(17)								4.63							35.06	17.11
(18)					0.30										18.99	1.89
(19)							0.31	2.50							19.92	5.94
(20)								0.38	0.01		0.17		0.08		5.41	1.34
(21)															19.90	1.25
(22)								3.38			15.85				62.82	57.50
(23)					0.50		0.02	0.56	0.05		0.51	0.21	0.09		20.84	5.49
(24)					3.20			2.82							38.86	24.81
(25)							0.42								18.30	3.96
(26)								1.52							57.81	44.37
(27)								3.75							10.50	3.75
(28)								1.10							28.08	5.72
(29)					0.13			0.35			0.35		0.28		21.68	2.81
(30)															9.81	1.08
(31)															18.88	1.25
(32)								0.50							14.85	1.20
(33)															15.78	0.79
(34)															6.15	0.00
(35)								0.95							9.73	0.95
(36)									1.23						11.23	1.23
(37)		0.08						0.23							6.51	0.31
(38)															4.19	0.00
(39)															6.23	0.00
(40)															7.26	0.00
(41)							0.59	1.45					0.06		24.74	7.63
(42)							4.03	2.22							18.16	6.25
(43)					0.22	1.40		1.09							25.18	3.03
(44)					0.50		0.40		0.04		0.67	1.49	0.82		33.68	13.31
(45)								4.11							13.58	6.17
(46)															7.17	0.00
(47)								0.58				0.34	0.28		23.49	7.55
(48)													0.23		9.48	3.53
(49)								2.03							28.07	5.74
(50)													0.89		8.03	0.89
T1		0.02	0.04	0.04	0.18	0.02	0.12	0.69	0.03	0.01	0.23	0.20	0.15	0.00	17.20	5.74
T2		0.01	0.00	0.00	0.15	0.02	0.09	0.63	0.03	0.00	0.21	0.17	0.14	0.00	16.47	4.85