Keiretsu Membership, Firm Size, and Corporate Returns on Value and Cost*

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Abstract

We test how keiretsu membership affects the Fama and French (1999) required IRR on value (or cost of capital) and the IRR on cost (or return on investment), 1974-95, of all listed non-financials in Japan. Rather than computing point estimates from aggregate data, we employ non-linear cross-sectional regression analysis of individual-firm data and we control for industry and size factors in returns. We find that firms have added value—and significantly so—regardless of industry, size, and governance system. In terms of cost of capital, we find no evidence of a keiretsu advantage. In fact, within the segment of medium- and small-sized firms the keiretsu ones often have the *higher* expected return on value. In terms of return on investment, mid- and low-cap firms show no clear difference but top-league keiretsu firms notched up definitely lower numbers than did comparable non-keiretsu ones. Our interpretation is that keiretsu groups have cross-subsidized their larger member firms, a strategy that led the latter to over-invest.

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Introduction

An important issue in corporate finance is how firms perform under different systems of corporate governance and financing, and whether one governance system stands out as superior. Under the Anglo-American system, firms tend to be shareholder-value oriented, being financed and disciplined at arm's length by the capital market. Some other countries, and most prominently so Germany and Japan during the post-war period, traditionally give other stakeholders much more influence; and financing and controlling is done by banks and large industrial shareholders, often in a much more hands-on way and, some claim(ed), with a longer-run perspective than what is standard in a stockmarket-driven system. For example, Japan, long one of the world's fastest growers and still the country with the second most valuable stock market, has a keiretsu system in which reciprocal holdings among business firms and between industrials and their main bank enable financing and disciplining within the group.[1] There has been much division in the literature, both theoretical and empirical, as to how keiretsu membership affects corporate performance in general and the cost of capital in particular. In this paper, we shed new empirical light on the issue and exploit the fact that corporate governance in Japan is far from homogeneous. Specifically, next to the keiretsu groups, there are many Japanese firms with a much more Anglo-Saxon governance concept. This allows us to study the issue empirically without introducing a host of inter-national noise factors.

Unlike previous studies in this field, reviewed below, we gauge corporate health by both the cost of capital and the corporate return on investment. Both are measured as internal rates of return (IRRs) over a long period and covering a wide set of firms—in fact, all of Japan's listed non-financials, over 22 years, 1974 to 1995. This use of long-period, market-wide IRRs has been pioneered by Fama and French (1999). However, rather than just providing point estimates from highly aggregated data, our approach is to estimate IRRs by non-linear

[1] See Shleifer and Vishny, 1997, for a survey of corporate governance around the world. Nakatani, 1984, and Gerlach, 1992, offer reviews of the keiretsu groups, and Aoki, Patrick, and Sheard, 1994, of Japan's main-bank system. Porter, 1992, and Jacobs, 1993, raise economic-policy concerns about the alleged lack of long-term perspective among American corporations

regression on suitable rescaled individual-firm data. This procedure allows us to (*i*) better use the information from small firms, (*ii*) assess the significance of any observed return differences, and (*iii*) control for both size and industry effects in returns. Taking into account size and industry is crucial—not only because the keiretsu/non-keiretsu distribution is far from neutral in those respects, but also because it helps interpretating the findings. Especially the analysis of size effects allows us to weed out many of the possible propositions about how keiretsu membership affects cost of capital and return on investment.

Our empirical findings are as follows. First, against the traditional view on the advantages of a main-bank-centered system, we find no evidence that keiretsu firms enjoyed a lower required return on value than did comparable non-keiretsu ones. To the contrary, for medium- an small-sized firms the evidence actually is that, taking into account size and industry, the required return on value was actually higher within the keiretsu subsample. Second, we find that top-league keiretsu firms experienced definitely poorer returns on investment than did comparable non-keiretsu ones. Third, the resulting effect of keiretsu membership on Value Added is unclear for medium- and small-sized ones, but significantly negative for large firms. The most likely joint explanation of these findings is that smaller members of a keiretsu group tend(ed) to be milked so as to cross-subsidize the larger firms within the cluster; that this cross-subsidizing was mostly done through banking channels rather than regular transfer pricing; and that it led to overinvestment and poor returns among the groups' large firms.

This paper contributes to the literature in several ways. First, our measures of health improve on those used before. Unlike the accounting profits used in many studies, our IRRs are over a long period and, via the terminal value, also embody expectations about the post-sample period. And the FF (1999) return on value avoids many of the theoretical restrictions and practical problems associated with the Weighted Average of Costs of Capital. Second, we demonstrate that although many return differences can be traced to industry and size, a keiretsu-membership effect is still significant in many cases. Third, while we find that many extant results appear to be robust with respect to how one measures corporate health, we stress the heterogeneities across the size spectrum. For instance, while Weinstein and Yafeh (1998) already show that keiretsu firms had a higher cost of capital than did non-keiretsu firms, we point out that this is valid for smaller firms only. Their finding that keiretsu firms showed lower profitability (see also Nakatani, 1984) is qualified in a similar way: only large keiretsu firms turn out to provide significantly lower returns on investment than large non-keiretsu firms. Also, we can identify the large keiretsu firms as the segment that suffers from the soft-

budget-constraint problem, viz. persistence with unprofitable projects, that Dewatripont and Maskin (1995) predict in less arm's-length and more centralized credit markets like Japan's. Lastly, we do find that one segment, the smallest keiretsu firms, does seem to have flourished in its investments despite its high cost of capital.

The paper is structured as follows. Section 1 reviews the literature. In Section 2, we present our basic methodological choices and provide the details of our regression-based estimator of the Fama and French (1999) IRR yardsticks. Section 3 describes the data and discusses some qualitative characteristics of the sample and subsamples. Statistical results are proffered and interpreted in Section 4. Section 5 concludes.

1 Conflicting views on the Keiretsu system

1.1 The Literature

The success of Japans economy during most of the postwar period has greatly stimulated academic interest in the merits of its system, and many authors have related this success to Japan's distinct main-bank tradition. To avoid confusion, we start with a few definitions. One concept is relationship banking, i.e. having a long-standing tradition of doing a lot of financial business with a bank, which therefore gets to know the company well. A main-bank-*centered* system, in contrast, goes beyond relationship banking in the sense that it is, in Aoki et al.'s (1994) well-chosen words, "multifaceted": the bank is at the center of a conglomerate cluster of firms, and the intra-group links go beyond simple relationship banking (see below). A keiretsu,[2] in its most general sense, is a cluster of firms. There are hundreds of these in Japan. Some of them are "vertical" ones, that is, a swarm of suppliers linked to a central manufacturer such as Toyota. Its members typically do relationship banking but their bank is not the center of the group, and needs not even be the same across each and every industrial member. The second, best-known and most traditional type of keiretsu is called "financial" or "horizontal", because they are main-bank-centered and diversified across industries. Mitsui, Mitsubishi, Sumitomo, and Fuyo are the successors to the pre-war zaibatsu, i.e. the holding companies of the type one also sees in many European countries, with (*de facto*) controlling stakes in at least one bank and in many industrial companies, sometimes via sub-holding companies. When the zaibatsu holding companies were broken up, their role in corporate-governance and finance was handed

[2]See Gerlach, 1992, for a comprehensive anatomy of the keiretsu groupings

on to the group's bank; and their equity stakes in subsidiaries were transformed into cross holdings among members.

In this paper, the term "keiretsu" is used in the narrow sense only, that is, the financial/horizontal type. Thus, like many researchers before us—for example Hoshi, Kashyap, and Scharfstein (1990a,b, 1991); Prowse (1990,1992); Weinstein and Yafeh (1998); Dewenter and Warther, (1998)—we equate main-bank-centered relationships with keiretsu membership. We distinguish it from relationship banking—which, as Aoki, Patrick, and Sheard (1994) argue, virtually every Japanese firm has adopted. One has to realise that, since relationship banking is wide-spread, most firms may already benefit from the potentially lower monitoring costs and asymmetric-information costs associated with a house-bank relation. However, regarding finance and governance, keiretsu membership has implications that go beyond relationship-banking. First, there are financial channels other than through the main bank. For example, whenever this is in the interest of the group as a whole, cash can also be redistributed among members via cross-participations and dividends, or via transfer pricing. In the same vain, financing of especially the smaller firms can be facilitated by the group's soga sosha (trading firm—a reinvoicing center, really), which essentially acts as central counterparty for all internal and external trade contracts (Miyashita and Russell, 1994). This way, the soga sosha fulfills some of the traditional banking functions: diversifying credit risks and reducing information asymmetries. Last, cemented with cross-holding, financial keiretsu main-banks usually send their own directors and auditors to sit on the board of member firms. This close monitoring may allow keiretsu main banks to achieve much more, re corporate governance, than a regular relationship bank.[3]

There is an important strand in the literature that views the keiretsu system as one of the explanations of Japan's rebirth after 1945. For example, Hoshi, Kashyap, and Scharfstein (1990a,b, 1991) find that, thanks to their close relationships with the main banks, Japanese firms have been less constrained by their internal cash position, allowing them to continue their investments and growth even facing a shortage of cash. Comparing firms from Japan and the U.S. (whose governance system is a natural rival to Japan's), Prowse (1990) finds that reciprocal holdings among Japan's firms and banks greatly mitigate the agency problems between shareholders and debtholders. Kaplan and Minton (1994) and Kang and Shivdasani

[3]One example of action that goes beyond relationship banking is the rescuing of financially distressed firms. Sheard (1994) lists 42 rescue cases for the past 30 years, and finds that almost all of them occur in financial-keiretsu groups. This highlights the governance function of Japanese main-bank system.

(1997) likewise confirm the positive role of a main bank in helping firms in financial difficulties. In a theoretical study, Berglof and Perotti (1994) further argue that the cross holdings in the keiretsu governance structure makes internal discipline more sustainable over time. Shleifer and Summer (1988) point out another advantage of a governance structure that can fend off hostile takeovers. Any hostile takeove breaks up valuable (long-term) implicit contracts. Thus, a corporate governance mechanism that is resistant to hostile takeovers adds value in an economy where such implicit contracts are usueful. Also, the keiretsu bank, being less dependent on external funding and benefiting from implicit co-insurance from other firms within the group, is often able to extend loans at conditions that would have been impossible in more arm's-length contracts. In short, in terms of cost of capital and operating efficiency, keiretsu members may reap benefits that go beyond what is within available, through pure relationship banking, to non-keiretsu firms. On the other hand, the keiretsu's potential for cross-subsidizing could also mean that investment projects may be undertaken that would not have passed a more arm's-length test (see Dewatripont and Maskin, 1995).

This has brought us to the contra side of the debate. In view of the Japan's economic slump and persistently depressed stock market in the 1990s, the more recent literature has naturally become more critical towards the country's governance system (see Allen, 1996, for a review on this reversal of opinions). Kang and Stulz (1995) document that, during the 1990-93 Japanese stock-market slump, firms whose bank debt represent a larger fraction of their total debt invested less and produced significantly lower stock returns.[4] Moreover, Weinstein and Yafeh (1998) find that, for 1977-86, main-bank firms exhibit lower profitability and growth as well as a higher cost of capital relative to unaffiliated firms. As this was before the stockmarket slump and the ensuing credit crunch, liquidity constraints with the banks themselves are not the likely explanation. Rather, Weinstein and Yafeh (1998) interpret their findings as consistent with the hypothesis of rent-extracting or holdup behavior by banks that have information monopolies on client firms (Sharpe, 1990; Rajan, 1991; and Houston and James, 1996). Also, the monitoring role of the main banks seems to have been quite narrow in focus. Morck and Nakamura (1998) show that, for 1981-87, banker appointments in a firm's board of directors more often took place in response to poor concurrent liquidity, and less as a reaction to lagging

[4]Kang and Stulz (1998) highlight the impact of the whole banking sector instead of the influence of the main-bank relationship on the Japanese firms during the economic slum and credit crunch. However, in the context of Japan, since the main-bank affiliated firms usually take more bank loans, they interpret their findings as an adverse effect of bank-centered corporate governance.

share values. Moreover, Morck and Nakamura (1999) argue that Japanese governance practices did not assign effective control rights to residual claimants, as governance power was too much in the hands of banks rather than shareholders. Consistent with this view, Morck, Nakamura, and Shivdasani (1999) find that there is a negative relationship between bank ownership and firm value, provided that bank ownership is large enough to affect corporate governance but not so large as to align bank interests with those of shareholders.

Yet, the recent outcry against the main-bank system is by no means unanimous. Anderson and Makhija (1999) observe that, as one would expect, public-debt-constrained Japanese firms took on relatively more bank debt in 1985-89. But when the restrictions on placement of public debt were lifted, in 1990, these firms continued to take on more bank debt without adverse effects on growth. Anderson and Makhija conclude that, for firms where arm's-length debt would imply high agency costs, banks do provide monitoring benefits and do not impose meaningful holdup cost. This is in sharp contrast to the findings by Houston and James (1996) for U.S. firms. And while Gibson (1995) finds that, in 1991-92, some banks in Japan did harm their client firms by hindering investment, such behavior seemed to be restricted to "weak" (and mostly small) banks. Thus, Gibson concludes that problems in the banking sector had no major impact on the Japanese economy.

1.2 Competing hypotheses

Thus, from the literature the picture is by no means clear, whether one takes a theoretical or an empirical perspective. Table 1 summarizes the a priori arguments. In terms of cost of capital (or expected return on value, in Fama and French (1999)'s terminology), main-bank-oriented firms may benefit from lower monitoring and agency costs, as we saw; and, to the extent that these firms are part of a keiretsu group, co-insurance would further lower the financial-distress-related costs. But others argue that relationship banking could actually raise a firm's cost capital, notably because of hold-up behavior by main banks. If, as empirical work suggests, such behavior already occurs in the U.S., then it could become even more likely when, as within a keiretsu, the house bank is supported by the firm's main shareholders, or when rent-extraction is part of a socially accepted cross-subsidization program rather than something to be done more or less on the sly.

The ambiguity of the predictions is even larger when we also consider the likely keiretsu-impact on return on investment (or return on cost), Fama and French (1999)'s second measure

Table 1: Potential Explanations for differential returns

Factors that may increase a firm's cost of capital

factor—general	size-related comments	governance-related comments
• asymmetric information and adverse selection leads to excessive risk spreads on borrowing	• more information asymmetries for smaller firms—unless resolved by relationship banking without ripoff	• Most firms, K or not, have a house bank • but K-firms links go far beyond relationship-banking
• banks rip off customers that are, or have become, dependent on them	• banks' hold-up behavior, if any, is more likely towards small firms that have (fewer or) no alternatives	• hold-up behavior towards some firms may even be an explicit and accepted part of K-group's cross-subsidization policy
• a narrow income base and/or a volatile cashflow worsen default risk	• default risk is especially a problem for smaller (undiversified) firms	• co-insurance within K groups may allow smaller members to reduce default risk

Factors that may decrease a firm's return on investment

factor—general	size-related aspects	governance-related aspects
• low revenues: lower market power and more competition, or transfer pricing	• lack of market power is more likely for small firms	• transfer pricing may be an explicit and accepted part of K-group's cross-subsidization policy
• **EITHER** (heterogenous firms, dynamic environment:) high cost of capital or liquidity constraints preventing exploitation of windfall opportunities or niches, lowering profitability • **OR** (homogenous firms except for size; static neoclassical setting:) lower cost of capital or absence of liquidity constraints leading to more investment, decreasing return on investment	• (see size-related determinants of cost of capital) • liquidity constraints more likely for smaller firms—unless small firms' problems resolved by relationship banking without ripoff	• (see governance-related determinants of cost of capital)
• poor management, implying little or no competitive advantage		• better monitoring may improve performance • in K firms, poor management is less likely to be weeded out • smaller K firms may even serve as dumping ground for redundant staff from larger member firms
• stakeholders, esp. employees and politicians, press for overinvestment	• union power or political pressure tends to be larger in larger firms	• opportunities for cross-subsidized overinvestment are especially present for larger K members.

of corporate health. The predictions about how keiretsu membership may affect return on investment very much depend on one's views on what the main determinant of corporate profitability is. The most intuitive view probably is that, even within industries, firms are quite heterogeneous, and thrive on competitive advantage and entrepreneurial ability in exploiting windfall opportunities. But the firm's ability to respond quickly may be hampered by capital constraints, themselves due to e.g. incentive and information asymmetries (see, for instance, Jensen and Meckling, 1976; Myers and Majluf, 1984). In this view, if keiretsu groups internalise the capital markets and its member firms have swifter and ampler access to capital, they should be more profitable. At the negative end of the spectrum, if keiretsu membership leads to cross-subsidization and overinvestment, then the IRR on cost is low. In short, in this view, (*i*) the return on investment reflects management's ability to spot and implement (only) good projects; (*ii*) the higher this return, the better; and (*iii*) opinions are divided as to which way keiretsu membership affects the quality of investments.

Neoclassical industrial economists, however, would think different. Under the traditional "structure-conduct-performance" paradigm, firms within an industry are viewed as substantially homogenous (apart from, possibly, size); returns from investment are decreasing (at least around the optimum); and unconstrained value maximization, if feasible, equates marginal return on capital to marginal cost. The implication of that line of reasoning is that the (hard-to-predict) effect of keiretsu membership on the cost of capital will affect the return on investment in the same direction. Thus, (*i*) the return on investment does not necessarily say a lot that is not yet contained in the cost of capital, (*ii*) it therefore is neither good nor bad in itself, and (*iii*) if opinions are divided as to how keiretsu membership influences the cost of capital, then so they are on how return on investment is affected.

Yet another view arises if capital constraints (see above) are analysed from this standard neoclassical angle rather than from the competitive-advantage perspective. Any such constraints would generally prevent firms from equating marginal cost and return. If, as before, keiretsu membership helps solving this problem, then keiretsu members would typically invest more. Given decreasing returns to scale, this implies that their returns on investment are lower rather than higher. In short, under this third view (*i*) a high return on investment reflects a funding problem; (*ii*) in that sense, it is bad rather than good; and (*ii*) keiretsu firms would have *lower* IRRs on cost if the internalized capital market solves the liquidity problems.

In view of the ambiguity of the theoretical predictions, the purpose of our paper is to empirically compare a system with shareholder-value orientation and arm's-length financing

to a rival system where other stakeholders have more influence and where control and financing are much more internalized. To that end we study both the gross profitability (that is, return on the cost of corporate investment) and the required return on market value (or cost of capital), for firms with different governance structures but similar size and industry characteristics. In the next section we describe in more detail how we approach the issue.

2 Test Methodology

We start with a discussion of the basic requirements we want to meet in this article, and continue with the practical research design.

2.1 Fundamental Research Choices

The lack of consensus about the pros and cons of the Japanese main-bank system and the mixed empirical results call for an examination that (i) controls for the non-governance-related aspects of performance, (ii) is comprehensive, (iii) is based on a robust measure of corporate health, and (iv) allows significance tests. We start our discussion with non governance-related aspects of performance—specifically: size and industry, and country-specific factors.

To study the costs and benefits of corporate-governance structures, one could have contrasted the performance of, say, U.S. and Japanese or German firms. Obviously, however, such a comparison would have brought in a host of other determinants of performance other than corporate governance, such as the possible effects of capital market segmentation on the required return on value, as well as differences in accounting and tax rules and other institutional factors (see e.g. Rajan and Zingales, 1995, and La Porta et al., 1999). To avoid such cross-country differences, we have chosen to compare two classes of firms from one single country, Japan. Prowse (1992), among others, stresses that the non-keiretsu segment of Japan's economy is much closer to the Anglo-American tradition, with firms much more subject to the capital market discipline. The presence, within one country, of large populations of firms subject to distinct governance systems provides a better-controlled test ground for the two governance systems. Thus, for most part of our analysis in the paper we separate the Japanese non-financial firms in two groups, (financial/horizontal) keiretsu firms—that is, companies closely affiliated with the Big Six industrial groups—and non-keiretsu firms (members that are

very weakly affiliated, or not affiliated, with the Big Six).[5]

Among the other factors that may have affected the relative performance of the two groups, industry and size effects loom large. Indeed, size and industry (or beta, which is often associated with industry) are well-known determinants of profitability and required return; and keiretsu groups do tend to be under-represented in non-traditional sectors and in the lower end of the size distribution (see Section 3.1 for numerical evidence). Thus, one should surely take into account "main" (additive) size- and industry-effects in the return or cost of capital. It should be realized, though, that the potential impact of keiretsu memberships may be confined to particular categories of firms. For instance, information asymmetries as well as liquidity constraints (and the corresponding potential gains from relationship banking or help from friendly firms) are a priori more important for smaller firms; but then also a bank's potential for rent-extraction is larger towards weaker clients. Likewise, reliance on external financing (and, hence, the risk of liquidity constraints or the bank's scope for hold-up behavior) is less important in mature industries. For these reasons, we introduce size and industry not just as "main" effects but also as interactions with the governance variable. While these interactions may appear to be complicating factors in our search for governance effects, it turns out that an analysis of size interactions, in tandem with keiretsu-membership effects, allows us to empirically distinguish between the host of possible views listed in Table 1.

Our second objective, next to ceteris-paribus testing, is comprehensiveness. We attain this by considering all listed non-financial firms in Japan over a 22-year period, 1974-1995, quite similar to one of the time spans, 1973-96, studied by Fama and French (1999).

Our third requirement is a robust analytical measure of corporate health. Many studies (McCauley and Zimmer, 1989, and Frankel, 1991, and others) have used as the required return on value the traditional weighted average of cost of capital (WACC) with various (and

[5]An alternative research design would have been to classify firms as having a house bank or not, as in Campbell and Hamao (1994). They classify main-bank firms as firms that had taken up their largest outstanding loans from any of the 19 major Japanese banks in fiscal year 1983/4. As a result, Campbell and Hamao identify 77 percent of all listed Japanese non-financials as main-bank firms. However, as argued above, keiretsu members are even less dependent on external financing than are non-keiretsu firms even if the latter have a main bank, and keiretsu firms are also more stakeholder-oriented than non-keiretsu ones. In addition, keiretsu membership is readily identifiable and more stable than a Campbell-Hamao classification on the basis of a firm's loans. Lastly, a keiretsu/non-keiretsu classification produces more balanced groups than does the Campbell-Hamao classification. Thus, we adopt the keiretsu-membership criterion as the indicator of a less capital-market-oriented governance system. A reader that is interested in main-bank relations or not, would correctly conclude that our classification is noisy; however, misclassification biases against finding any differences, which makes the test conservative in that respect.

sometimes rather ad hoc) inputs,[6] and their measures of corporate investment returns are largely accounting ratios. The WACC is, however, based on rather restrictive assumptions, and the required inputs are not easy to obtain. In our paper, we basically adopt an approach recently pioneered by Fama and French (1999) (hereafter FF): we study the "IRR on cost of investment" and the "IRR on market value", as well as the spread between the two returns, for keiretsu versus non-keiretsu firms. However, we modify the original FF approach in several ways.

The original FF approach is to compute IRRs on cost and on market value from aggregate data (initial investment, interim cash flows, and terminal value), either for the entire corporate sector or industry by industry. Each such computation produces a point estimate for either the return on cost or the required return on value, depending in whether investments are measured at cost or at capital-market value. In the present paper, this procedure is applied only to compare the Japanese corporate sector (as a whole) to its U.S. counterpart.[7] But such an estimation procedure still leaves room for improvement: (i) each aggregate is dominated by its larger firms, so that the information from smaller corporations is under-used; (ii) any observed divergence between these IRRs may be driven by industry and size factors or institutional differences rather than governance-related aspects; and (iii) there is no way to gauge the significance of the observed differences. Similar drawbacks apply if we compare, within Japan, IRRs from aggregate keiretsu data to those from the aggregate non-keiretsu segment. Thus, we use such IRRs for exploratory purposes only; for most of the work we instead rely on IRRs estimated from scaled individual-firm data using non-linear regression and controlling for size and industry factors, as explained in Section 2. This way, we can also test the significance of differences between returns on cost and on value or between returns to keiretsu and non-keiretsu firms for various size and industry combinations.

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[6]The methodology in Weinstein and Yafeh (1998) is markedly different from others. Their cost of capital gap between keiretsu and non-keiretsu is derived from their model. However, their model does rely on a discount rate of the WACC type. One advantage of the WACC approach is that it can correct for the interest tax-shield effect under Miller-Modigliani assumptions. However, the size and even the very existence of this tax shield are controversial. At the very least, the WACC is likely to overstate the tax-shield effect.

[7]We find no support for the popular notion that Japan's cost of capital is lower then the U.S. one, once we take into account the currency factor.

2.2 Specification and Estimation of IRRs on value and on cost

By definition, the IRRs are discount rates that make the total present value of cash flows into and out of a project equal to zero. FF (1999) calculate the IRRs of the U.S. corporate sector by treating the entire private sector as a single investment project. That is, the FF IRRs on value and cost are the discount rates, r_v and r_c, that solve, respectively,

$$FBV_0 = \sum_{i=1}^{T} \frac{X_t - I_t}{(1+r_v)^t} + \sum_{i=1}^{T} \frac{FS_t - FBV_t}{(1+r_v)^t} + \frac{TV_T}{(1+r_v)^T}, \tag{2.1}$$

and

$$FBC_0 = \sum_{i=1}^{T} \frac{X_t - I_t}{(1+r_c)^t} + \sum_{i=1}^{T} \frac{FS_t - FBC_t}{(1+r_c)^t} + \frac{TV_T}{(1+r_c)^T}. \tag{2.2}$$

In (2.1) and (2.2), the variables are defined as in FF (1998):

FBV_t (firms bought at market value, time t) is the aggregate initial market value of firms that first enter the sample in year t; time 0 is the first year in the sample;

FBC_t (firms bought at cost, time t) is their aggregate initial book value;

X_t is aggregate cash earnings (after-tax earnings before deduction of interest and depreciation) for year t for the firms that were in the sample in year $t-1$;

I_t is the aggregate gross investment (net investment plus depreciation) of these firms. By a standard cash-flow equation, $X_t - I_t$ equals the volume of current payouts (dividends, interest) minus net security issues (equity or debt) in year t; that is, $X_t - I_t$, when positive, equals the net amount paid out in year t; otherwise it measures the net amount raised from capital markets.

FS_t (firms sold during year t) is the terminal market value of firms that leave the sample in year $t < T$, where T is the end-of-sample year;

TV_T is the aggregate terminal market value of firms that still exist at the end of the sample period.

If the IRR-on-value is a long-term average obtained from a wide aggregate, it can be used as an estimate of the ex ante required return for the representative firm; and the IRR-on-cost likewise estimates the expected return on investment or book value.

Equations (2.1) and (2.2) can be applied to any aggregate—e.g. the keiretsu and non-keiretsu subgroups—but such a procedure would have some limitations (see Section 2.1). To cope with these problems, we work with individual-firm data rather than aggregates. Expected

returns are allowed to vary across firms, depending on industry (proxying for beta), size, and governance structure. We distinguish ten industries (described in Section 3) and five size quintiles. To model, for instance, the return for a non-keiretsu firm, we generate a set of industry dummies $I_{i,j}$, $i = 1,...10$, (where $I_{i,j}$ is equal to 1 iff firm j is from industry i), and we let a_i denote the expected return for a non-keiretsu firm of the i-th industry in the largest quintile, size quintile 5. Similarly, we define $S_{s,j}$, $s = 1, ..., 4$, as a set of size dummies indicating membership of the s-th size quintile, and we let e_s denote the expected return differential for quintile s relative to the largest quintile expected return on value. Then the expected return on value for a non-keiretsu firm j is the firm's industry average corrected for a size effect:

$$r_{v,j} = \sum_{i=1}^{10} a_{v,i} I_{i,j} + \sum_{s=1}^{4} e_{v,s} S_{s,j}. \tag{2.3}$$

A similar equation can be written for return on cost, $r_{c,j}$:

$$r_{c,j} = \sum_{i=1}^{10} a_{c,i} I_{i,j} + \sum_{s=1}^{4} e_{c,s} S_{s,j}. \tag{2.4}$$

For firms that are keiretsu members we allow each of the parameter vectors a and e to shift, by b and f, respectively. Specifically, if firm j is a keiretsu member, we set the keiretsu-membership dummy, K_j, equal to unity instead of zero, and specify the expected returns in general as

$$r_{v,j} = \sum_{i=1}^{10} (a_{v,i} + b_{v,i} K_j) I_{i,j} + \sum_{s=1}^{4} (e_{v,s} + f_{v,s} K_j) S_{s,j}. \tag{2.5}$$

and

$$r_{c,j} = \sum_{i=1}^{10} (a_{c,i} + b_{c,i} K_j) I_{i,j} + \sum_{s=1}^{4} (e_{c,s} + f_{c,s} K_j) S_{s,j}. \tag{2.6}$$

Note that we let the keiretsu effect depend on size and industry, as per our discussion in Section 2. Note also that size enters the equation as a set of size-class dummies, rather than as a cardinal number (like the log of value): this specification does not impose a particular functional form on the relation between IRR and size.

Relative to FF, expected returns on value or on cost are now constrained to be equal across firms with similar characteristics, implying that the individual-firm returns can no longer perfectly fit a given firm's individual cash-flow pattern. Thus, the value equation for each firm needs to be expanded with an error term that captures the firm's idiosyncratic factor:

$$FBV_{j,n(j)} = \sum_{t=n(j)+1}^{N(j)} \frac{X_{j,t} - I_{j,t}}{(1 + r_{v,j})^t} + \frac{TV_{j,N(j)}}{(1 + r_{v,j})^{N(j)}} + \epsilon_{v,j}, \tag{2.7}$$

and

$$FBC_{j,n(j)} = \sum_{t=n(j)+1}^{N(j)} \frac{X_{j,t} - I_{j,t}}{(1+r_{c,j})^t} + \frac{TV_{j,N(j)}}{(1+r_{c,j})^{N(j)}} + \epsilon_{c,j}. \tag{2.8}$$

In these equations, $n(j)$ is the starting year for firm j (0 if the firm was already listed in 1974, or the number of years to go to its first listing if not), and $N(j)$ its end year (21 if the firm was still listed in 1995; if not, the number of year between 1974 and the year of j's delisting). Lastly, to reduce the dominance of large firms—or, in statistical terms, the size-related heteroscedasticity in the residuals of (2.7) or (2.8)—we divide through the entire equation (2.7) or (2.8) by $FBV_{j,n(j)}$ or $FBC_{j,n(j)}$, respectively.

Note that bank debt, like other debt and unlike equity, is inevitably recorded at nominal value. This means that hold-up behavior, if any, does show up in the estimated cost of capital. To see this, note that, in principle, any excessive interest charges do not change the net amount paid out or raised, $X_t - I_t$, nor the true market value of the firm: they lower the dividends and the value of equity, but they simultaneously boost the interest payments and the true market value of debt. In our data, however, debt is valued at par. So if a bank overcharges a customer, our data report a lower value of the firm for the same total payouts, implying a higher cost of capital. In the return on cost, in contrast, where assets and liabilities are taken at book value, neither total payout nor the initial cost of investment are affected by excessive interest fees, so the return on cost (or return on investment) is unaffected. This would be in contrast to the effects of transfer pricing: if the group's soga sosha siphons off profits by overcharging or underpaying for goods, then profitability (r_c) is affected but not the cost of capital (r_v).

3 Data

Our Japanese data are retrieved from the Pacific-Basin Capital Markets (PACAP) databases developed by the Sandra Ann Morsilli Pacific-Basin Capital Markets Research Center at the University of Rhode Island. The annual data on balance sheets and income statements cover the 22 fiscal years 1974 to 1995. Most Japanese firms have a fiscal year ending in March. Thus, fiscal year 1974 runs from April 1, 1974 to March 31, 1975, and so on. We select all non-financial firms that have (annual) data on market and book value for at least two consecutive years. As in FF (1999), the capital stock of firms includes only debt that pays explicit interest (PACAPs long-term loans and debentures plus short-term loans in current liabilities). Non-interest-bearing liabilities are mainly short-term accounts payable (A/P). Book capital is the

total end-of-year book value of long-term debt (PACAPs data items BAL14 and BAL15), short-term debt (BAL11), and equity for firms appearing in the corresponding fiscal year. Book equity is total assets (BAL9) minus total liabilities (BAL17). Market capital is the total end-of-year book value of short- and long-term debts plus the market value of equity (MKTVAL or share price (MKT3) times shares outstanding (MKT5)) at the end of March, regardless whether firms have a fiscal year end in March. Deflation, where needed, is by the CPI.

Given their distinct governance structure, we are particularly interested in the six major Japanese industrial groups, the keiretsu, that existed during the sample period: the Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, and Daiichi Kangyo groups. Keiretsu membership, being a key feature in the Japanese economy, is readily identifiable and stable over time. However, in the literature there is no unified classification of keiretsu membership. The keiretsu firms in our sample either meet the classification by Nakatani (1984), or are the closely-affiliated members (with the degree of the 2-, 3-, and 4-star inclination) to the six groups as classified in the 1992/93 edition of *Industrial Groupings in Japan—the Anatomy of the Keiretsu*. By implication, then, our non-keiretsu firms are either the unaffiliated firms or the weakly related members (a 1-star affinity to the Six Groups).

3.1 General Description; Distribution across Size and Industry Classes

In this section we provide some descriptive information that justifies our regression specification or will be useful in interpreting the statistical results provided in Section 4. Table 2 shows some summary statistics for the sample. Over the 22 years 1974-95, the average number of non-financial firms present per year is 1337, of which the keiretsu-affiliated firms account for 38.8 percent. This is an average; in fact, the keiretsu importance in terms of numbers has been dropping from 41.5 percent in the second half of 1970s to 36.1 percent in the first half of 1990s.

It is well known that equity cross-holdings among business firms are widespread in Japan. From Table 2, the average cross-holdings in each year amounts to 20.1 percent of the total market equity of all non-financial firms, or 11.1 percent of their total market capital (book debt plus market equity). Equity cross-holdings have steadily decreased, from 21.5 percent of equity in 1974-79 to 16.6 percent in 1991-1995. Not all of this decrease should be ascribed to a waning of the the keiretsu system: an important second factor behind this result has been the privatisation of NTT, at the time the most valuable company in the world and, of course, not

Table 2: Sample Description

The table provides the average of annual number of firms, cross-holding, book and market capital. We start from PACAPs fiscal year-end data on the Japanese domestic non- financial firms (all Japanese Industry Codes except 0501-0513) listed in the First and the Second Sections. We choose firms with annual data on market and book value of capital for at least two consecutive years. Keiretsu firms are close members (classified as 2-, 3-, or 4-star) of the Six Major Japanese Industrial Groups. Non-keiretsu firms is the balance but excluding Utilities (Code 0801) and Communications (0705). "Book capital" is the total end-of-year book value of long-term debt (PACAP items BAL14 and BAL15), short-term debt (BAL11), and equity. "Book equity" is total assets (BAL9) minus total liabilities (BAL17). "Market capital" is the total end-of-year book value of all debt plus the market value of equity [(MKTVAL or share price (MKT3) times shares outstanding (MKT5)] at the end of March. From the number of shares owned by the non-financial firms (JAF78) and the total number of shares owned (JAF81) in each firm we obtain two cross-holding adjustment factors (see French and Poterba, 1991): $K = \sum[JAF78 \times MKT3] / \sum[JAF81 \times MKT3]$ and $H = K \times [TotalMarketEquity]/[totalMarketCapital]$. Purged of cross-holdings, we measure market equity, market and book capital by $(marketequity) \times (1-K)$, $(marketcapital) \times (1-H)$, and$(bookcapital) \times (1-H)$ in trillions of JPY.

	Firms		Cross-Holding		Book Capital		Market Capital	
	All	of which	K (%)	H (%)	All	of which	All	of which
Years		keiretsu (%)				keiretsu (%)		keiretsu (%)
1974-79	1168	41.45	21.46	8.73	68.25	58.64	93.72	58.01
1980-85	1296	39.52	21.16	11.36	104.93	55.83	165.30	55.82
1986-90	1415	37.35	20.52	14.69	167.09	52.14	383.68	49.09
1991-95	1512	36.13	16.63	9.89	236.70	50.91	373.56	48.81
1974-95	1337	38.78	20.07	11.07	139.00	54.64	242.74	53.30

a keiretsu member. The temporary increase of the alternative measure, cross holdings divided by total value, during the "bubble" years 1986-90 merely reflects the increase of equity values relative to debt values during that period.[8]

Table 2 also shows that the time-averaged aggregate market and book capital of all non-financial firms increases over the sample period. Their grand averages are 242.7 trillion Yen of market value and 139.0 trillion of book value. Keiretsu firms account for over half of the total market and book value before 1986, but their average market value drops below 50 percent afterwards, again reflecting, to a large extent, NTT going public.

We also verify the distribution across industries. As we see from Table 3, keiretsu firms are few and far-between in the service industry, and entirely absent from Utilities and Communications. This sector is also heavily regulated, and dominated by the atypical giant NTT. Thus, whenever we look for governance effects, we exclude the latter sector. In the other industries the imbalances are less pronounced, but keiretsu firms occasionally still account for close to

[8]The Japanese stock market crash following the bubble years happened in 1990. When we include that year into the subperiod 1986-90, our criterion is merely one of cutting the total sample into sub-samples of equal (five) years, as FF (1999) did. In fact, as can be seen also in the rest of the paper, the effect of the bubble years when we look at the averages for 1985-90 is not qualitatively influenced by the inclusion of 1990. Likewise, the results of averaging that hold for 1991-95 are also valid for 1990-95.

Table 3: Breakdown of Keiretsu Members across Industries and Size Quintiles

The table shows keiretsu members presence across industries and size quintiles, in terms of the average of the annual number of firms, book capital and market capital for 1974-1995 (See definitions in Table 2). We exhaustively decompose the Japanese non-financial sector into seven industries: Construction (Code 201), Manufacturing (301-315) — itself containing Food, Textile & Paper (301-303), Glass, Steel & Metal (304-306), (Petro)- Chemical & Rubber (307-310), and Machine & Equipment (311-315)—, Wholesale & Retail (401-402), Real estate (601), Service (901), Natural Resource & Transportation (101-103 and 701-704), Utilities & Communication (705 & 801). The latter contains NTT, listed as of in 1986. Size quintiles are formed by sorting the initial market capital of the firms that enter the sample at various years, discounted where necessary to 1974 using the aggregate FF return on value for keiretsu or non-keiretsu firms (taken from Table 6). Quintile 1 contains the smallest firms.

	Number of Firms		Book Capital		Market Capital	
	All	of which keiretsu (%)	All	of which keiretsu (%)	All	of which keiretsu (%)
All Firms						
All industries and sizes	1337	38.78	139.00	54.64	242.74	53.30
By industry						
Construction (industry 1.)	113	21.37	8.57	42.18	13.99	42.84
Manufacturing (2.-5.)	923	44.48	71.01	65.25	130.34	64.71
2. Food, Textile & Paper	166	44.00	9.48	61.61	17.17	63.30
3. (Petro)-Chemical & Rubbe r	174	54.12	13.40	66.52	25.81	65.84
4. Glass, Steel & Metal	154	54.98	14.73	68.60	25.16	68.33
5. Machine & Equipment	429	36.97	33.40	64.49	62.20	63.23
Tertiary (6.-10.)	301	27.92	59.46	32.86	98.42	27.40
6. Wholesale and Retail	133	29.19	21.66	63.13	30.76	57.26
7. Natural Resource, Transport	94	37.36	8.82	36.73	18.73	35.82
8. Real estate	19	30.75	3.94	61.20	6.38	66.69
9. Service	38	11.19	1.29	16.38	3.18	16.55
10. Utilities & Communication	17	0	23.72	0	39.37	0
10a. Id. without NTT	16	0	20.67	0	30.44	0
By Size Quintile						
Quintile 1 (Smallest Firms)	312	19.87	4.93	11.13	7.72	11.99
Quintile 2	312	26.60	7.56	19.36	12.12	20.66
Quintile 3	312	33.65	13.73	28.19	22.84	28.37
Quintile 4	312	37.82	22.82	43.60	39.79	45.10
Quintile 5 (Largest Firms)	312	57.05	183.33	55.95	307.10	54.18

70 percent of an industry. The second part of Table 3 shows that keiretsu membership is even more strongly related to size: the members of the six traditional industrial groups take up more than half of the largest-firms quintile, but become more and more under-represented as one descends the size scale. As there are strong priors that size and type of business affect returns, it is quite important to filter out size- and industry-related factors in IRRs.

3.2 Capital Structure

Table 4 provides some information on the capital structures of the two groups. Relative to the U.S., the average Japanese firm borrows more. This is especially so for keiretsu firms, which, conform to the conventional picture, take on far more bank debt, both short- and (especially) long-term. Straight bonds are also more intensively used by keiretsu firms, but even this reflects their banking connections: such debentures are typically issued through and guaranteed by main banks. Non-keiretsu firms, by implication, then rely to a larger extent on equity and (marginally so) on equity-linked debt. In the traditional pecking-order theory of Myers (1984), this reliance on equity should imply a higher required return on value.

Changes in capital structure are shown in Table 5. The format of the table follows the cash constraint

$$Y_t + Depr_t + \Delta S_t + \Delta LTD_t + \Delta STD_t = Inv_t + Div_t + Int_t, \tag{3.9}$$

where Y_t denotes earnings before interest but after taxes, $Depr_t$ depreciation, ΔS_t net stock issues, ΔLTD_t net issues of long-term debt, ΔSTD_t net issues of short-term debt, Inv_t investments, Div_t the dividend payout, and Int_t the interest paid. All figures in the table are annual data rescaled by beginning-of-year book value and then averaged over time.

From Table 5, non-keiretsu firms' annual investment has been, on average, higher than that of keiretsu firms by almost one percent of book value. The higher investments by non-keiretsu firms are made possible by lower interest payments (reflecting lower leverage) and more equity issues. Interestingly, as of 1990, both groups have cut down their investments by about half, while simultaneously departing from Myers' (1984) traditional pecking order by a relatively higher reliance on new equity. In the most recent subperiod, keiretsu firms actually have been reacting to a Myers (1977) debt-overhang problem by withdrawing short-term debt. Their choice of short-term debt as the item where cuts were needed may signal that their financial

Table 4: Japanese Keiretsu and Non-Keiretsu Capital Structures

Entries are average shares of different classes of liabilities, in percent of total market capital, for keiretsu and non-keiretsu firms in the sample at the end of each fiscal year—first for all Industry 1-9 firms (Panel A), and then separately for size quintile 5 (Panel B) and quintiles 1-4 (Panel C). Keiretsu/non-keiretsu adherence, quintiles, and equity are as defined in Table 3. Short-term debt is PACAPs data item BAL11, long-term debt is Long-term Loans (BAL14) plus Debentures (BAL15), which in turn consist of Bonds (JAF50) and Convertibles (JAF51).

Year	Equity	Long-Term Debt				ST Debt
		Total	Loan	Bond	Convrtbl	
Panel A: Keiretsu vs. non-Keiretsu, all sizes						
		Keiretsu Firms				
1974-80	36.92	34.41	27.43	5.27	1.70	28.67
1981-85	49.63	25.79	18.60	5.37	1.82	24.58
1986-90	65.62	18.03	9.06	6.83	2.14	16.35
1991-95	55.20	25.42	11.16	10.91	3.35	19.38
1974-95	50.49	26.69	17.55	6.93	2.20	22.83
		Non-keiretsu Firms				
1974-80	45.13	27.86	23.61	2.57	1.68	27.00
1981-85	58.64	18.40	13.25	2.83	2.33	22.96
1986-90	72.73	13.19	5.98	4.75	2.46	14.08
1991-95	63.05	19.64	9.10	7.11	3.42	17.31
1974-95	58.55	20.51	13.95	4.16	2.40	20.94
Panel B: Keiretsu vs. non-Keiretsu in Size Quintile 5						
		Keiretsu Firms				
1974-80	34.02	36.87	29.08	5.98	1.81	29.12
1981-85	45.57	28.75	20.73	6.25	1.77	25.69
1986-90	63.06	19.76	10.35	7.48	1.93	17.18
1991-95	52.36	27.56	12.45	11.96	3.16	20.08
1974-95	47.60	28.82	18.98	7.70	2.14	23.58
		Non-keiretsu Firms				
1974-80	38.85	34.32	28.80	3.56	1.96	26.83
1981-85	50.91	24.13	18.16	4.08	1.89	24.96
1986-90	69.87	16.03	8.39	5.69	1.94	14.10
1991-95	58.55	24.25	12.51	8.70	3.03	17.20
1974-95	53.45	25.35	17.84	5.29	2.21	21.20
Panel C: Keiretsu vs. Non-keiretsu firms in Size Quintile 1-4						
		Keiretsu Firms				
1974-80	53.28	20.50	18.12	1.27	1.12	26.21
1981-85	68.24	12.10	8.74	1.28	2.07	19.66
1986-90	77.19	10.15	3.10	3.92	3.13	12.66
1991-95	69.30	14.78	4.74	5.72	4.32	15.92
1974-95	66.18	14.92	9.67	2.78	2.48	18.90
		Non-keiretsu Firms				
1974-80	55.34	17.11	150	0.89	1.22	27.56
1981-85	68.29	11.10	7.03	1.27	2.80	20.61
1986-90	75.77	10.20	3.35	3.77	3.08	14.03
1991-95	67.94	14.61	5.37	5.37	3.88	17.45
1974-95	65.74	13.52	8.32	2.63	2.57	20.74

Table 5: Japanese Keiretsu and Non-keiretsu Cash In- and Outflows

The table shows the average of annual cash in- and outflows as percents of aggregate year-start book capital for keiretsu and non-keiretsu firms (Panel A), in size quintile 5 (Panel B), and in size quintile 1-4 (Panel C). See the definitions of keiretsu, non-keiretsu, and size quintiles in Tables 2 and 3. Components of the cash in- and outflows are expressed as percents of cash inflows, which balance cash outflows: $Y-t+Depr_t+\Delta S_t+\Delta LTD_t+\Delta STD_t = I_t + Div_t + Int_t$. $Y-t$ is the sum of net income (PACAPs data item INC9) and interest expense (JAF67), $Depr_t$ is depreciation expense (JAF74). ΔLTD_t is the change in the book value of the sum of long-term loans (BAL14) and debenture (BAL15) from $t-1$ to t. ΔSTD_t is the change in the book value of short-term debt (BAL11). Investment, I_t, is the change in book capital from $t-1$ to t, plus depreciation. Int_t is interest expense (JAF67). Div_t is dividend [dividend per share (MKT1) times shares outstanding (MKT5)]. The net flow from the sale and repurchase of stock, $\Delta S_t = I_t + Div_t + Int_t - Y_t - Depr_t - \Delta STD_t - \Delta LTD_t$, balances the cash flow identity.

Year	Y	Depr	Δ S	Δ LTD	Δ STD	Inv	Div	Int
Panel A: Keiretsu vs. Non-keiretsu, all firms								
Keiretsu firms								
1975-80	11.09	4.91	0.15	2.69	1.84	11.27	1.25	8.16
1981-85	10.59	5.72	0.26	1.59	1.99	11.81	1.26	7.08
1986-90	8.30	5.79	1.43	3.95	1.99	15.52	1.23	4.70
1991-95	5.02	4.34	1.57	0.67	-0.26	7.31	0.84	3.18
1975-95	8.86	5.18	0.82	2.25	1.41	11.47	1.15	5.90
Non-Keiretsu firms								
1975-80	11.19	5.50	0.89	1.37	1.75	11.79	1.47	7.44
1981-85	10.16	5.81	0.80	1.17	2.16	12.49	1.51	6.09
1986-90	7.87	5.24	2.20	4.89	1.82	16.91	1.43	3.69
1991-95	4.76	3.69	1.68	0.43	0.99	8.02	0.90	2.62
1975-95	8.62	5.08	1.37	1.94	1.68	12.28	1.33	5.08
Panel B: Keiretsu vs. Non-keiretsu in Size Quintile 5								
Keiretsu firms								
1975-80	10.96	4.73	0.01	3.12	1.98	11.37	1.2	8.22
1981-85	10.54	5.55	0.03	1.65	2.01	11.33	1.2	7.25
1986-90	8.35	5.71	1.15	3.89	2.10	15.07	1.19	4.95
1991-95	5.13	4.36	1.54	0.83	-0.56	7.11	0.82	3.37
1974-95	8.86	5.08	0.67	2.38	1.39	11.22	1.11	6.05
Keiretsu firms								
1975-80	10.98	5.72	0.41	1.82	1.83	11.6	1.31	7.85
1981-85	10.12	6.01	0.23	0.64	2.29	11.12	1.34	6.83
1986-90	7.83	5.68	1.54	5.25	0.71	15.38	1.37	4.28
1991-95	5.04	4.01	1.5	0.55	1.11	8.28	0.88	3.04
1974-95	8.61	5.37	0.94	2.05	1.49	11.65	1.24	5.58
Panel C: Keiretsu vs. Non-keiretsu in Size Quintiles 1-4								
Keiretsu firms								
1975-80	11.95	6.08	1.06	0.08	0.97	10.65	1.54	7.79
1981-85	10.94	6.81	1.67	1.24	1.84	14.85	1.62	6.03
1986-90	8.02	6.21	3.03	4.29	1.35	18.16	1.49	3.25
1991-95	4.44	4.28	1.77	-0.19	1.42	8.58	0.95	2.2
1974-95	8.98	5.9	1.83	1.28	1.45	13.09	1.42	4.93
Non-keiretsu firms								
1975-80	11.59	5.09	1.76	0.35	1.55	11.9	1.76	6.67
1981-85	10.22	5.51	1.67	1.9	1.95	14.5	1.78	4.97
1986-90	7.92	4.75	2.9	4.58	3.21	18.84	1.5	3.02
1991-95	4.46	3.34	1.86	0.3	0.87	7.75	0.92	2.17
1974-95	8.7	4.67	2.01	1.72	1.89	13.15	1.5	4.34

health was worse than that of non-keiretsu firms.[9] Still, many differences in Table 5 are of uncertain economic insignificance; and it is hard to detect an overarching pattern. Thus, we now turn to the central issues of the paper, the estimated returns on investment and required return on value from which, it turns out, a coherent picture emerges. For exploratory purposes, we first start with the results from the original FF approach.

3.3 Fama-French Point Estimates of the IRRs: Comparison to U.S. and Robustness Checks

While in many respects the regression-based results are more informative than the FF point estimates, the latter are suitable if the objective is to compare with the U.S. results or to explore the sensitivity of the IRRs to the terminal date. Regression-based IRRs do not lend themselves easily for comparison with FF's U.S. results because our methodology is different; and to obtain an idea of the evolution of cost and return over time, the regressions are not convenient either because each estimation produce 90 separate IRRs (nine sectors times five size classes times two governance systems). Panel A of Table 6 shows the estimates of IRR on value and cost, nominal and real, in Japanese Yen (JPY) and U.S. dollar (USD), of all Japanese non-financials, keiretsu versus non-keiretsu firms, and individual industries for 1974-95. The underlying cash flows are available on request.

When denominated in (undeflated) JPY, the estimate of IRR on value of all non-financials is 8.01 percent and the estimate of IRR on cost is 11.34 percent. Thus, on average the Japanese non-financial corporate sector has added value over the past two decades at a nominal rate of 3.33 percent per year. Adjusting the cash flows in equations (2.1) and (2.2) for inflation only lowers both legs of the cost-benefit spread by essentially the same number (to 4.95 versus 7.94 percent, respectively) and does not materially influence the spread itself (3.0 percent in real terms). Panel A of Table 6 also shows estimates of IRR on value and cost of keiretsu and non-keiretsu firms separately. Over the entire period, non-keiretsu firms added more percentage value than did keiretsu firms. Both legs of the spread contribute positively to this result. Non-keiretsu firms had not only a lower cost of capital (IRR on value: 8.61 versus

[9]Flannery (1986) and Diamond (1991) argue that firms that anticipate an imminent improvement in credit ratings have a greater incentive to borrow short-term. In the U.S., Guedes and Opler (1996) find that firms with good credit ratings issue not just long-term but also short-term debt, while firms with speculative-grade credit ratings borrow in the middle of the maturity spectrum. Also James (1987) shows that investors tend to take firms' increase in (short-term) bank debt as a favorable signal. Thus, we can interpret the short-debt withdrawing evidence as bad information.

Table 6: IRRs on Value and Cost, 1974-95, Computed from Aggregated Data

The table shows the IRRs on value and cost, defined in equations (2.1) and (2.2), for all non-financial firms, keiretsu and non-keiretsu firms (in Panel A), and industrial sectors (Panel B), over 1974-95. Keiretsu definition and industrial sectors are as in Tables 2 and 3. The IRR on value measures the return on investments of when one (*i*) acquires all firms at market value when they enter the sample, (*ii*) cashes in all interim payouts and subscribes to all new issues, and (*iii*) sells at market value either when a firm leaves the sample before 1995 or when the portfolio is liquidated (1995). The IRR on cost assumes corporate assets are acquired at book, rather than market value. Annual nominal cash flows in USD are converted from the original JPY cash flows using the USD/JPY rate in each end-March (from PACAP). We compute real IRRs by using annual nominal cash flows in JPY (or in USD) divided by the Japanese (or U.S.) Consumer Price Index in March (from PACAP and CRSP). Returns are in percents, p.a..

	IRR on Value in JPY		IRR on Cost in JPY		IRR on Value in USD		IRR on Cost in USD	
	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
Panel A: All Firms, and by governance type								
All Non-financials	8.01	4.95	11.34	7.94	13.24	7.63	16.89	10.86
Keiretsu	9.07	5.71	11.26	7.73	14.56	8.61	16.86	10.72
Non-keiretsu	8.61	5.56	11.74	8.42	13.96	8.33	17.29	11.34
Panel B: By Industrial Sector								
1. Construction	7.97	4.89	10.31	7.04	13.41	10.17	15.88	12.45
2. Food, Textile & Paper	8.72	5.37	11.36	7.77	14.04	10.54	16.83	13.09
3. (Petro)-Chem. & Rubber	9.66	6.32	12.02	8.47	15.21	11.70	17.70	13.98
4. Glass, Steel & Metal	8.94	5.32	11.47	7.62	14.43	10.63	17.10	13.06
5. Machine & Equipment	9.22	6.12	12.12	8.78	14.79	11.52	17.84	14.31
6. Wholesale & Retail	8.92	5.65	11.04	7.58	14.29	10.87	16.55	12.92
7. Natural Res. & Transport	8.01	4.87	11.45	8.07	13.20	9.93	16.97	13.43
8. Real estate	7.34	4.57	9.44	6.55	12.75	9.83	14.90	11.87
9. Service	7.16	4.74	12.76	9.86	12.65	10.09	18.48	15.42
10. Utilities & Com.	3.26	1.06	10.37	7.29	7.51	5.30	15.73	12.52
10a. Id. without NTT	9.11	5.94	9.89	6.70	14.52	11.20	15.36	12.02

9.07 percent, and adjusted for inflation, 5.56 versus 5.71 percent) but also a higher return on corporate investment (IRR on cost: 11.74 versus 11.26, and after inflation, 8.42 versus 7.73 percent).[10] As we shall see below, these aggregate numbers are somewhat misleading: the "average" keiretsu's return-on-investment shortfall is essentially due to the top size-quintile, while the cost-of-capital handicap originates from the mid- and small-caps. Be it as it may, the picture thus far runs counter to the traditional perception that keiretsu firms benefit from a corporate governance system with internal financing sources.

As noted before, the above results are just point estimates without information regarding (in-)significance; also, they are likely to be dominated by the largest firms in each group and do not control for size and industry differences across the keiretsu/non-keiretsu divide. Industry does seem to make a difference. For example, in Panel B, among the nine sectors that include both keiretsu and non-keiretsu, the estimated IRRs on value in JPY have a range of 2.5 percent p.a., varying from 7.16 percent (construction) to 9.66 percent (services). But even this result must be partly due to size effects. Thus, pending a more careful analysis below, the FF-style IRRs are mostly interesting for purposes of international comparison.

When we translate all cash flows into USD at the contemporaneous spot rate[11] and then compute the USD-based IRRs shown in Panel A of Table 6, the estimates of the IRR on value and on cost for all Japanese non-financials both increase by very similar amounts—roughly, the average per annum appreciation of JPY—to 13.24 and 16.89 respectively. The estimates in real terms are 7.63 and 10.86 percent. These estimates are larger than the U.S. numbers in FF (1999). Thus, the conventional claim that Japan's cost of capital is much below the cost of capital elsewhere in the world (for example, McCauley and Zimmer, 1989) is confounded by

[10] Estimates of return on value for all non-financials fall below both the estimates for keiretsu and non-keiretsu firms because Sector 10, Utilities and Communications, in which there has been no keiretsu presence, is excluded when keiretsu and non-keiretsu samples are selected. NTT (in Sector 10) went public in 1986, near the peak of the Japanese equity market, and with its enormous weight it substantially lowers the estimate return on value for the value-weighted sample of all non-financials.

[11] An implicit assumption of this translated-cash-flow approach is that capital markets are integrated, otherwise the buying and selling of Japanese assets at any desired date is impossible. In reality, however, the opening-up of Japan's capital market really started only in early 80s (and slowly so, at that). A second problem is the assumption that the long-term realized evolution of the exchange rate is close to the expectations. (This problem of course applies also for any other variable in this model, e.g. stock prices and CPI levels.) The latter problem would be solved if, instead of valuing the project as such, we value the project hedged against exchange risk. Under this approach, the USD-based return on the hedged asset is, a priori, roughly equal to the JPY-based return plus the difference between the USD and JPY risk-free rates. To implement his second approach we need to identify "the" foreign and domestic risk-free rates in a sample covering 22 years and having non-flat term structures at all dates. Thus, we have chosen the first approach.

a numeraire effect.[12]

We add two (descriptive) robustness checks on the positive sign of Value Added. First, the cost of assets is likely to be underestimated because of historic-cost accounting and expensing of investments in intangibles (R & D, training, advertising). How large can the measurement error in cost be without overturning our conclusion that Japans corporate return on cost exceeds cost of capital? It turns out that Value Added would drop to zero if our estimated book value of entering firms would understate replacement cost by 62 percent for all non-financials, by 37 percent for keiretsu firms, and by 56 percent for non-keiretsu firms. (The FF figure for the U.S. over a similar period is 35 percent.) Thus, it is unlikely that the underestimation of the cost of assets would come anywhere near the levels needed to invalidate the conclusions.

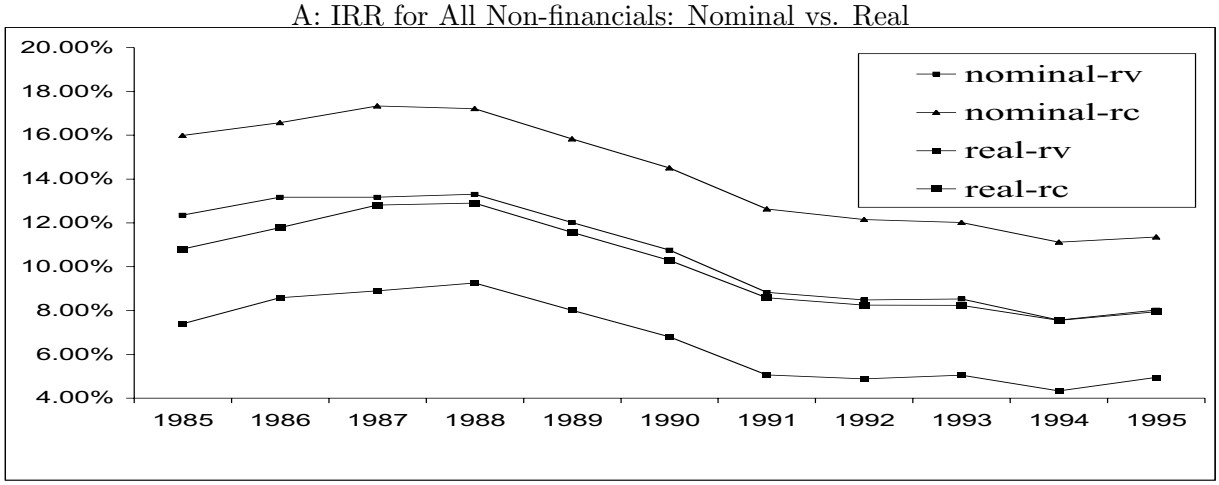
In a second robustness check, we compute the IRRs on value and cost in JPY for different termination dates. To that end, we compute IRRs for termination year 1985 using the data of 1974-85, and we obtain similar estimates for each of the years 1986 to 1995 by sequentially adding back more data years at the end. Figure 1.A depicts the evolution of estimates of both nominal and real IRRs for all non-financial firms from termination years 1985 to 1995. The IRRs are highest for termination years 1987-88 and lowest for the 1990s, reflecting the movements of the Japanese stock prices. In real term, the plots just shift down in an almost-parallel fashion. The evolution of IRRs is predictably smooth because each estimate shares at least 90 percent of the data with the adjacent years. The spread between IRR on cost and value, whether nominal or real, remains positive for any termination date. Thus, our conclusion that the firms have been adding value is not qualitatively sensitive to the termination year.

Still, it is true that the net performance of all firms has slipped in recent years, and especially so in the keiretsu segment. This is obvious from the evolution of the value-added spreads in Figure 1.C.: while both IRRs went on rising as long as the stock market rally (or bubble) lasted (see Figure 1.B), the benefit-cost spreads for both keiretsu and non-keiretsu have been shrinking as of 1985. Perhaps not coincidentally, 1985 is also the date as of which Japan's share in world exports starts declining. It seems that Japan's problems predate the

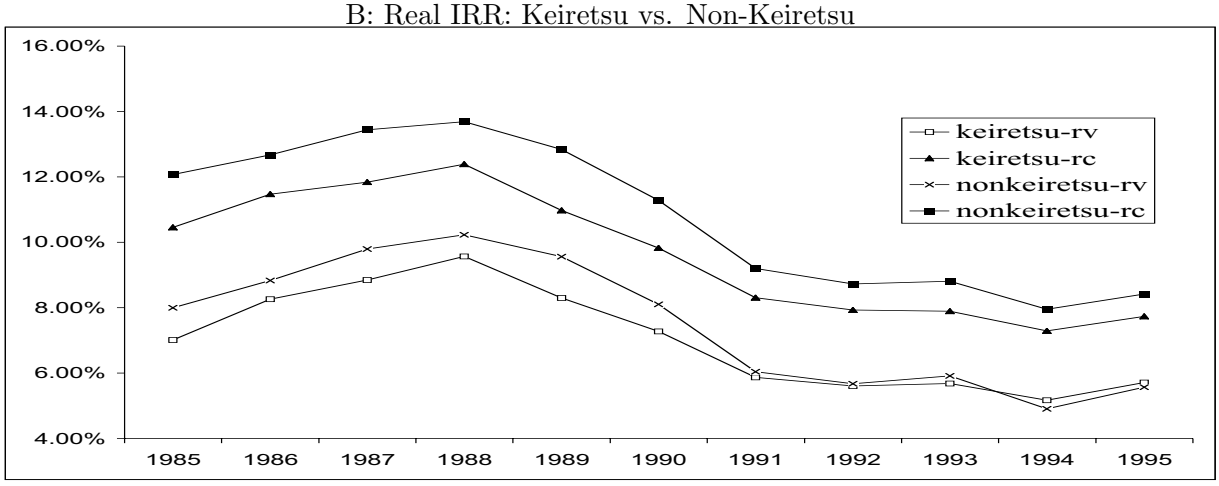
[12]FF find that, for the U.S. non-financials, the nominal and real IRRs on value are 11.78 and 5.57 percent and the nominal and real IRRs on cost are 13.97 and 7.52 percent for 1973-96. It is not obvious whether the U.S.-Japan difference is significant, and, if so, whether its cause is a size or industry effect, a difference in risk, or a result of market segmentation. Note also that, like in the FF study, our results are strongly dominated by initial value, with net intermediate cashflows as the second-important factor and with assets sold as a very distant third. When net cashflows are split into investment outflows and financing inflows, each of these separately gets a large weight.

Figure 1: IRR on value and cost in JPY

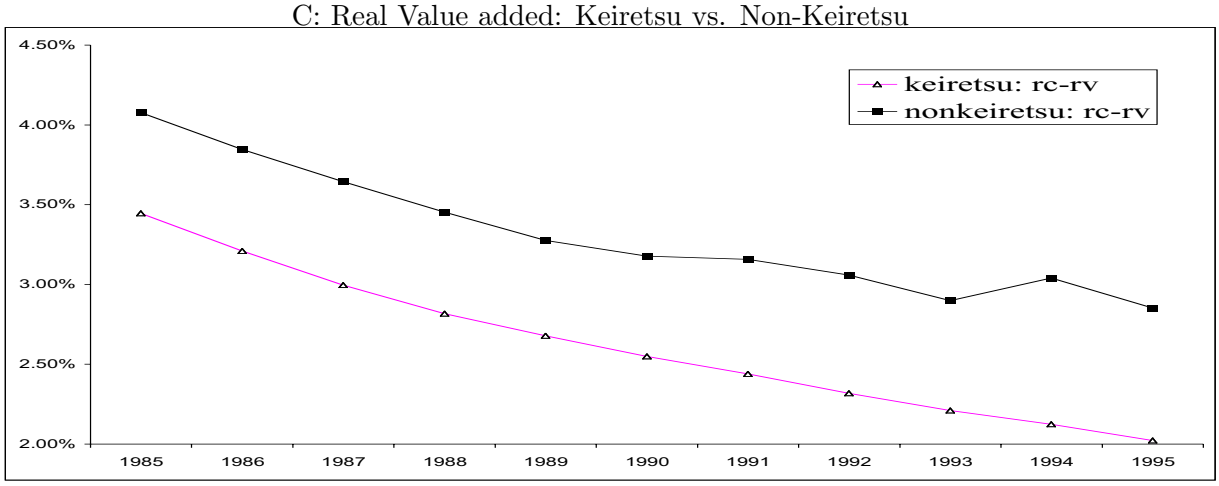
A: IRR for All Non-financials: Nominal vs. Real



B: Real IRR: Keiretsu vs. Non-Keiretsu



C: Real Value added: Keiretsu vs. Non-Keiretsu



stock-market collapse. A second observation from the graphs is the rates of decline, keiretsu versus non-keiretsu, seem to diverge in the early 90s, with the keiretsu Value Added dropping markedly faster than the non-keiretsu one for subsequent years.

After this exploratory look at the data we now turn to a statistically more careful analysis of the 1974-95 IRRs.

4 Regression Estimates of IRRs on Value and Cost, and Value Added

We first look at the performance in the segment of large firms, the most eye-catching segment of Japan's corporate sector but, as we shall see, not necessarily representative for it. We then present the empirical findings for the smaller firms. The interpretation of these observations follows in subsection 4.2.

4.1 Empirical findings

For convenience, we reproduce, below, the return-on-cost and return-on-value specifications, (2.5) and (2.6), that are substituted into the regression equations (2.7) and (2.8) :

$$r_{v,j} = \sum_{i=1}^{10}(a_{v,i} + b_{v,i}K_j)I_{i,j} + \sum_{s=1}^{4}(e_{v,s} + f_{v,s}K_j)S_{s,j}.$$

and

$$r_{c,j} = \sum_{i=1}^{10}(a_{c,i} + b_{c,i}K_j)I_{i,j} + \sum_{s=1}^{4}(e_{c,s} + f_{c,s}K_j)S_{s,j}.$$

The regressions are run jointly, using GMM with the regressors as instruments. To handle outliers, we ranked the firms on the basis of the ratio (final market value)/(initial book value), and trimmed the upper five percent.[13] Panels A and B of Table 7 present the estimates for the industry and size factors in the cost of capital (or return on value, r_v), return on investment at cost (r_c), and the value-added spread ($r_c - r_v$). All returns and spreads, being based on deflated cash-flows, are real numbers. As there is no keiretsu presence in Industry 10 (Utilities and Telecommunications), we omit that sector from the estimation and its dummy from the equation; thus, all tables produce parameters for industries 1 to 9 only. As can be seen from

[13]Smaller trims (results available on request) have the effect of increasing the IRRs slightly but do not affect the return patterns across industries and sizes.

the above equations, the all-dummies-zero base case is a large (i.e. quintile-5) non-keiretsu firm. The columns labeled $r_{v,i}$ and $r_{c,i}$ in Panel A1 display, for the base-case firms in each of the industries, the IRRs on value and cost, respectively, next to the value-added spreads, $a_{c,i} - a_{v,i}$. Panel A2, to the right, shows for each industry the differential IRR and value-added factors, $b_{v,i}$, $b_{c,i}$, and $b_{c,i} - b_{v,i}$, for keiretsu firms in the same top-size class; thus, a positive coefficient in Panel A2 means that, for keiretsu firms, the parameter is estimated to be higher than for non-keiretsu firms. Panel B1, next, shows the differential factors between small and large non-keiretsu firms, $e_{v,s}$, $e_{c,s}$, and $e_{c,s} - e_{v,s}$ for size classes s = 1,...4. For symmetry and convenience of interpretation, the differential factors for small- and mid-cap keiretsu are shown relative to large ones; that is, we display $e_{v,s} + f_{v,s}$, $e_{c,s} + f_{c,s}$, and $e_{c,s} + f_{c,s} - e_{v,s} - f_{v,s}$ rather than just the f parts. Lastly, we also show, in Table 8, the keiretsu/non-keiretsu return differential, for each of the industries $i = 1, ..., 9$ and small- and mid-cap quintiles $s = 1, ..., 4$. These differentials are given by $b_{c,i} + f_{c,s}$, $b_{v,i} + f_{v,s}$, and $b_{c,i} + f_{c,s} - b_{v,i} - f_{v,s}$. The model's fit, as measured by the corrected R-squared, is 40 percent for the cost equation and 70 percent for the value equation.

Figure 2 can be used as a navigation guide to the interpretation of the parameters, the layout of Table 7 and 8, and the discussion of the empirical results. The 2×2 box refers to the main subdivisions (keiretsu/non-keiretsu, large/smaller). In each of its four corners, the figure shows the parameter combination needed to compute the levels of the IRRs for the chosen size×governance combination. The largish two-headed arrows that link two adjacent boxes refer to comparisons between two size×governance combinations. The boxed symbols within these arrows show the parameters used to test for the corresponding differences in IRRs, and the text in these arrows summarizes the salient findings.

Before turning to these findings, we first internally validate a finding obtained earlier with the FF-methodology: Value Added is now found to be positive not just for the aggregate, but also across governance groups, size classes, and industries, and significantly so. The VA-column in Table 7.A1 demonstrates this directly for the Q5 size class of non-keiretsu firms, but a positive benefit/cost spread also obtains for each and every other subsample, and the numbers are significant in all $9 \times 5 \times 2$ cells bar one (tables available on request). Our main interest, however, is in the differences between subgroups. In what follows, we discuss each of the four size×governance comparisons shown in Figure 2.

The first issue is whether keiretsu membership makes a difference among large firms (quin-

Figure 2: Overview of models and empirical findings

The figure provides a navigation guide to the interpretation of the parameters, the layout of Tables 7 and 8, and the discussion of the empirical results on the parameter estimates of return on value (or cost of capital), r_v, and return on cost (on investment), r_c:

$$r_{v,j} = \sum_{i=1}^{9}(a_{v,i} + b_{v,i}K_j)I_{i,j} + \sum_{s=1}^{4}(e_{v,s} + f_{v,s}K_j)S_{s,j} \quad , \quad r_{c,j} = \sum_{i=1}^{9}(a_{c,i} + b_{c,i}K_j)I_{i,j} + \sum_{s=1}^{4}(e_{c,s} + f_{c,s}K_j)S_{s,j}.$$

The 2-by-2 box refers to the main subdivisions (keiretsu/non-keiretsu, large/smaller). In each if its four corners, the figure shows the parameter combination needed to compute the levels of the IRRs for the chosen size/governance combination. The largish two-headed arrows that link two adjacent boxes refer to comparisons between two size/governance combinations. The circled symbols in these arrows show the parameters used to test for the corresponding differences in IRRs, and the text in these arrows summarizes the main findings.

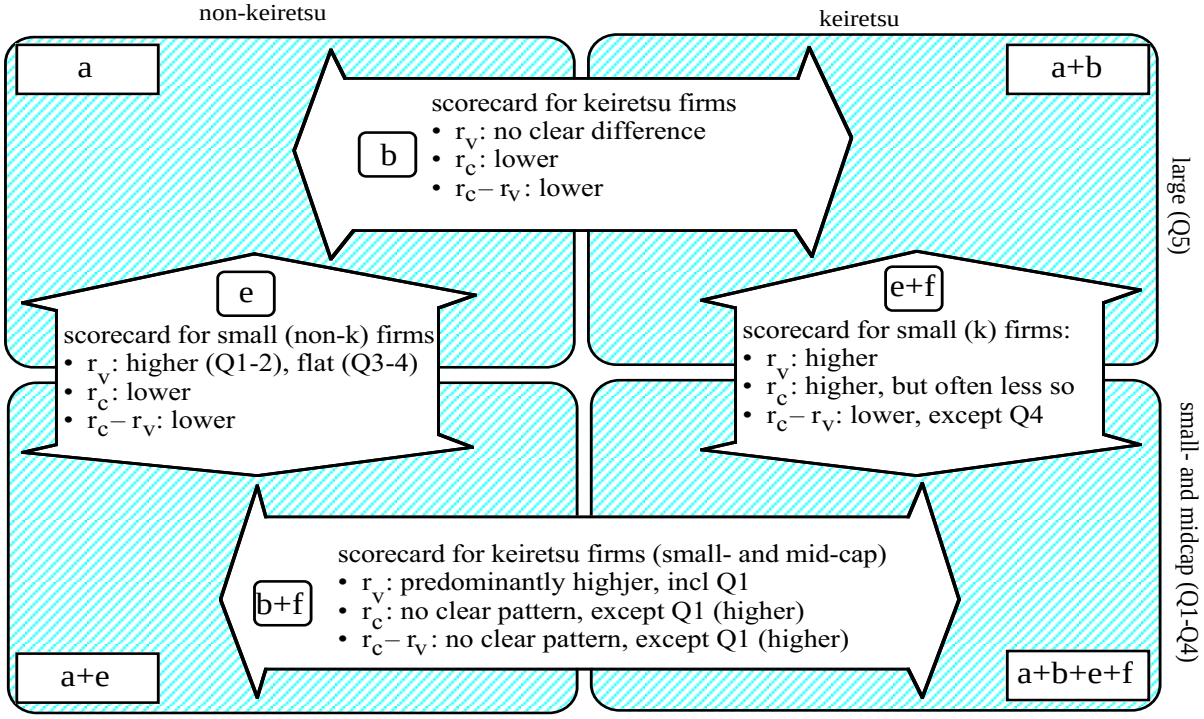


Table 7: Estimates of Real IRR and Value-Added: levels by industry and differentials across size classes and governance types

The regressions estimate the real IRRs and Value Added for keiretsu and non-keiretsu firms. The IRRs on value and cost are modeled as

$$r_{v,j} = \sum_{i=1}^{9}(a_{v,i} + b_{v,i}K_j)I_{i,j} + \sum_{s=1}^{4}(e_{v,s} + f_{v,s}K_j)S_{s,j} \quad , \quad r_{c,j} = \sum_{i=1}^{9}(a_{c,i} + b_{c,i}K_j)I_{i,j} + \sum_{s=1}^{4}(e_{c,s} + f_{c,s}K_j)S_{s,j}.$$

The regressors (shown as upper-case symbols) are dummies, with $I_{i,j}, i = 1, ..., 9$, indicating firm j's membership of industry i, K_j its membership of one of the six keiretsu , and $S_{s,j}, s = 1, ..., 4$, its belonging to s-th size quintile. Industries, keiretsu membership and size quintile are as defined in Tables 2 and 3. Panel A1 presents the estimates of IRRs and Value Added by industry for the largest (quintile 5) non-keiretsu firms, while Panel A2 present the corresponding keiretsu differentials (still for large firms). Panels B1 and B2 show the size effects (quintile-s versus quintile-5 differential) in the IRRs as well as in Value Added, for non-keiretsu and keiretsu, respectively. We estimate by cross-sectional GMM (1462 firms) using the regressors as instruments, and the t-values are based on heteroscedasticity-consistent standard errors. Cash flows are CPI-deflated and returns are in real p.a. percentages.

Panel A: Industrial Real IRRs and Value Added of Non-vs. Keiretsu Large (Quintile 5) Firms

	A1. Estimated $a_{-,j}$ (IRR and Value Added, large non-keiretsu)						A2. Estimated $b_{-,j}$ (Keiretsu Effect for Large Firms, relative to A1)					
Industry	r_v	t-test	r_c	t-test	VA	t-test	Δr_v	t-test	Δr_c	t-test	ΔVA	t-test
1	5.97	15.90	9.14	14.20	3.17	6.78	-1.04	-1.80	-1.64	-2.04	-0.60	-0.99
2	5.45	14.33	8.95	15.53	3.50	7.90	-0.27	-0.59	-0.82	-1.04	-0.55	-0.86
3	6.23	14.99	9.73	15.90	3.50	7.72	-0.52	-1.09	-1.79	-2.57	-1.27	-2.53
4	5.64	17.23	9.41	15.04	3.77	6.99	0.32	0.76	-1.19	-1.62	-1.51	-2.55
5	5.41	17.16	9.39	15.40	3.97	7.83	0.27	0.71	-1.38	-2.03	-1.65	-3.00
6	4.83	12.52	9.36	13.04	4.53	6.85	1.49	2.42	-0.76	-0.84	-2.25	-3.00
7	4.94	11.72	7.95	13.18	3.01	7.81	-1.08	-1.81	-1.97	-2.74	-0.89	-1.97
8	4.38	9.22	8.63	6.96	4.26	3.91	0.64	0.68	-1.59	-0.99	-2.23	-1.83
9	4.52	6.69	10.33	9.69	5.81	6.32	0.35	0.17	-2.57	-1.27	-2.92	-2.24
all zero?	$\chi^2(4)$	prob	$\chi^2(9)$	prob	$\chi^2(9)$	prob	$\chi^2(9)$	prob	$\chi^2(9)$	prob	$\chi^2(9)$	prob
Wald χ^2	537.1	0.00	361.3	0.00	85.41	0.00	18.78	0.03	11.82	0.22	16.8	0.05
all equal?	$\chi^2(8)$	prob	$\chi^2(8)$	prob	$\chi^2(8)$	prob	$\chi^2(8)$	prob	$\chi^2(8)$	prob	$\chi^2(8)$	prob
Wald χ^2	21.26	0.01	9.57	0.3	23.75	0	18.71	0.02	3.74	0.88	12.33	0.14

Panel B: Non-keiretsu and Keiretsu-specific Size Effects in Real IRRs and Value Added

	B1. Estimated $e_{-,s}$ (non-keiretsu size effect relative to large ones)						B2. Estimated $e_{-,s} + f_{-,s}$ (keiretsu size effect relative to large ones)					
Quintile	Δr_v	t-test	Δr_c	t-test	ΔVA	t-test	Δr_v	t-test	Δr_c	t-test	ΔVA	t-test
4	-0.58	-1.67	-1.11	-1.88	-0.53	-1.04	0.28	1.06	0.90	2.55	0.62	2.57
3	-0.29	-0.85	-0.87	-1.46	-0.58	-1.18	0.05	0.19	0.37	0.78	0.32	0.79
2	0.54	1.77	-1.02	-1.78	-1.57	-3.26	0.78	2.84	0.58	1.55	-0.19	-0.87
(small) 1	0.76	1.98	-1.51	-2.34	-2.27	-4.71	1.70	5.07	1.50	2.92	-0.20	-0.54
all zero?	$\chi^2(4)$	prob	$\chi^2(4)$	prob	$\chi^2(4)$	prob	$\chi^2(4)$	prob	$\chi^2(4)$	prob	$\chi^2(4)$	prob
Wald χ^2	22.91	0.00	2.12	0.55	50.22	0.00	30.33	0.00	12.39	0.01	11.45	0.02
all equal?	$\chi^2(4)$	prob	$\chi^2(4)$	prob	$\chi^2(4)$	prob	$\chi^2(4)$	prob	$\chi^2(4)$	prob	$\chi^2(4)$	prob
Wald χ^2	22.9	0.00	5.95	0.20	59.66	0.00	6.91	0.07	11.89	0.01	10.87	0.01

tile 5, or Q5). The estimates of differential return on value, Δr_v, provide no support whatsoever for the hypothesis that, at least for Q5 firms, keiretsu membership brings along a lower required return on value: across the nine industries, the four instances of negative return differentials (indicating a lower cost of capital for keiretsu members) are insignificant and marginally outnumbered by positive differences (of which one is significant). In light of the heterogeneous signs of the coefficients, the significance of the Wald test cannot be interpreted as providing evidence for a lower required return on value either. In terms of the return-on-cost differential Δr_c, however, we do see consistent and large differences: all estimates are negative (that is, Q5 keiretsus' investments provide unambiguously lower payoffs than those of similar-sized unaffiliated firms), and about half of these estimates are individually significant. Also, the profitability gap tends to be economically substantial: estimated return differences always exceed one percent, and are always more than large enough to outweigh any cost-of-capital advantage a keiretsu firm may have enjoyed. All resulting differential value-added spreads are estimated to be negative, with six or seven of them significantly so. The Wald test confirms this conclusion.

These results from large firms, with keiretsu firms enjoying no cost-of-capital edge and reaping a lower return on investment, does not necessarily reveal the full picture. As argued in Section 2.1, many of the governance-related effects, if any, may be much more noticeable among smaller firms. The size-factor estimates for keiretsu and non-keiretsu firms are in Panel B of Table 7.

We again start with the cost of capital (or IRR on value). The e_v coefficients in Table 7.B1 show that, relative to large corporations in the same industry, medium-sized non-keiretsu firms (quintiles 4 and 3) may have enjoyed a somewhat lower required return on value; but the evidence of that is, at best, statistically shaky, and there is no obvious Bayesian prior in favor of such an effect either. What does seem certain is that the smallest non-keiretsu firms, quintiles 2 and 1, did face stiffer costs of capital, up to 0.75 percent higher than the large firms. The same size-effect is found, even stronger, among keiretsu firms, where the cost-of-capital differential, Δr_v in Panel B2, rises monotonically the smaller the firm becomes. Although these IRRs-on-value are not quite the same as average holding-period returns, our finding of a size factor in IRRs-on-value is in line with many others' findings, starting with Banz (1981), regarding size effects in expected holding-period returns on stocks.

Note that these size-related cost-of-capital differentials are relative to large firms within

each governance group, so for quintiles 1-4 we still have to compute the total returns before we can compare keiretsu firms to non-keiretsu ones. Table 8 provides this information for every industry×size combination. Panel A shows that in the mid- and small-cap segment (and unlike what we saw for large firms) keiretsu firms tend to have a systematically different cost of capital relative to non-keiretsu ones. By and large, the keiretsu firms seem to be the disadvantaged ones: 25 out of the 36 $(b_v + f_v)$-estimates are positive, all of the significant t-statistics are positive, and the Wald tests clearly reject a zero effect.

The results for return on investment (IRR on cost) for our small- and mid-cap firms are less clear. First look at the size factors within each governance group. Among non-keiretsu firms (Table 7.B1), small firms do monotonically and significantly worse than large ones, while within the keiretsu segment small firms notch up clearly higher returns than do large ones (Panel B2). Recall, however, that the basis of comparison for the latter result is low: as we saw, large keiretsu firms realized particularly unimpressive returns on investments. When we directly compare, for smaller firms within each industry, the returns for keiretsu and non-keiretsu firms—see $b_c + f_c$ in Table 8.B—the picture is mixed. The smallest (Q1) keiretsu firms do seem to have provided higher returns than did non-keiretsu ones, but in the three midcap quintiles the positive-to-negative tally is only 17 to 10, and not a single coefficient is significant.

We finish with a look at Value Added for Q1-4 firms. The size factors within each governance group, $e_c - e_v$ for non-keiretsu and $e_c - e_v + f_c - f_v$ for keiretsu firms, are found in Table 7, Panel B1 and B2 respectively. The smaller a non-keiretsu firm, the lower its percentage value-added spread. Smallish keiretsu firms, in contrast, do better than large ones; but this effect is not monotone in size, and seems to be mostly a reflection of the particularly bad performance among the largest keiretsu firms. In effect, when we directly compare the Q1-4 value-addeds, industry by industry, across the governance groups (Table 8.C), a clear difference emerges only for the smallest size quintile. For the midcaps in Q4-2, indeed, 10 coefficients are positive against 17 negative, and no result is significant. In contrast, for Q1 only three coefficients are negative (and insignificantly so, at that) while three of the six positive ones are significant.

The remaining issue is how all these findings may fit together. We start with our results for large corporations, and then turn to the smaller firms to narrow down the list of possible interpretations.

Table 8: Keiretsu/non-Keiretsu Differentials, for Quintile 1-4 Firms, in Real IRRs and in Real Value Added by Industry, 1974-95

This table shows the differences, keiretsu versus non-keiretsu, in real p.a. IRR on value (Panel A), IRR on cost (Panel B), and Value Added (Panel C) per quintile (1 to 4) and industry (1 to 9), 1974-95. The IRRs on value and cost are modeled as in Table 7 (see *ibid* for definitions and estimation procedure):

$$r_{v,j} = \sum_{i=1}^{9}(a_{v,i} + b_{v,i}K_j)I_{i,j} + \sum_{s=1}^{4}(e_{v,s} + f_{v,s}K_j)S_{s,j} \quad , \quad r_{c,j} = \sum_{i=1}^{9}(a_{c,i} + b_{c,i}K_j)I_{i,j} + \sum_{s=1}^{4}(e_{c,s} + f_{c,s}K_j)S_{s,j}.$$

Panel A: Keiretsu/Non-keiretsu Differential in Real IRR on Value for Quintile-s Firms by Industry $b_{v,i} + f_{v,s}, i = 1, ..., 9, s = 1, ..., 4$

	Quintile 4		Quintile 3		Quintile 2		Quintile 1	
Industry i	Δr_v	t-test	Δr_v	t-test	Δr_v	t-test	Δr_v	t-test
1. Construction	-0.18	-0.30	-0.70	-1.16	-0.81	-1.29	-0.10	-0.16
2. Food, Textile & Paper	0.59	1.19	0.07	0.15	-0.03	-0.07	0.67	1.18
3. (Petro)-Chem. & Rubber	0.34	0.65	-0.18	-0.38	-0.29	-0.61	0.41	0.78
4. Glass, Steel & Metal	1.18	2.66	0.66	1.52	0.55	1.21	1.25	2.66
5. Machine & Equipment	1.13	2.93	0.61	1.58	0.51	1.42	1.21	2.93
6. Wholesale & Retail	2.35	3.65	1.83	2.92	1.72	2.58	2.42	3.20
7. Natural Res., Transp.	-0.22	-0.34	-0.74	-1.09	-0.85	-1.26	-0.15	-0.20
8. Real estate	1.50	1.59	0.98	1.00	0.87	0.90	1.57	1.56
9. Service	1.22	0.60	0.70	0.34	0.59	0.29	1.29	0.64
Wald's $\chi^2(9)$, (prob)	26.33	(0.00)	20.40	(0.02)	19.27	(0.02)	24.24	(0.00)

Panel B: Keiretsu/Non-keiretsu Differential in Real IRR on Cost for Quintile-s Firms by Industry $b_{c,i} + f_{c,s}, i = 1, ..., 9, s = 1, ..., 4$

	Quintile 4		Quintile 3		Quintile 2		Quintile 1	
Industry i	Δr_c	t-test	Δr_c	t-test	Δr_c	t-test	Δr_c	t-test
1. Construction	0.36	0.51	-0.40	-0.51	-0.04	-0.05	1.36	1.69
2. Food, Textile & Paper	1.19	1.67	0.42	0.46	0.79	1.09	2.19	2.54
3. (Petro)-Chem. & Rubber	0.22	0.38	-0.55	-0.90	-0.18	-0.33	1.22	1.79
4. Glass, Steel & Metal	0.82	1.23	0.05	0.07	0.42	0.61	1.82	2.30
5. Machine & Equipment	0.63	1.24	-0.14	-0.26	0.23	0.49	1.63	2.52
6. Wholesale & Retail	1.24	1.47	0.48	0.57	0.84	0.95	2.25	2.34
7. Natural Res., Transp.	0.04	0.05	-0.73	-0.86	-0.36	-0.47	1.04	1.16
8. Real estate	0.41	0.26	-0.35	-0.22	0.01	0.01	1.42	0.85
9. Service	-0.56	-0.29	-1.33	-0.66	-0.96	-0.49	0.44	0.22
Wald's $\chi^2(9)$, (prob)	5.62	(0.78)	4.12	(0.90)	3.88	(0.92)	10.63	(0.30)

Panel C: Keiretsu/Non-keiretsu Differential in Real Vale Added for Quintile-s Firms by Industry $(b_{c,i} + f_{c,s}) - (b_{v,i} + f_{v,s}], i = 1, ..., 9, s = 1, ..., 4$

	Quintile 4		Quintile 3		Quintile 2		Quintile 1	
Industry i	Δr_c	t-test	Δr_c	t-test	Δr_c	t-test	Δr_c	t-test
1. Construction	0.54	0.97	0.30	0.49	0.77	1.39	1.47	2.55
2. Food, Textile & Paper	0.60	1.08	0.35	0.43	0.82	1.48	1.52	2.35
3. (Petro)-Chem. & Rubber	-0.12	-0.30	-0.37	-0.82	0.11	0.31	0.81	1.75
4. Glass, Steel & Metal	-0.36	-0.69	-0.61	-1.05	-0.13	-0.26	0.57	0.94
5. Machine & Equipment	-0.51	-1.28	-0.75	-1.74	-0.28	-0.88	0.42	0.94
6. Wholesale & Retail	-1.10	-1.64	-1.35	-2.04	-0.88	-1.41	-0.18	-0.26
7. Natural Res., Transp.	0.26	0.63	0.01	0.03	0.48	1.17	1.18	2.48
8. Real estate	-1.08	-0.93	-1.33	-1.12	-0.86	-0.74	-0.16	-0.13
9. Service	-1.78	-1.47	-2.02	-1.57	-1.55	-1.25	-0.85	-0.67
Wald's $\chi^2(9)$, (prob)	12.42	(0.19)	18.31	(0.03)	12.35	(0.02)	16.79	(0.05)

4.2 Interpretation

For large firms, the picture is as follows: keiretsu firms appear to have no statistically detectable cost-of-capital advantage over similar-sized non-keiretsu ones, but their return on investment is unambiguously lower. The lack of any beneficial effect in terms of agency costs is not necessarily surprising: also non-keiretsu firms have house banks, and among large listed firms, information asymmetries or liquidity constraints must be rare in the first place. The results on return on investment, however, (where non-keiretsu returns are much higher) is open to more than one possible interpretation. From our discussion of Table 1 in Section 2.2, the competing views can be regrouped as follows:

(a) in the static, neoclassical decreasing-returns view, without liquidity constraints, a high return on investment just follows from a high cost of capital; so it is, in itself, neither good nor bad;

(b) still within the same decreasing-returns view, but with a capital-market failure, a high return on investment reflects underinvestment caused by liquidity constraints, so it is bad;

(c) under the heterogeneous-firm, competitive-advantage view, a high return on investment points to a less competitive industry or better management (including competitive edge, shareholder-value focus), so it is good.

The notion that the non-keiretsu-firms' higher return on investment mirrors a higher cost of capital—view (a), above—is not supported by the data. We found that, across the board, required returns are not systematically higher for keiretsu firms. Looking at the individual numbers in Table 7.A, we also see that non-keiretsu industries with higher required IRRs-on-value do not have systematically higher IRRs-on-cost. For instance, the slope of a quick OLS regression of r_v on r_c across the nine industries turns out to have a value of only 0.16, which is insignificantly above zero (p=0.70) and significantly below unity (p=0.07); and the adjusted R^2 of that regression is even negative.

Might the higher r_cs among large non-keiretsu firms reflect underinvestment caused by liquidity constraints, view (b)? After looking at smaller-firm results, we can reject this notion by contradiction, as follows. If it would be true that even large non-keiretsu firms have trouble raising funds, then smaller non-keiretsu should have even more problems in this field and thus, in this view, have even higher r_cs. However, smaller non-keiretsu firms in the same

industry turn out to have *lower* r_cs than large non-keiretsu ones, which does not conform to the liquidity-constraint/underinvestment view. This then leaves us with the third view, (c): large keiretsu firms were, generally speaking, less professionally run or they happened to be in more competitive sectors. The sluggish-management interpretation, in turn, may have been the result of a less Darwinian environment for keiretsu *sarari men*, or it may have been the result of deliberate cross-subsidized overinvestment in large firms, under political or employee pressure. Let us see which of these views best fits the numbers.

The hypothesis that the large keiretsu-firms' low returns on investment reflect a lower market power is unconvincing. We already correct for industry and size effects, which eliminates one possible explanation relative to non-keiretsu firms. Also, if even large keiretsu firms singularly lack market power, then smaller players should do even worse in this respect. Yet, smaller keiretsu firms obtain better returns on investments than large ones. Thus, the poor returns to large keiretsu firms probably have little to do with differential market power.[14] This leaves us with two remaining views: a less capable management, and/or cross-subsidized overinvestment.

Are there any traces of cross-subsidizing in our tables? Funneling cash from smaller firms to large ones, if it did take place, could have occurred via two channels: either by transfer pricing via the soga sosha (the group's reinvoicing center), or by hold-up behavior from banks towards smaller firms to the benefit of the larger group members. There is no statistically clear evidence of transfer pricing among keiretsu firms. Indeed, if operating-profit reallocation did occur on a large scale, then small keiretsu firms should look less profitable than similar-sized non-keiretsu ones in the same industry. Yet we do not observe this: the r_c-differences are, generally speaking, insignificant, and the (weak) evidence for differential performance is actually in favor of the keiretsu firms rather than against them (as one would have expected if there were systematic transfer pricing). Thus, cross-subsidization, if any, would have to be through the banking system and show up in the cost of capital, r_v. We do see, indeed, that smaller keiretsu firms have higher estimated r_vs than larger ones. This, of course, could still be the inevitable result of size-related information asymmetry, one that even the most benevolent bank cannot cure. More tellingly, however, smaller keiretsu firms also have higher r_vs than non-keiretsu firms of the same industry and size. Thus, keiretsu membership does not

[14] In our terminology, market power is purely size-related, and successfull product differentiation is part of the managerial-ability explanation of return on investment.

seem to provide the beneficial effects that some predict. Rather, our verdict tends towards the holdup-behavior hypothesis—albeit a selective variant, where stealing is from the small so as to subsidize the large—possibly combined with a less nimble management.

We conclude, in the next section, by linking the above statistical analysis to some of the qualitative findings, from Section 3.1, on capital structure.

5 Concluding Remarks

In this paper, we estimate the IRRs on value and cost for the Japanese non-financials for 1974-95, using a methodology that allows expected returns to vary across industries, size classes, and governance systems. Like Fama and French (1999), who apply a similar yardstick to U.S. data, we find that Japan's non-financials firms have added value. We can also confirm that this is a statistically significant and pervasive phenomenon, holding irrespective of industry, size, and governance system. The main issue of the paper is, however, how keiretsu membership affects the components of Value Added: the required return on value and the return on cost. As far as cost of capital is concerned, we find no evidence whatsoever that keiretsu firms enjoy an advantage relative to comparable non-keiretsu ones. To the contrary, for medium- and small-sized firms the finding is that keiretsu firms often suffer from a higher required return. In terms of return on investment, we find that top-league keiretsu firms experienced definitely poorer payoffs than did comparable non-keiretsu ones; for medium- to small-sized firms there is no clear difference. The resulting effect of keiretsu membership on Value Added was pervasively negative for large firms, and rather unclear for medium- and small-sized ones.

The findings regarding the cost of capital do not support the traditional perception that keiretsu firms have an edge in that respect. So lower agency costs do not seem to be the reason why they borrow more (as we noted in Section 3.2). Rather, their higher leverage is more likely to be the reflection of co-insurance and size—larger firms, benefitting from internal diversification, can (and do) borrow more—or a way of supporting overinvestment, rather than mainly a rational response to lower agency costs. Possible explanations why there is no noticeable cost-of-capital advantage are that also non-keiretsu firms tend to have a main bank, and that there may be few important information asymmetries anyway about firms that, being listed, are never really small in the first place. In short, for many firms the advantages of keiretsu membership may be less important than they are often cracked up to be or may very well have been in the past.

While these arguments may explain the absence of a cost-of-capital advantage for affiliated firms, they fail to explain why significant differences in the required return always correspond to a keiretsu disadvantage rather than the other way around. For an explanation of that phenomenon, we have to fall back on a somewhat heterodox view in the literature: some keiretsu firms, being captive customers of the group's bank, are being overcharged. There is support for this hold-up-behavior hypothesis in our data: higher costs of capital are observed only for smaller firms, which have fewer or no alternative sources of financing. The selectiveness of banks' holdup tactics could also help explain why large keiretsu firms, not being at the paying end of the scheme, borrowed relatively more even though their investments were smaller (relative to asets) and less profitable.

A frequently-advanced potential advantage of keiretsu membership is that intra-group financial flows reduce liquidity constraints on investments, thus allowing higher growth. Our finding, in Section 3.2, that non-keiretsu firms actually invested more than did keiretsu members does not necessarily contradict this proposition: keiretsu firms are typically larger and tend to be in mature industries, so that their opportunities for profitable investment may have been relatively less abundant. One advantage of our analysis of returns on cost is that it does provide information on profitability after controlling for size and industry factors. We find that, among large firms of a given industry, keiretsu members tend to register lower returns on cost. After ruling out other explanations, one likely cause of these low returns is that large keiretsu-firms had too easy access to funds. Our results on financing policies point into the same direction: relative to non-keiretsu firms, keiretsu members may have over-borrowed and -invested. Indeed, as of 1985 and especially 1990, both classes of firms have cut down their investments, and have also departed from the traditional pecking order, relying relatively more on new equity. At the same time, however, keiretsu members have actually been withdrawing short-term debt, which suggests that their financial health was worse than that of non-keiretsu firms (who expanded their short term borrowing).

Financial keiretsu groups (or the zaibatsu out of which many keiretsu grew) may have been economically useful in the days when capital markets were primitive and highly imperfect. There still are traces of such a beneficial role: some of the smallest keiretsu firms seem to have flourished in their investments despite their high cost of capital. But otherwise, keiretsu groups seem to have outlived their erstwhile economic usefulness.

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