Corporate Structure, Liquidity, and Investment: Evidence from Japanese Panel Data

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EVIDENCE FROM JAPANESE PANEL DATA*

by

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Abstract

This paper presents evidence consistent with the view that information and incentive problems in the capital market affect investment. We come to this conclusion by examining two sets of Japanese firms. The first set have close financial ties to large Japanese banks that stand ready to supply funds for promising investment projects. For these bank-affiliated firms, liquidity plays little or no role in determining investment while Tobin's \( q \) is a statistically significant determinant. We find very different results for a second set of firms that do not have close links to a major bank and presumably face greater information and incentive problems in their arms-length capital-market transactions. For these firms investment is very sensitive to liquidity and \( q \) is statistically insignificant. Our findings have important implications for understanding differences between investment in the U.S. and Japan.
1. Introduction

This paper explores the empirical relationship between corporate financial structure and investment. The analysis focuses on the implications of models based on information and incentive problems between corporate managers and the capital market. This theoretical work has gained prominence because of its plausible assumptions about capital-market imperfections. Yet, it lacks empirical support because of the obvious difficulties in measuring information and incentive problems.

Our contribution is to examine one of the theory's key implications using panel data on Japanese manufacturing firms. These firms differ substantially in the nature of their relationships with the capital market. This variation enables us to determine the extent to which firms face information and incentive problems.

Many Japanese firms are affiliated with industrial groups or "keiretsu". These groups serve many functions; most interesting from our perspective is the role they play in reducing the financing costs of member firms. These firms receive substantial debt and equity financing from the large city banks at the center of the group. This close financial link to a single bank mitigates information and incentive problems that typically arise when there are diffuse investors and none has an incentive to monitor the firm.

In contrast, another set of Japanese firms raises capital via arms-length market transactions. These firms generally lack a close relationship with a single bank and are more likely to face information and incentive problems in the capital market. This difference between the two sets of firms enables us to explore the implications of the theory.
An important unifying theme of the theoretical literature is that it is more costly to finance investment with external funds than with internal funds. As a result, firms are more likely to invest if they do not have to raise funds from the capital market, but can finance investment with cash flow from existing operations. Although the models focus on different information and incentive problems, they all predict that liquidity will be an important determinant of investment.

Jensen and Meckling [1976] and Myers and Majluf [1984] are two prominent contributions to this literature. Jensen and Meckling argue that incentive problems raise the cost of external finance. Outside financing dilutes management's ownership stake, thereby exacerbating incentive problems that arise when managers control the firm but do not own it. Myers and Majluf stress information problems rather than incentive problems, but reach a similar conclusion. If managers are better informed about the firm's prospects than investors, the firm's risky securities will sometimes be underpriced, raising the cost of external financing. In both cases, managers will find it more attractive to finance investment with internal funds. Thus, for firms facing information and incentive problems, cash flow will be an important determinant of investment. We explore this implication.

The remainder of the paper consists of six sections. We begin in Section 2 with a discussion of the important institutional features of Japanese corporate finance. We argue that these institutions enable firms with close bank affiliations to circumvent financing problems that independent firms usually face. Section 3 describes the data and provides more details about the differences between affiliated and independent firms.
Section 4 presents our basic evidence on the effect of cash flow on investment. We find -- in accord with the theory -- that cash flow is positively related to investment for independent firms, but much less so for affiliated firms. Of course, investment will tend to be positively correlated with cash flow not only because of the financing problems discussed above, but also because cash flow is positively related to firms' investment opportunities. Therefore, simply regressing investment on cash flow will not isolate the effect of information and incentive problems. To control for the future investment opportunities of the firm, we include in our regression equations Tobin's q -- the ratio of the market value of the firm to the replacement cost of capital.

This q-based approach to the investment effects of liquidity is similar to recent work by Fazzari, Hubbard, and Petersen [1988a,b]. They study the link between liquidity and investment for a panel of U.S. firms. They argue that firms with low dividends do not pay out much because they face greater difficulty raising external capital. Thus, they are more likely to be liquidity constrained than firms with high dividends. They indeed show that the investment behavior of these firms is more sensitive to cash flow. Our approach differs in that we focus on the institutional features of Japanese finance rather than earnings retention patterns.

Section 5 builds on our central finding that cash flow matters only for independent firms. In the first part of the section we analyze the investment behavior of the many firms which are neither affiliated nor independent. These hybrid firms have business relations with other members of the group, but their ties to group banks are much weaker than those of affiliated firms. As the theory predicts, we find that
liquidity is significant for these firms, but less so than for independent firms.

The remainder of Section 5 considers the possibility that the stock of cash (in addition to the flow) is a determinant of investment. We find a large positive effect for independent firms and a very small positive effect for affiliated firms. Again this is consistent with the view that independent firms face significantly greater difficulty raising capital.

In Section 6, we discuss alternative explanations of our results. We also try to distinguish among some of the theories that are based on information and incentive problems. Section 7 contains a summary and a discussion of the implications of our findings. In addition we discuss suggestions for future work and some recent changes in the structure of Japanese corporate finance.

2. Institutional Features of Japanese Corporate Finance

As discussed above, many Japanese corporations are affiliated with industrial groups or "keiretsu", which are said to coordinate the activities of member firms. The largest and most important of these groups are both diversified and vertically integrated. For example, the Mitsubishi group has member firms in the automobiles, beer, chemicals, and space software industries. By conservative estimates, 89 of the top 200 Japanese industrial firms have strong business connections to the six major groups: Mitsubishi, Mitsui, Sumitomo, Fuji, Dai-ichi Kangyo, and Sanwa. These firms account for 40 to 55 percent of total sales in the natural resources, primary metal, industrial machinery, chemicals, and cement industries.

In addition, these firms do much of their buying and selling within the group; as an extreme example, Gerlach [1987] reports that Mitsubishi
Aluminum sold 75 percent of its output to other group firms and bought 100 percent of its inputs from group firms. He also estimates that affiliated firms are three times as likely to do business with other firms within their group than with unaffiliated firms.

More interesting from our perspective, however, are the financial ties among group firms. The most important financial link is between group firms and the banks at the center of each of the six primary industrial groups. The banks in these six groups include the five largest in the world and a total of nine of the world's top fourteen banks.\(^2\)

Affiliated firms do a substantial fraction of their borrowing from the group banks. This contrasts with unaffiliated, independent firms who tend to spread out their borrowing across several banks. It is also different from the borrowing patterns of large U.S. corporations who rely more heavily on the corporate bond market. In addition to lending money to these firms, group banks (there are typically more than one) own as much as 5 percent of the equity of member firms; often affiliated life insurance companies own equity as well.\(^3\)

For several reasons, these close ties are likely to reduce the cost of capital of affiliated firms. First, because banks own large equity stakes in member firms and lend considerable capital, they have strong incentives to get around the information and incentive problems typically associated with arms-length capital-market transactions. This concentration of financial claims in the hands of a few banks reduces the free-rider problems that plague firms with diffusely held debt and equity.
Moreover, because affiliated banks are both shareholders and debtholders, firms will have less incentive to take actions that benefit one class of investors at the expense of another. The concentration of borrowing and the linkage of debt to equity also reduces the cost of financial distress because it reduces conflicts that typically arise among investors when a firm is near default. 4

There is considerable anecdotal evidence in favor of the view that group banks ease conflicts among creditors. For example, Abegglen and Stalk [1985] point to Mazda, the automobile manufacturer, which experienced great financial difficulty during the 1970s. As a member of the Sumitomo group, Mazda had close connections with the group’s major bank. When the company got in trouble one of the managing directors of Sumitomo’s bank assumed the leadership of the firm and led it out of financial distress. Indeed, a former head of Sumitomo bank was quoted as saying, "We are always prepared to help out when a member firm is in trouble. We won’t allow any group member companies to go into business failure." Sheard [1985] documents several other instances in which a group bank bailed out an affiliated firm.

In contrast, Sheard notes that the lack of strong banking relations was an important factor behind the four largest Japanese post-war failures: Kojin, Eidai Sangyo, Osawa Shokai, and Rikkar. In none of these cases was a bank willing to step in and organize a workout. He cites an article in Nihon keizai shimbun (the Japanese financial daily paper) entitled, "The weakness of not having a main bank," describing the Osawa Shokai failure.

In sum, close banking ties reduce information and incentive problems for two reasons. First, banks have the incentive to monitor the firm
because of their large financial stakes in the firm. Second, conflicts among creditors are reduced, particularly when a firm is in financial distress.

3. Data Description

The sample we analyze is a subset of the Japanese manufacturing firms that have been continuously listed on the Tokyo Stock Exchange since 1965. To simplify the construction of q, we restricted the sample to those firms whose accounting years consistently ended in March. We extracted most of the data from the Nikkei Financial Data tapes. (See Hoshi and Kashyap [1987] for further details on data construction and definitions.)

Separating these firms into affiliated and independent subsets is somewhat difficult. Several publications (Keiretsu no Kenkyu, Industrial Groupings in Japan, and Nihon no Kigyo Shudan) attempt to make this decomposition. Because we are interested in the financing options available to firms, we adopt Nakatani's [1984] refinement of the Keiretsu no Kenkyu classification.

Nakatani's refinement stresses the strength of the financial ties between group firms and group banks. Hence all of Nakatani's "group firms" were identified by the Keiretsu no Kenkyu definition that focuses on the percentage of shares owned by other group firms, the propensity to borrow from the group bank, and participation in the group's regular conferences. He then refined their definition (Nakatani [1984], p. 233) by considering only firms which belong to the 6 major groups: Mitsubishi, Mitsui, Sumitomo, Sanwa, Fuji and Dai-ichi Kangyo. He also required that the firm was always affiliated with the same group and that at least one of the following conditions held for 1972, 1976, and 1982:
a) The member bank was the biggest lender to the firm for the last three years consecutively, and shareholding within the group exceeded 20 percent;

b) The member bank has lent more than 40 percent of the firm's total debt for the last three years consecutively;

c) For historical reasons, the firm might be considered affiliated. However, if 30 percent or more of the equity shares of the firm was held by a parent company, then the firm was classified as a subsidiary rather than a group-affiliated firm.

It is important to keep in mind that group "membership" is not clearly defined; there are no membership dues or cards. Instead, it is best to think of a group as a network of business and financial relationships of varying degrees and kinds. We have chosen to focus on the financial aspects of group affiliation, in particular a firm's relationship with a major bank. Nakatani uses this screen as a definition of group affiliation, but it is better to think of this as a type of affiliation. Some firms in the sample will not fit Nakatani's definition; nevertheless, they may have close business relationships with other non-financial firms in the group. In Section 5 we attempt to identify these firms and contrast their investment behavior with the firms labeled by Nakatani as affiliated or independent.

The intersection of Nakatani's sample and our's leaves us with 121 group firms and 25 independent firms. According to Keiretsu no Kenkyu, as of 1981, only 83 of the 859 non-financial firms listed on the Tokyo Stock Exchange were completely independent of an industrial group. Thus, the small number of independent firms in our sample reflects the fact that there are indeed few of them in the Japanese economy. The remaining
195 firms analyzed in Section 5 are hybrids of affiliated and independent firms.

Table 1 shows a number of summary statistics comparing the two sets of firms. All statistics are computed for the fiscal years 1976 to 1982. As the table shows, the rate of investment, as measured by the ratio of investment to the beginning of period capital stock, is about the same across the two classes. The independent firms tend to invest slightly more and their investment is more volatile. A similar conclusion holds for liquidity and production. The liquidity-capital and production-capital ratios of the independent firms are both larger and more volatile. Average \( q \) is slightly higher for independent firms.

The most striking difference between the two sets of firms is that affiliated firms tend to have much higher ratios of debt to equity. Recall that, by definition, group firms will tend to borrow primarily from one bank, but our definition did not require that they borrow large quantities of yen. The differing debt-equity ratios is consistent with the view that close bank affiliation reduces the cost of debt financing.

The last three lines of the table show that the two types of firms are similar in several other dimensions. Independent firms are slightly larger and tend to have slightly higher sales growth; both types of firms hold roughly similar percentages of short-term liquid securities.

4. Basic Regression Results

The regressions below reinforce the typical finding in the investment literature that the simple and most elegant form of the \( q \) theory does not adequately explain investment. Because Hoshi and Kashyap [1987] have already investigated the empirical problems of the \( q \) theory,
Table 1

Summary Statistics Comparing Affiliated and Independent Firms

<table>
<thead>
<tr>
<th></th>
<th>Affiliated Firms</th>
<th>Independent Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Firms</td>
<td>121</td>
<td>25</td>
</tr>
<tr>
<td>Median I/K</td>
<td>.118</td>
<td>.136</td>
</tr>
<tr>
<td>Mean Stand. Dev. I/K</td>
<td>.119</td>
<td>.143</td>
</tr>
<tr>
<td>Median Liquidity/K</td>
<td>.229</td>
<td>.285</td>
</tr>
<tr>
<td>Mean Stand. Dev. Liquidity/K</td>
<td>.115</td>
<td>.151</td>
</tr>
<tr>
<td>Median Production/K</td>
<td>6.97</td>
<td>7.83</td>
</tr>
<tr>
<td>Mean Stand. Dev. Production/K</td>
<td>1.36</td>
<td>1.58</td>
</tr>
<tr>
<td>Median Average q</td>
<td>.94</td>
<td>1.15</td>
</tr>
<tr>
<td>Median Debt/Equity</td>
<td>1.09</td>
<td>.76</td>
</tr>
<tr>
<td>Median Capital Stock</td>
<td>12491</td>
<td>14514</td>
</tr>
<tr>
<td>Median Sales Growth Rate</td>
<td>.083</td>
<td>.094</td>
</tr>
<tr>
<td>Median Short-term Securities/K</td>
<td>.135</td>
<td>.108</td>
</tr>
</tbody>
</table>

\[1\] Medians calculated for all firms across all years. Standard Deviations are calculated on a firm by firm basis and then averaged. Investment and capital, K, are for depreciable assets, other variables are described in the text. The units for the capital stock are millions of yen.
we do not dwell on these problems here. Instead, we focus on the sensitivity of investment to liquidity.

We report our basic regression results in Table 2. These regressions, like most that follow, include as regressors a set of yearly dummies, average q, current liquidity, and production in the previous year. Current liquidity is defined as income after tax plus depreciation less dividend payments. To eliminate the effects of scale, we normalize investment, production, and liquidity by the firm's capital stock in the beginning of the year. Finally, to remove firm-specific effects, we measure all variables as deviations from the firm's mean. We chose to include production in our regressions for several reasons. First, the empirical investment literature has repeatedly shown the existence of an accelerator effect in the data. Jorgenson [1971] summarized the literature by writing, "Real output emerges as the most important single determinant of investment expenditure." Recent work using panels of British and American firms by Blundell et. al. [1988] and Fazzari et. al. [1988] show that the accelerator effect is important even in models with q. By including production in our regressions, we guarantee that we are not merely recovering this well-known accelerator effect through liquidity measures. In our sample, as we shall see shortly, we have no trouble distinguishing between production and liquidity effects when both variables are included.

A theoretical argument based on monopolistic competition can also be used to justify the inclusion of production. Schiantarelli and Georgoutous [1987] show that for firms with market power, both q and production will affect investment. For both reasons, we proceed by including production in our model.
The first three columns of Table 2 exhibit our regression results when we do not account for group affiliation and pool the 146 affiliated and independent firms. These columns report three regression equations that include, respectively, beginning-of-period q, end-of-period q, and both beginning- and end-of-period q. We present these different specifications to address different assumptions about the correlation between the regressors and residuals.

By using beginning-of-period q we can be sure that it is uncorrelated with the disturbance term in the investment equation. Hence, the significance of q in this regression is a reasonable way to assess the importance of q in determining investment. As the table indicates, q is a significant determinant of investment, although lagged production and current liquidity are more significant.

A possible objection to this regression is that liquidity contains news about future profitability that is not contained in beginning-of-period q. Hence, it is possible that liquidity is significant because beginning-of-period q omits information about future investment opportunities.

The second column shows the regression results when we replace beginning-of-period q with end-of-period q. End-of-period q will be endogenous since it includes the end-of-period replacement cost in its denominator. This, in turn, includes the replacement cost for investment made during the year. Accordingly, the coefficient associated with end-of-period q will be biased towards zero.

The first two columns bear out this prediction: the estimated coefficient on end-of-period q is noticeably smaller than the coefficient on beginning-of-period q. However, the advantage of using end-of-period
Table 2
Baseline Investment Regressions
Affiliated and Independent Firms

<table>
<thead>
<tr>
<th></th>
<th>Pooling Indep. &amp; Group Firms</th>
<th>Pooling Indep. &amp; Group Firms</th>
<th>Pooling Indep. &amp; Group Firms</th>
<th>Group Firms</th>
<th>Indep. Firms</th>
<th>Group Firms</th>
<th>Indep. Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Firms</td>
<td>146</td>
<td>146</td>
<td>146</td>
<td>121</td>
<td>25</td>
<td>121</td>
<td>25</td>
</tr>
<tr>
<td>Average q (Beg. of Period)</td>
<td>.0051 (.0024)</td>
<td>.0053 (.0024)</td>
<td>.0065 (.0030)</td>
<td>.0059 (.0046)</td>
<td>.0058 (.0031)</td>
<td>.0065 (.0046)</td>
<td></td>
</tr>
<tr>
<td>Average q (End of Period)</td>
<td>.0001 (.0024)</td>
<td>-.0009 (.0024)</td>
<td>.0027 (.0030)</td>
<td>-.0070 (.0048)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquidity_t / K</td>
<td>.113 (.030)</td>
<td>.128 (.029)</td>
<td>.115 (.030)</td>
<td>.049 (.031)</td>
<td>.419 (.087)</td>
<td>.046 (.031)</td>
<td>.441 (.088)</td>
</tr>
<tr>
<td>Prod_{t-1} / K</td>
<td>.024 (.0024)</td>
<td>.024 (.0024)</td>
<td>.024 (.0024)</td>
<td>.026 (.0024)</td>
<td>-.002 (.0090)</td>
<td>.026 (.0024)</td>
<td>-.002 (.0090)</td>
</tr>
</tbody>
</table>

1 Dependent variable is I/K. All variables are entered as deviations from firm specific means. The regressions all include a set of yearly dummy variables and cover Fiscal Years 1977-82. Standard errors are reported below the coefficient estimates.
q is that it contains at least as much information about future profitability as liquidity. Hence, these results suggest that the importance of liquidity does not stem from the news it conveys about future profitability.

As a compromise, we include both beginning- and end-of-period q in our regressions. This may inhibit an interpretation of the importance of q, but it guarantees that current liquidity does not proxy for information about future profits. The third column reports the results of this regression: q, liquidity and past production are all important determinants of investment.

The last four columns of Table 2 contain the main result of the paper: liquidity is unimportant for affiliated firms while it is important for independent firms. For the affiliated firms, investment continues to depend on q and production but it is essentially unrelated to current liquidity. In contrast, for the independent firms the link between investment and liquidity is very significant. All else being equal, a 100 yen increase in current liquidity leads to a 42 yen increase in investment. For these firms, however, we cannot determine precisely whether q is important. Note that the results are robust to the inclusion of end-of-period q, as a comparison of the last four columns of the table indicates.

These results are very striking. The marginal effect of liquidity on independent firms' investment is nearly ten times as large as the effect for affiliated firms' investment. As one might expect these differences are statistically significant.

The finding that liquidity is more important for independent firms than affiliated firms is robust to alternative specifications and
orthogonality assumptions. Table 3 shows that our basic findings are replicated i) when additional lags of liquidity are introduced, ii) when production is removed or additional lags of production are added, iii) when lags of both production and liquidity are added and iv) when instrumental variable estimation is used to control for the possible information content of liquidity.

Specifically, the first two columns show that the flavor of our results is preserved when we add three lags of liquidity. The sum of the estimated liquidity coefficients for the group firms is .139, which is significantly different from zero. Because the data are demeaned, this estimate implies that several successive years of above average cash-flow would lead to slightly higher investment.

As the table indicates, the effect of liquidity on investment is much stronger for the independent firms. The sum of the coefficients on liquidity .478; at the 5% significance level, we cannot reject the hypothesis that this is larger than the sum for groups firms. In the next section, we consider further whether accumulated liquidity holdings are an important determinant of investment.

The next two columns show that our basic claim is also true if the extra lags of liquidity are included and production is completely dropped from the specification. When production is dropped, however, the sum of the liquidity coefficients for independent firms is only twice that of the affiliated firms. The results in columns five and six indicate that our conclusion also goes through when additional lags of production are added to the standard specification. The seventh and eighth columns show that simultaneously including extra lags of both production and liquidity also makes no difference.
Table 3
Alternatives to Baseline Investment Regression
Affiliated and Independent Firms

<table>
<thead>
<tr>
<th></th>
<th>Group Firms</th>
<th>Indep. Firms</th>
<th>Group Firms</th>
<th>Indep. Firms</th>
<th>Group Firms</th>
<th>Indep. Firms</th>
<th>Group Firms</th>
<th>Indep. Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average q (Reg. of Period)</td>
<td>.0048 (.0032)</td>
<td>.0063 (.0046)</td>
<td>.0072 (.0033)</td>
<td>.0063 (.0046)</td>
<td>.0056 (.0031)</td>
<td>.0059 (.0046)</td>
<td>.0045 (.0032)</td>
<td>.0061 (.0046)</td>
</tr>
<tr>
<td>Average q (End of Period)</td>
<td>.0030 (.0030)</td>
<td>-.0066 (.0048)</td>
<td>.0020 (.0032)</td>
<td>-.0066 (.0047)</td>
<td>.0027 (.0030)</td>
<td>-.0068 (.0047)</td>
<td>.0030 (.0030)</td>
<td>-.0065 (.0008)</td>
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<tr>
<td>Liquidity (_t)</td>
<td>.046 (.032)</td>
<td>.460 (.090)</td>
<td>.073 (.034)</td>
<td>.463 (.088)</td>
<td>.044 (.031)</td>
<td>.438 (.088)</td>
<td>.046 (.032)</td>
<td>.456 (.090)</td>
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<td>K</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Liquidity (_t-1)</td>
<td>-.063 (.031)</td>
<td>-.147 (.109)</td>
<td>.141 (.032)</td>
<td>-.137 (.090)</td>
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<tr>
<td>K</td>
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<tr>
<td>Liquidity (_t-2)</td>
<td>.008 (.028)</td>
<td>.095 (.088)</td>
<td>.050 (.029)</td>
<td>.095 (.088)</td>
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<tr>
<td>K</td>
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<tr>
<td>Liquidity (_t-3)</td>
<td>.022 (.029)</td>
<td>.069 (.080)</td>
<td>.030 (.030)</td>
<td>.070 (.080)</td>
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<tr>
<td>K</td>
<td></td>
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<tr>
<td>Prod (_t-1)</td>
<td>.024 (.0025)</td>
<td>.002 (.0116)</td>
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<td></td>
<td>.029 (.0032)</td>
<td>-.0079 (.0096)</td>
<td>.028 (.0033)</td>
<td>.0026 (.0127)</td>
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<tr>
<td>K</td>
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<td>Prod (_t-2)</td>
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<td>-.0050 (.0036)</td>
<td>.0098 (.0092)</td>
<td>-.0055 (.0037)</td>
<td>.0090 (.0109)</td>
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<tr>
<td>Prod (_t-3)</td>
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<td>.0073 (.0066)</td>
<td>.0013 (.0031)</td>
<td>.0092 (.0084)</td>
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</table>

1 Dependent variable is 1/K. All variables are entered as deviations from firm specific means. The regressions all include a set of yearly dummy variables. The OLS estimates are for Fiscal Years 1977-82 and the I.V. estimates are for Fiscal Years 1978-82. Standard errors are reported below the coefficient estimates.
Finally, the last two columns of Table 3 report instrumental variable (IV) estimates. For these regressions, we condition only on predetermined variables, so we omit end-of-period q. The instruments include lags of all the variables in the model (I/K, q, Liquidity/K, and Production/K) as well as lags of other balance sheet variables that we suspect are correlated with liquidity—Sales/K, Operating-Income/K and holdings of Liquid Short-term Securities/K.

The IV estimates of the impact of liquidity on investment are similar, although much less precise than the OLS estimates reported in Table 2. The drop in precision is not surprising: transitory movements in cash-flow will be only weakly correlated with past data.

Overall, we conclude that the estimated difference between independent and affiliated firms is not due to the auxiliary assumptions implicit in our basic model.

We discuss alternative explanations of our results in Section 6, but one alternative is worth dismissing now. Some have argued that group membership is endogenous; the factors that lead firms to join groups might be correlated with the factors that reduce the sensitivity of investment to cash flow.

We find this claim unconvincing for two reasons. First, most firms have been affiliated with banks for more than 25 years. This means that group affiliation is essentially fixed and independent of short- and medium-term fluctuations in financing needs.

Second, suppose firms did join groups to get around capital-market imperfections. If this were true, group firms would be those for whom investment would otherwise be most sensitive to cash flow. This type of sample selection would make it very unlikely that group firms' investment
is unrelated to their cash flow. If anything, this endogeneity strengthens our results. Moreover, arguing that these regressions uncover the mechanism by which firms decide to affiliate implicitly concedes the point that capital-market imperfections are important.

5. More Evidence

In this section we extend our analysis in two ways. First, we consider the investment behavior of firms that do not fall neatly into one of the two categories considered above. Second, we explore the investment effects of the stock of liquid assets rather than just the flow.

A. Other Types of Firms

We can divide the 195 firms that we do not classify as independent or affiliated into three subcategories. Two of these subcategories include firms that are somewhere in between affiliated and independent. The theory predicts that liquidity matters more for these hybrid firms than for affiliated firms, but less than for independent firms. The data reflect this prediction. The third set are subsidiaries of group firms. We find, as one would expect, that for these firms investment does not depend much on cash flow.

The first sub-category is composed of 25 firms that have some connection with a major group, but may not have close financial ties with a bank. These firms are members of the groups' President's Council which meets monthly to discuss broad business concerns facing the group. Each of the six major keiretsu have some form of a President's Council. Membership is fairly prestigious and generally restricted to firms with active business ties to other members of the group.
There are several reasons why President’s-Council firms may not have met Nakatani’s criteria for group affiliation. First, the firm may have only recently joined the President’s Council or may have switched group affiliation. Alternatively, the firm may have been involved in some merger activity. Or, the firm may have a ceremonial appointment to the President’s Council, but may not have any active affiliation with the group. Finally, it may have weak affiliation with the group’s bank.

Depending on the reason for exclusion, we have different priors about whether these firms have ready access to funds from the group bank. Unfortunately, we do not know exactly why Nakatani excluded each firm. Nevertheless, it is fair to assume that in general these firms have weaker ties to the group bank. It is not clear, however, whether these firms also have weaker non-financial affiliations with other firms in the group.

The first two columns of Table 4 show that liquidity is a significant determinant of investment for these firms. The large standard errors of the estimated liquidity coefficients suggest that there is considerable heterogeneity among these firms. It seems likely that for some of these firms liquidity is irrelevant while for others liquidity is important. Given the various reasons why these firms were not classified as affiliated, it is not surprising that we estimate this coefficient imprecisely. Nevertheless, the results are consistent with the idea that liquidity is more important for firms with weaker bank ties.

The second sub-category is composed of 155 firms which are neither independent nor affiliated. Nakatani does not consider these firms to be strong group members, and none is a member of the President’s Council of
Table 4
Baseline Investment Regressions\(^1\)
Firms with Indeterminate Status

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td># of Firms</td>
<td>25</td>
<td>25</td>
<td>155</td>
<td>155</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Average q (Beg. of Period)</td>
<td>-0.0025 (0.0040)</td>
<td>-0.0062 (0.0051)</td>
<td>-0.0012 (0.0034)</td>
<td>-0.0016 (0.0034)</td>
<td>0.0198</td>
<td>0.0181</td>
</tr>
<tr>
<td>Average q (End of Period)</td>
<td>0.051 (0.0044)</td>
<td></td>
<td>0.0026 (0.0034)</td>
<td></td>
<td>0.0029</td>
<td>0.0089</td>
</tr>
<tr>
<td>Liquidity(_t) _K</td>
<td>0.391 (0.147)</td>
<td>0.393 (0.147)</td>
<td>0.290 (0.031)</td>
<td>0.289 (0.031)</td>
<td>-0.076</td>
<td>-0.076</td>
</tr>
<tr>
<td>Prod(_t-1) _K</td>
<td>0.032 (0.0074)</td>
<td>0.031 (0.0074)</td>
<td>0.022 (0.0037)</td>
<td>0.022 (0.0037)</td>
<td>0.023</td>
<td>0.024</td>
</tr>
</tbody>
</table>

\(^1\) Dependent variable is I/K. All variables are entered as deviations from firm specific means. The regressions all include a set of yearly dummy variables and cover Fiscal Years 1977-82. Standard errors are reported below the coefficient estimates.
the six major keiretsu; however, these firms are not sufficiently distanced from the six major groups to be called independent. It is also possible that some of these firms may be members of a minor industrial group.

The middle two columns of Table 4 show that their investment patterns reflect this hybrid status. Liquidity is quite important for these firms; the estimated coefficient on liquidity lies in between the estimates for the group firms and the completely independent firms. This finding suggests that the closer a firm moves to one of the major keiretsu banks, the more easily a firm can attract funds to finance investment projects.

The final sub-category is composed of the 15 firms that Nakatani classifies as subsidiaries of the group firms. The fifth column of Table 4 shows that liquidity is not a major determinant of investment for these firms. The coefficient on liquidity is borderline significant and negative while production and beginning-of-period q are quite important. The final column shows that adding end-of-period q to the regression does not change any of these conclusions. Since these firms, at least through their parent companies, have access to the group bank, it is reassuring to see that their investment is not particularly sensitive to their cash-flow.

B. Stock of Liquid Assets

We turn now to the question of whether other liquid assets besides our measure of liquidity determines the level of investment. Fazzari, Hubbard and Petersen [1988b] have shown that for non-dividend paying U.S. firms, both stock and flow measures of liquidity significantly influence investment.
As a proxy for the firms' stock of liquid assets, we use its short-term liquid security holdings. The vast majority of the firms in our sample hold these type of securities. They are a particularly appropriate proxy because firms explicitly designate these assets as ones they can readily convert into cash.  

We should point out that there is likely to be some spurious correlation between the stock of these cash-equivalents at the beginning of the year and investment over the course of the year; firms that plan to invest during the year are likely to move some of their assets into these liquid, interest-bearing securities in preparation for making the payments on their investment projects.  

Table 5 presents our results when we add these securities (normalized by the capital stock) to the basic regression. The first two columns show that the holdings of these cash equivalents are systematically related to investment for both the affiliated and independent firms. The effect is much stronger for the independent firms. The small significant effect for affiliated firms is consistent with the results in Table 3 when several lags of cash flow were included.

The third and fourth columns of the table show that when instruments are used to purge the regression of possible simultaneity bias, the results are consistent with our earlier findings. Both the flow and stock of liquidity are important for independent firms and insignificant for affiliated firms. Again the precision of the estimates deteriorates when instrumental variable estimation is used; this is not surprising given the nature of the data.

To summarize, the results from Tables 4 and 5 provide further evidence in favor of the type of asymmetric information and moral hazard
Table 5

Investment Regressions with Flows and Levels of Liquidity\(^1\)
Affiliated and Independent Firms

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>I.V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group Firms</td>
<td>Indep. Firms</td>
</tr>
<tr>
<td># of Firms</td>
<td>121</td>
<td>25</td>
</tr>
<tr>
<td>Average ( q ) (Beg. of Period)</td>
<td>0.0056 (.0031)</td>
<td>0.0068 (.0042)</td>
</tr>
<tr>
<td>Average ( q ) (End of Period)</td>
<td>0.0029 (.0030)</td>
<td>-0.0049 (.0044)</td>
</tr>
<tr>
<td>( \text{Liquidity}_{t} / K )</td>
<td>0.040 (.031)</td>
<td>0.461 (.080)</td>
</tr>
<tr>
<td>( \text{Prod}_{t-1} / K )</td>
<td>0.026 (.0024)</td>
<td>-0.014 (.0085)</td>
</tr>
<tr>
<td>( \text{Short Security}_{t-1} / K )</td>
<td>0.057 (.023)</td>
<td>0.447 (.084)</td>
</tr>
</tbody>
</table>

\(^1\) Dependent variable is \( I/K \). All variables are entered as deviations from firm specific means. The regressions all include a set of yearly dummy variables. The OLS estimates are for Fiscal Years 1977-82 and the I.V. estimates are for Fiscal Years 1978-82. Standard errors are reported below the coefficient estimates.
models that we set out to test. The evidence shows that both the stock and flow of liquidity are important determinants of investment for firms that we have a priori identified as most likely to face an imperfect capital market. We also find that the distance between a firm and major bank is systematically related to the sensitivity of investment to cash flow.

6. Distinguishing Among Competing Explanations

The evidence presented thus far demonstrates that the link between investment and cashflow is strong for unaffiliated firms and weak for affiliated firms. We have interpreted these results as evidence in favor of the view that bank affiliation reduces information and incentive problems. We begin this section by considering two competing explanations of our results that are not based on capital-market imperfections. We conclude the section by trying to distinguish between two information and incentive explanations of our results.

A. Industry Effects

A possible explanation of our results is that investment depends on cash flow in some industries, but not others. If there are systematic differences in the industries of independent and affiliated firms, our results simply reflect these industry differences. We find no evidence in support of this view.

Table 6 shows the breakdown of firms by broad industrial classification. Given the small number of independent firms, comparison on a finer industry level is not informative. The distribution of firms across industry groups is roughly similar for independent and affiliated
Table 6

Distribution of Independent and Affiliated Firms by Broad Industrial Group

<table>
<thead>
<tr>
<th>Industries</th>
<th>Number of Affiliated Firms (% of total affiliated firms)</th>
<th>Number of Independent Firms (% of total independent firms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food, Textiles, Pulp &amp; Paper, Clay, Glass &amp; Stone</td>
<td>25 (21%)</td>
<td>3 (12%)</td>
</tr>
<tr>
<td>Electric Machinery and Precision Machinery</td>
<td>26 (21%)</td>
<td>6 (24%)</td>
</tr>
<tr>
<td>Oil, Chemicals, Rubber, and Drugs</td>
<td>24 (20%)</td>
<td>7 (28%)</td>
</tr>
<tr>
<td>Steel and Non-Ferrous Metals</td>
<td>18 (15%)</td>
<td>3 (12%)</td>
</tr>
<tr>
<td>Autos and Transportation Durables</td>
<td>7 (6%)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Machines</td>
<td>16 (13%)</td>
<td>5 (20%)</td>
</tr>
<tr>
<td>Miscellaneous, and Ship Building</td>
<td>5 (9%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>All Industries</td>
<td>121</td>
<td>25</td>
</tr>
</tbody>
</table>
firms. Thus, it appears that our classification scheme for financial affiliation is not simultaneously separating out firms by industry.

Even with this aggregated industry classification, regression analysis will not be helpful because there are too few independent firms. However, if we pool independent firms and quasi-independent firms -- both of whom showed a strong sensitivity of investment to cash flow -- we can crudely gauge whether industry effects explain our results.

To conserve space, we briefly summarize our results. For affiliated firms, cash flow is insignificant in each of the six sets of industries. In four of the six categories, the coefficient is small and precisely estimated. The only large coefficient is for the transportation industries (autos and transportation durables), where there are only 7 firms. The sixth category, which includes electric and precision machinery, is the only case where cash-flow is close to being significant. Here the coefficient is moderately large (.187), but also imprecisely estimated (the standard error is .106). On balance, there is no evidence that pooling industries is responsible for our finding that cash-flow is only a minor determinant of affiliated firms' investment.

Analysis of the the pooled sample of independent and quasi-independent firms shows that pooling industries also does not account for our findings on independent firms; in each industry group, cash flow appears to be an important determinant of investment. For five of the six broad industry categories, cash-flow is significant at the five percent level. For the remaining category, which includes the Food, Textile, Pulp and Paper, and Clay, Glass and Stone industries, cash-flow is significant at the twenty-five percent level. The coefficients differ somewhat across the industries; however, given the different degrees of
affiliation in the pooled sample of independent and quasi-independent firms, it is not clear that this variation is meaningful. On the whole, separating firms by industry suggests that cash flow is important for independent and quasi-independent firms and that it is not important for affiliated firms.

B. Measurement Error

Another explanation of our findings is that the accounting measures of cash flow might be more polluted for affiliated firms than for independent firms. There are two reasons to believe this might be the case. First, affiliated firms' transactions with other group firms may not take place at market prices. Second, affiliated firms may try to shuffle income across firms to reduce tax liabilities or to smooth reported income. In either case, a standard error-in-variables argument could explain why the coefficient on cash flow is insignificant for group firms.

We find this class of explanations unconvincing for several reasons. First, the tax-reduction and income-smoothing explanation presumes a degree of strategic micro-management that is inconsistent with what we know about behavior within the group. There are undoubtedly enough product-market linkages among group firms to enable them to shuffle income. However, these firms are all publicly traded and independently managed. It is hard to believe that firms have an incentive to make themselves look bad to help other firms.

This explanation then depends on the existence of an institutional structure that would coordinate and enforce transfers among firms. Neither of the two obvious candidates, the President's Council nor the banks, appear to have undertaken this role. The President's Council
meeting is described as a loosely organized gathering which does not deal with these types of details. Moreover, banks do not seem to impose these restrictions on their customers. As one Sumitomo executive put it, "We are a big company now, and cannot be run even from the President's President's office. How possibly could the President's Council or some other Sumitomo grouping do it?"

In addition to the qualitative evidence against this explanation, we can quantify the extent of measurement-error bias and show that it is small. Using a technique that Griliches and Hausman [1986] have developed, we can construct a consistent estimate for the cash-flow coefficient in our basic model. This technique relies on the fact that the different transformations that eliminate firm-specific effects lead to different biases in the coefficient estimates when measurement error is present. By making an assumption on the form of the measurement error, and combining several estimates of the coefficient on the mis-measured variable, we can obtain a consistent estimate. Therefore, this procedure is valid even if we cannot explain the source of measurement error.

We find no evidence that cash flow is mismeasured for independent firms. For group firms, there may be measurement error. If we maintain that recorded cash flow is simply a noisy estimate of true cash flow, so that the measurement error is serially uncorrelated, then our estimate of the coefficient on cash flow rises from .049 to .093. Assuming instead that group members actively shuffle income, we would expect the transfers to boost bad years and depress good years. Measurement error would then be negatively correlated. In this case, the coefficient is smaller than .093; however, without knowing the size of the serial correlation
parameters, we cannot construct an estimate. In either case, the investment of independent firms is at least five times more sensitive to cash flow than the investment of affiliated firms.

C. Over-investment or Under-Investment?

Thus far we have not been specific about which type of information and incentive problems are responsible for capital-market imperfections. All of the theories imply that cash flow will be an important determinant of investment, but they may differ in whether there is too much or too little investment.

The predominant view is that information and incentive problems constrain investment. For example, this is implied by the models of Jensen and Meckling and Myers and Majluf discussed in the Introduction. In contrast, Jensen [1986] and others have argued that if managers have a preference for growth over profitability, they may invest free-cash flow in negative net present value projects. In this view, the correlation between cash flow and investment represents over-investment rather than under-investment. According to the theory, close bank affiliation mitigates this problem because the bank can monitor the firm and prevent it from investing in unprofitable projects.

While the empirical analysis presented above does not distinguish between these two views, for several reasons we believe that the over-investment explanation is not appropriate here. First, the data cover a period of healthy growth in the Japanese economy. It is difficult to believe that these firms had exhausted all their valuable investment projects. This is particularly implausible in high-growth industries like electric and precision machinery (computing, office automation, etc.) which have enjoyed tremendous success.
Second, over-investment is plausible in some industries but as a general phenomenon it is unlikely. McConnell and Muscarella [1985] have shown that, in the U.S., when a firm announces an investment project, share prices rise on average. This is true of all industries except oil, where Jensen and others have documented the tendency for companies to engage in excessive exploration. Thus the evidence suggests that, on the whole, the market thinks that the average investment project is valuable.

Finally, we are trying to distinguish empirically between the two views. The overinvestment view suggests that if there is an agent to monitor of the firm's investment activity, then the inefficiency can be reduced. There is nothing in this view that requires the monitor to be a bank or have a deep pocket. Indeed, the theory suggests that concentrated share ownership can also mitigate this incentive problem. Thus, we are investigating whether the sensitivity of investment to cash flow varies with the concentration of ownership. Preliminary results suggest that there is not much variation.

7. Concluding Remarks

In this paper we have presented evidence consistent with the view that information and incentive problems in the capital market affect corporate investment. This evidence comes from the fact that investment by firms with a close relationship to a bank -- those firms that we a priori believe can overcome these problems -- is much less sensitive to their liquidity than firms raising their capital mainly through arms-length market transactions.

These findings have at least two important implications. First, they suggest that the institutional arrangements in Japan may offer Japanese firms an important competitive advantage. While international
cost-of-capital comparisons are generally quite difficult to make, the evidence here documents that Japanese institutions may enable firms to mitigate capital-market imperfections. To the extent that the U.S. capital market has no analogous institutional arrangement, U.S. firms may be operating at a disadvantage. Further research on the investment behavior of firms in other countries with integrated banking systems (such as Germany) would be helpful in evaluating the importance of this effect.

Secondly, our results lend support to the view recently put forward by Greenwald, Stiglitz and Weiss [1984] and Bernanke and Gertler [1987] that capital-market imperfections contribute to excessive output fluctuations. In this view, high current profits increase current liquidity, thereby generating investment and increasing future output and profitability. Using similar reasoning, Bernanke [1983] has argued (and presented evidence) that the breakdown of the financial system was one of the important determinants of the depth and persistence of the Great Depression. Our evidence suggests that financial factors are also likely to be important in other macroeconomic episodes; since information problems are an inherent feature of all capital markets, shocks to the financial sector should routinely be transmitted to the real economy.

There are several ways in which we can build on our analysis. First, it would be interesting to know whether debt-holdings, equity-holdings, or the linkage of the two is crucial in reducing the sensitivity of investment to cash flow. Our classifications essentially identify firms with large debtholdings, although many of the banks that lend money to a firm will also have an equity stake. The data on shareholdings is available from Keiretsu no Kenkyu, so the analysis is straightforward.
Second, it would be worthwhile to investigate whether the identity of large shareholders matters for the investment equations we estimate. Does concentrated bank ownership have different implications for investment than concentrated individual shareholdings? Moreover, how does share ownership by the board of directors and top management affect investment?

Finally, some recent changes in Japanese corporate finance are worth exploring. The links between banks and affiliated firms have been gradually weakening. Japanese firms now borrow substantially more from corporate bond markets and less from the banks. From 1975 to 1987, bank borrowing by large manufacturing firms dropped from 44.7% of all funding to 16.6%, and bond and equity financing rose from 17.3% to 39.6%.

The increase in direct financing reflects a boom in the use of foreign bond markets: between 1977 and 1984, this market increased eightfold. This was brought about by a relaxation in regulations on foreign bond issues that enabled firms to issue bonds denominated in foreign currency without the Japanese government's permission.

It is possible that this shift is also due to fundamental changes in the financing needs of Japanese corporations. The post-war era, particularly through the early 1970s, was one of extraordinary expansion. The opportunities for rapid expansion have slowed down considerably. And, the need for external financing has also gone down as Japanese companies reap the rewards of their earlier investments. Given the reduction in investment opportunities, increases in cash flow, and greater access to international capital markets, Japanese managers do not seem to rely on the banks as much. Whether these financing shifts spill over into investment behavior remains to be seen.
Endnotes

1. See Goto [1982] for a description and analysis of the coordination role of the industrial groups.

2. These statistics come from the American Banker's 1988 survey, The Top 500 Banks in the World. For perspective, Citibank, the largest U.S. bank, is 22nd in the world and less than half the size of the top four banks.

3. Banks are prohibited from owning more than 5% of a company's equity. This is in contrast to the U.S. where the Glass-Steagall Act prohibits equity ownership by banks.

4. In this regard, the capital structures of these Japanese firms resemble many U.S. firms that have undergone leveraged buyouts. Many of these firms are "strip-financed": like Japanese banks, investors hold both the firm's debt and its equity.

5. These basic selection rules leave us with a sample of 353 firms. We drop 12 more firms for which the absolute value of q exceeded 50 in any accounting year.

6. It is not clear if dividends are discretionary and whether they belong in a measure of liquidity; however, when we estimate our model including dividends, our results do not change. This is not surprising given that the low payout rates in Japan.

7. If a firm has market power, it knows that if it invests and produces more output it will depress price in the future. The size of this effect depends on both future and current levels of output as well as the elasticity of demand.
8. Specifically, the instruments are three lags each of Liquidity/K, Sales/K, Production/K, Operating Income/K, two lags of Beginning of Period Short-term Securities/K and one lag of \( q \) and I/K. Using the lag of \( q \) forces us to drop one year in the estimation, but noticeably improves the estimates. Given that \( q \) is explicitly forward looking it is not surprising that it is a good instrument.

9. One of the Japanese institutional arrangements that comes with the tight banking relationships is that many firms have short-term assets which are held on deposit at their bank, but are not readily convertible into cash. Therefore finding cash equivalent assets is not straightforward.

10. The instruments used here are essentially the same as used in the IV estimation shown in Table 3. The one difference is that lagged I/K is not included here. For the exact list see footnote 8.

11. This quote comes from Gerlach, p. 70.

12. These statistics come from Corporate Statistics Quarterly.

13. This statistic comes from Securities Markets in Japan.
References


American Banker [1988], *The Top 500 Banks in the World*.


Hoshi, Takeo and A. Kashyap [1987], "Evidence on q for Japanese Firms," unprocessed MIT mimeo.


Keiretsu no Kenkyu (Research on Industrial Groups). Tokyo: Keizai Chosa Kyokai (annual publication).


*Securities Markets in Japan*, Japan Securities Research Institute.
