

**Internal Capital Markets and Investment Efficiency:
Evidence from Japanese Industrial Groups***

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Abstract

Using a sample of 12,136 firm-years between 1993 and 1998, I examine the investment policies of firms in Japanese industrial groups. My findings indicate that internal capital markets among keiretsu firms are active. Investment at the firm level is positively correlated with cash flows from the remainder of the keiretsu. Furthermore, firms in industrial groups tend to invest more than predicted if their growth opportunities are below-average and invest less than predicted if their growth opportunities are above-average. These findings suggest that the reallocation of capital within keiretsu firms is inefficient.

1. Introduction

Prior studies on internal capital markets in U.S. conglomerates have yielded three broad conclusions. First, internal capital markets appear active in allocating resources across business units. Second, this allocation seems inefficient in that capital is not always allocated to the business units with the most profitable investment opportunities. Third, this misallocation in capital is associated with firm value. Diversified firms invest differently than single segment firms and trade at a discount relative to single segment firms. Moreover, the discount is associated with the extent of misallocation.¹

It has been argued that external capital markets do not fund all available value-increasing projects due to agency costs and information asymmetries.² Under such conditions, internally generated capital is less costly than external sources of funds. Internal capital markets can potentially improve investment efficiency by decreasing information asymmetry and agency costs through allocation by a headquarters that may be more effective than monitoring by external suppliers of capital. However, the current research suggests that instead of improving a firm's investment policies, internal capital markets have actually made conglomerates' investment less efficient relative to single segment firms, on average.

This paper builds upon the previous literature by studying internal capital markets within Japanese industrial groups. Japanese industrial groups, called keiretsu, have interlocking share ownership and are hypothesized to function similarly to conglomerates. Japanese industrial groups come in two forms. Horizontal keiretsus operate in a diverse range of industries and are

¹ See Berger and Ofek (1995), Lamont (1997), Lang and Stulz (1994), Rajan, Servaes and Zingales (2000), Scharfstein (1998) and Shin and Stulz (1998). Other research that disputes these results include: Campa and Kedia (1999), Chevalier (2000), and Graham, Lemmon and Wolf (1999).

² For example: Jensen, (1986), Jensen and Meckling, (1976), and Myers and Majluf, (1984).

centered on a main bank. There are eight horizontal keiretsus that have an average of 86 firms each during the sample period. The vertical keiretsus are more focused along a value chain within an industry and are typically centered on a major industrial firm(s) rather than a bank. The number of identified vertical keiretsus varies somewhat over the sample period. As of 1998, there were 35 vertical keiretsus identified that had an average of seven firms each.

Industrial groups expand our understanding of internal capital markets in two important ways. First, the corporate governance structure of an industrial group utilizes both internal monitoring of the industrial group similarly to conglomerates, but also may benefit from monitoring from the external market. A presumption of theoretical models that predict inefficient allocation of capital in internal capital markets is that the external market is unable to contract directly with a segment within a conglomerate. While this assumption seems logical for segments within conglomerates, it would seem that direct contracting and monitoring from the external market could exist for firms in industrial groups. The presence of external monitoring alters the predictions of theoretical models, such as Rajan, Servaes and Zingales (2000) and Scharfstein and Stein (2000) that predict inefficient allocation of capital in conglomerates. Secondly, Chevalier (2000) argues that tests that provide evidence of active internal capital markets in conglomerates are incorrectly specified since these studies have to rely on industry proxies for a division's growth opportunities. This problem is mitigated by looking at industrial groups since, arguably more accurate proxies for growth opportunities are available for each member of the internal capital market because each member has a market price associated with it.

Using a sample of 12,136 firm-years between 1993 and 1998, I examine the investment policies of firms in Japanese industrial groups. I find evidence that both vertical and horizontal

industrial groups have active internal capital markets. Specifically, investment for firms in both horizontal and vertical groups is positively related to the cash flow of the other firms in their respective keiretsus. This result is similar to Shin and Stulz's (1998) evidence of active internal capital markets in U.S. conglomerates.

In addition, I document several other pieces of evidence that collectively suggest that the investment policies of keiretsu firms are inefficient. First, investment is less sensitive to a proxy for growth opportunities and more sensitive to operating cash flow than is the investment of independent firms. Second, using a measure of investment efficiency similar to Rajan et al. (2000), I find that investment of horizontal group members is less efficient than that of their independent firm peers. Third, this measure of efficiency is positively related to the excess value of industrial groups. This evidence suggests that greater visibility to the external market does not improve the performance of internal capital markets in Japanese industrial groups, relative to previous evidence of internal capital markets with lower segment level visibility to the external market. Moreover, this evidence is robust to previously documented specification issues for growth opportunities.

The remainder of this paper is organized as follows. Section 2 discusses the existing theoretical and empirical evidence on internal capital markets. Section 3 discusses the keiretsu and their internal capital markets. Section 4 describes the sample and reports descriptive statistics. Section 5 reports the multivariate results. Section 6 concludes.

2. Internal Capital Markets: Theory and Evidence

2.1 Theory

Jensen and Meckling (1976), Myers and Majluf (1984), and Jensen (1986) provide the theoretical foundation for how an internal capital market can improve a firm's investment policy. Jensen and Meckling (1976) argue that management will not necessarily act in the shareholders' best interest, but will maximize their own utility. The presence of free cash flow exacerbates this problem because; the manager's utility may be increased by having control of a larger firm (Jensen, 1986).

Myers and Majluf (1984) show that information asymmetry can lead to sub-optimal investment policy. Under some conditions, managers will forego a positive net present value project since some of the value of the firm's assets in place will transfer to the new security holders. This can make the existing shareholders worse off for undertaking a value-creating project. A firm can mitigate this problem by having financial "slack". Firms that have capital available to invest in positive net present value projects as they arise can lessen the underinvestment problem. Unfortunately, as Jensen (1986) observes, financial slack can also be used for negative net present value projects as well.

The external market requires a higher return than the internal capital market due to the combination of the agency problem, which can lead managers to desire to undertake negative net present value projects and the presence of an information asymmetry that exists between managers and the suppliers of capital. This way the external market will be fairly compensated in aggregate. The more costly external capital can lead to capital constraints and underinvestment for the firm.

Subsequent theoretical models demonstrate that utilizing an internal capital market can mitigate the costs associated with these capital market imperfections. Stein (1997) creates a model that shows that an internal capital market can increase value through “winner picking,” by shifting investment capital among the firm’s projects. Having projects with unrelated cash flows enhances the firm’s ability to winner pick. Stein’s model shows that this value increase associated with having a diversity of projects with unrelated cash flows is offset by the firm’s increasing inability to accurately predict the outcome of these projects as the diversity increases. The increasing inability to predict cash flows can lead to inefficient allocation of resources. These offsetting factors lead to an optimal level of diversification, maximizing the value of an internal capital market.

Scharfstein and Stein (2000) and Rajan, Servaes and Zingales (2000) develop agency theories for why internal capital markets can distribute capital in a less efficient manner than external capital markets. Both models show that under some conditions, corporate headquarters will transfer investment capital from stronger to weaker business units. Rajan, Servaes and Zingales predict investment capital flows from high opportunity, asset weighted segments to low opportunity, asset weighted segments. Scharfstein and Stein predict that investment capital flows from high opportunity to low opportunity segments. Both theories argue that diversification leads to lower values for most conglomerates relative to a set of pure play firms.

Stein (1997) like Rajan, Servaes and Zingales (2000) has an optimal point of diversification to maximize value. Both of these models show that conglomerates can have investment policies that are more efficient than those of single segment firms. However, these models along with Scharfstein and Stein (2000), show that agency effects and information asymmetries at the division level can lead to less efficient investment than single segment firms.

2.2 Empirical Evidence

Lamont (1997) provides evidence that investment in the non-oil divisions of oil conglomerates is related to the cash flow of the oil division. Shin and Stulz (1998) expand on this result by showing that internal capital markets in conglomerates appear to be active and distribute capital in a manner such that divisions with better investment opportunities do not have priority for investment capital. Berger and Ofek (1995) show that U.S. conglomerates trade at a discount relative to a collection of similar single segment firms.³ They present evidence that less efficient investment policies of conglomerates, relative to single segment firms, explain this result.

Scharfstein (1998) and Rajan, Servaes and Zingales (2000) provide empirical evidence in support of their respective models that both predict a decrease in value for most diversified firms due to an allocation of investment capital that is less efficient than for single segment firms. Rajan, Servaes and Zingales further show that this investment capital transfer among divisions is directly related to a diversification discount. This evidence collectively suggests that the internal capital markets of U.S. conglomerates allocate capital less efficiently than the external capital market does for single segment firms.

Chevalier (2000) shows that the observed evidence of active internal capital markets and cross-subsidization may be due to incorrectly specified tests. Chevalier shows that firms exhibit the same characteristics of active internal capital markets and cross-subsidization before a merger occurs. Since these results hold before an internal capital market can exist between the

³ The fact that diversified firms trade at a discount is debated. Graham, Lemmon and Wolf (1999) and Campa and Kedia (1999) both argue that the diversification discount is much smaller than Berger and Ofek's (1995) results or possibly does not exist at all.

business units, she argues that the tests showing active internal capital markets in conglomerates and cross-subsidization appear to be incorrectly specified.

Chevalier argues that using a median industry estimate of Tobin's Q as a proxy for a firm's growth opportunities does not properly control for growth opportunities. Pre-merger firms have the same evidence of valuation discounts and cross-subsidization when industry estimates of Tobin's Q, are used. When firm level estimates of Tobin's Q are used the results of active internal capital markets and cross-subsidization disappear in these pre-merger firms implying that the results for active internal capital markets and cross-subsidization might also disappear if a better division level estimate of Q is used. Unfortunately, industry proxies are all that is available to estimate growth opportunities by using a market-based measure since divisions in conglomerates are not separately traded.⁴ This issue can be avoided in this study, since each member of an internal capital market in an industrial group is a separate firm, and thus, has a market value.

3. Internal Capital Markets in Keiretsus

3.1 Structure of the Keiretsu

Japanese industrial groups come in two forms. Most often when the keiretsu is referred to in English it is the "yoko" (horizontal) form being discussed. Keiretsus also come in a "tate" (vertical) form. Horizontal keiretsus operate in a diverse range of industries and are centered on a main bank. There are eight horizontal keiretsus that have an average of 86 firms each during the sample period.

⁴ With the notable exception of tracking stock.

An example of a horizontal group is the Dai-Ichi Kangyo (DKB) group. This group is centered on Dai-Ichi Kangyo bank and the Itochu Corporation trading company. The industrial group includes insurance companies such as Fukoku Mutual Life Insurance and Nissan Fire and Marine Insurance. DKB also has major manufacturers including Isuzu Motors and Kobe Steel. DKB has chemical firms (Shiseido Co), paper manufacturing (Honshu Paper), oil (Showa Shell Sekiyu) and well as many other firms in a diverse range of businesses such as the Tokyo Dome and Yaskawa Electric. The final tally for the DKB group includes 98 publicly listed firms in 1998.

Cross equity holdings are extensive among members of an industrial group. The Japanese Fair Trade Commission puts the range of group ownership in an average firm between 19% and 45% for the largest 6 keiretsu in 1989. This level of equity held among group members not only demonstrates financial interdependence within an industrial group, but it also shows that the group has collective control of each firm as these are large, widely traded companies. The possibility of an outsider successfully undertaking a hostile takeover is unlikely. Takeover activity is generally limited to agreed upon mergers with the approval of the group (Kester, 1991).

Vertical keiretsus are more focused along a value chain of an industry and are typically centered on a major industrial firm or firms rather than a bank. The number of identified vertical keiretsus varies somewhat over the sample period. As of 1998, there were 35 vertical keiretsus identified that had an average of 7 firms each. An example of a vertical group is the Toyota group. The Toyota group is centered on 3 automakers: Toyota Motor, Daihatsu Motor and Hino Motors. The other group members generally consist of what in the United States are referred to as tier 1 vendors to the automakers. Examples of these are Kanto Auto Works (assembly),

Futaba Industrial (mufflers), Aichi Steel Works and Toyoda Machine Works (power steering). Vertical groups also hold substantial cross equity holdings similar to horizontal groups. The depth of financial interdependence in vertical groups is similar to that of horizontal groups.

3.2 Possible Effects on Capital Allocation

The Japanese keiretsu have important differences with U.S. conglomerates regarding their ability to dictate investment policy. Foremost, the Japanese keiretsu does not have an official headquarters that can allocate capital in the manner that a headquarters is able to in a conglomerate. Once a decision is made regarding capital allocation, a conglomerate can simply allocate resources in the form of budgets to division managers. In industrial groups, it is less clear who makes the resource allocation decision and how the decision is carried out once the decision has been made.

While the horizontal groups do not have a chief executive officer, they do have the shachokai (president's assembly) that is comprised of representatives from the major firms in the keiretsu. These presidential councils of the keiretsus meet regularly, but the meetings are shrouded in secrecy. Some groups do not even allow the members of the presidential council to take notes to prevent any unauthorized written record of the meeting to exist (Miyashita and Russell, 1994). Official statements on what is discussed at the Presidential council meetings cite everything from the state of the economy to Japanese cultural events to golf. Supposedly, operational strategies are not discussed so as not to violate the Anti-Monopoly Law. These explanations are considered by most to be absurd since Japanese executives hold great contempt for the Anti-Monopoly Law and for the Fair Trade Commission that enforces the law. The Sanwa group gathers the presidents of 44 companies together every month. It seems improbable

that so many leaders of industry always arrange to be available to attend the meetings of the shacho-kai to discuss golf (Miyashita and Russell, 1994).

Aoki (1988) discusses the ability of the presidential councils to settle disputes between member firms, coordinate rescue operations for a financially distressed member firm, or explore projects that are beyond the scope or abilities of any single member firm. This description of these meetings implies that there is some group coordination of investment policy. Other writers such as Berglof and Perotti (1994) and Kester (1991) have also discussed bailouts of financially troubled firms, which provide examples of active internal capital markets at work within keiretsus.

Kester (1991) describes the bailout of Akai Electric who is a member of the Mitsubishi group. The Mitsubishi group was able to provide Akai with a combination of debt and equity capital to aid the financially distressed company. Mitsubishi Bank quadrupled its loans to the Akai Electric while Mitsubishi Electric increased its equity stake from 2.5% to 7.7%. Additionally, Mitsubishi group also integrated some of Akai's marketing arms and shared some production efforts with Mitsubishi Electric's. The speed of the rescue effort avoided any widespread panic among other lenders. None of the other 11 financial institutions that held debt contracts with Akai withdrew lines of credit. While this example is of an internal capital market infusing capital in a financially distressed firm, the coordination discussed above could also be used for other investment priorities as determined by the industrial group. Vertical groups do not have a president's council. The coordination among vertical group members is less formalized and more focused on product contracts that include the heavy use of trade credit.

The extent of financial interdependence between members of the keiretsu allows for multiple ways to transfer investment capital among member firms, through the coordinated efforts of

group members. Berglof and Perotti (1994) discuss the depth of financial interaction within industrial groups that goes beyond the cross-shareholdings. Trade credit and other debt contracts also heavily contribute to the cross financing of member firms. In 1991, within horizontal groups, the median firm received 31% of its total borrowing from financial institutions in its industrial group. Furthermore, intra-group trade credit is heavily used. From 1970-1985 18% of gross financing of non-financial Japanese firms is from trade credit compared to 8.4% for U.S. firms. Although this statistic covers independent and group firms, the depth of product relationships within industrial groups suggests that the heavy use of trade credit is a feature of the keiretsu.

Gilson and Roe (1993) describe how incentives in the keiretsu organization can create a more efficient coordinated investment policy relative to independent firms. They hypothesize that the cross-ownership within the keiretsu reduces the probability of any single firm engaging in opportunistic behavior, but rather will engage in a mutually beneficial manner. This alignment of incentives due to cross holdings of securities makes the incentives for each firm analogous to divisions in conglomerates that collectively share the liability of the conglomerate's outstanding securities. However, the overall ownership between any two firms in the keiretsu does tend to be small, so it would seem that there is still incentive for some firms to engage in opportunistic behavior.

There is no legal mechanism of enforcement for the decisions made by the presidential council or other group decisions made. However, there are not only voting rights and shared board members associated with cross shareholding, but there also is a moral obligation to abide by the decisions made by the president's council. Berglof and Perotti (1994) argue that the enforcement mechanism lies in the group's collective ability to remove poorly performing

managers. They claim that since Japanese managers tend to stay with their company for their entire careers, building up firm specific skills, the threat of removal is both credible and effective.

Conversely, the new theories predicting inefficient allocation (such as Rajan, Servaes and Zingales 2000; and Scharfstein and Stein, 2000) of resources in conglomerates may hold in the case of industrial groups or even be exacerbated by the industrial group structure.⁵ These theories specifically discuss internal capital markets in the context of conglomerates, however it seems plausible that their respective arguments could apply to industrial groups despite the lack of an official headquarters that allocates resources. Rajan, Servaes and Zingales' model has the headquarters with limited ability to reallocate capital among divisions. The headquarters has to provide incentives to the division heads to reallocate capital in a mutually beneficial manner. This seems most analogous to the case of the keiretsu. It may follow that industrial groups face the same agency and information asymmetry problems that can lead to a misallocation of resources that Rajan, Servaes and Zingales predict.

3.3 Internal Capital Markets in the Presence of External Market Monitoring

Do the incentives associated with the external market improve the effectiveness of internal capital markets? Kester (1991) states:

“In a sense, the Japanese corporate governance system can be viewed to secure the best of two worlds. By tying themselves to one another in groups, yet eschewing outright ownership and control, Japanese corporations have been able to exploit some of the high-powered incentives of the market that derive from independent ownership of assets, while

⁵ See Aoki (1988) for a more detailed discussion for how an industrial group may be even more prone to agency problems than non-group firms.

relying on selective intervention by key equity owners to adapt contracts to new circumstances as needed.”

The additional monitoring from the external market for firms in industrial groups does not seem to alter the predictions of models that predict increased investment efficiency of the conglomerate form. For example, Stein (1997) predicts that investment efficiency can increase by reducing information asymmetry through more effective monitoring by the headquarters relative to the external market’s ability to monitor if the division is a single segment firm. Thus, further visibility of the division manager’s actions to the firm’s external equity-holders should not influence the investment behavior of the firm since the model assumes that the headquarters already monitors more effectively and thus additional monitoring by the external market is superfluous in this setting.

The effect of monitoring from the external market does appear to alter the predictions of models that predict dysfunctional tendencies in conglomerates’ resource allocation. Scharfstein and Stein (2000) and Rajan, Servaes and Zingales (2000) both assume that the external market is unable to contract with divisional managers. The external market is unable to dictate the allocation of capital to specific projects or divisions within a conglomerate and is also unable to engage in ex-post contracting with divisional managers. Since, the external market is unable to directly contract with division managers, two layers of agents are required; a CEO that contracts directly with the security holders and division managers that contract with the CEO. It is in the second layer of agent to principal contracting, from CEO to division manager, where the lack of external market driven incentives for division managers can create a less efficient allocation of capital in conglomerates than in a comparable set of single-segment firms.

This assumption in Scharfstein and Stein (2000) and Rajan, Servaes and Zingales (2000) seems realistic for conglomerates, since a court would have a difficult time enforcing such contracts. It is not clear whether these assumptions hold for internal capital markets in industrial groups. While it is possible to contract with external suppliers of capital for its use and have market based incentive contracts with the CEOs of group firms, it is not obvious whether the high-powered market incentives that Kester speaks of actually do indeed exist for CEOs of group firms.

Group firms tend to rely heavily on debt contracts and equity investments from within groups for funding. Moreover, the lack of an active takeover market in Japan provides further evidence of the lack of discipline exerted by the external market. Ex-post contracting compensation based on the firm's equity performance is certainly available but it is debated whether the external market provides further value-increasing governance beyond the group's internal governance.⁶ Thus, the interpretation of this paper is clouded by the question of either; does external market monitoring and greater visibility improve the effectiveness of an internal capital market; or, does the external market provide any monitoring to the firms at all? This paper does not try to untangle whether the findings presented here reflect the existence (or lack of) external market monitoring or the relative effectiveness of external market monitoring. This paper does provide evidence about the effectiveness of the overall governance structure of group firms as it relates to capital allocation.

⁶ Dewenter, Novaes and Pettway (2001), Dewenter and Warther (1998), Ferris, Kumar and Sarin (1995), Kang and Shivdasani (1995, 1997), Kang, Shivdasani and Yamada (2000) and Kaplan and Minton (1994) all study aspects of the differences in governance between firms in the keiretsu and independent Japanese firms. The cumulative evidence does not clearly support or reject whether the external market provides effective monitoring for keiretsu firms beyond the group's internal monitoring.

3.4 Prior Evidence

There is evidence that the industrial group structure does utilize active internal capital markets. Shin and Park (1999) demonstrate that for industrial group members in Korea, investment is influenced by cash flows of other firms in their respective industrial group. Their cumulative evidence is inconsistent with improved investment efficiency. Perotti and Gelfer (1999) show that bank-led Russian industrial groups, which are structured in a manner similar to that of the horizontal Japanese groups studied here, extensively reallocate capital within their industrial group. They do not conclude whether the reallocation improves investment efficiency or whether some member firms are simply expropriating wealth from other members within the industrial group.

Current evidence is mixed as to whether there is a discount in firm value associated with firms in Japanese industrial groups. Lins and Servaes (1999) study whether there is a diversification discount for conglomerates in Japan. They find that the diversification discount only occurs in Japan for conglomerates that are members of a keiretsu. It is unknown whether there is a discount for single segment firms that are members of a keiretsu relative to independent single segment firms.

Hoshi, Kashyap and Scharfstein (1991) show that keiretsu firms appear to have lower capital constraints than independent Japanese firms. They argue that this is value increasing and not evidence of over-investment. Dewenter and Warther (1998) offer evidence that the stock price reaction to dividend announcements is lower for keiretsu firms. They argue that this is due to lower information asymmetries and reduced agency costs for keiretsu firms. This evidence suggests that keiretsu firms employ a more efficient investment policy for keiretsu firms as

agency costs and information asymmetries are the theoretical cause for sub-optimal investing policies.

Ferris, Kumar and Sarin (1995) also present evidence that agency problems are less pervasive in keiretsu firms than in independent firms. They show that analyst following, for group firms, is not related to proxies for potential agency conflict. Conversely, the proxies for potential agency conflict are significant in explaining analyst following for independent firms. They argue that this is evidence that the keiretsu provides a substitute governance structure, which lessens agency costs.

Does the industrial group structure allow some member firms to expropriate wealth from other member firms rather than allocating capital to its highest marginal use? There is some evidence of wealth expropriation between member firms within a keiretsu. This research has focused on the role of banks in the industrial group. Morck, Nakamura and Shividasani's (2001) evidence demonstrates that the influence of bank ownership on firm value changes at different levels of bank ownership. Their evidence shows that firm value increases at high levels of bank ownership. However, their evidence also shows that banks may extract rents through higher interest payments from the firm at lower levels of ownership, decreasing the value of the firm.⁷ Weinstein and Yafeh (1998) also find evidence of rent extraction by bank owners. Since banks act as the core of the eight horizontal keiretsus, evidence of rent expropriation from banks provides indirect evidence that capital is not being allocated to its highest marginal return within the keiretsu.

Kang and Stulz (2000) provide evidence that firms that are more closely associated with banks lost value during the early 1990s. This period was characterized by asset price deflation in

⁷ See Rajan (1992) for a discussion of holdup problems where banks are able to extract wealth from their clients.

Japan. They argue that the close relationship with struggling banks created a negative collateral effect for these firms. This suggests that horizontal group firms rely on capital generated within the keiretsu and face a capital constraint when the group member banks are in financial distress. Gibson's (1995) evidence is consistent with Kang and Stulz's results. Gibson shows that investment by firms with close relationship with a bank is positively related to the health of the bank.

Conversely, Claessens, Djankov, Fan and Lang (1998) examine ownership structures in Asia and find that in aggregate, ownership by banks increases value for a Japanese firm while ownership by corporations decreases value. Kang, Shivdasani and Yamada (2000) present an event study that shows positive abnormal returns for bidders in takeovers in Japan. The abnormal return is positively related to the strength of the acquirer's relationship with a main bank. They interpret this as evidence that there is value associated with a close relationship with a bank, and they argue that this relationship enhances investment efficiency.

The evidence regarding the wealth implications of membership with an industrial group is mixed and it is not clear to what extent internal capital markets are influencing these results. There are credible arguments for why internal capital markets in industrial groups might either increase or decrease the efficiency of capital allocation. Ultimately, this is an empirical question that this study will address.

4. Sample

4.1 Description of the sample

The sample is comprised of all Japanese firms from 1993-1998 that are listed on Worldscope and have all the necessary data. All financial data used in this study comes from Worldscope.

Each data point is required to have two consecutive years of data to fulfill the requirement for one year of lagged data. For example, in 1996 Worldscope has financial data on 2,301 Japanese firms. Of these, 103 firms are eliminated due to missing data leaving 2,198 sample firms for 1996. Most of the 103 firms did not have 1995 data available and thus were eliminated from the sample.

The sample firms are categorized as to their membership in industrial groups or listed as independent. Membership in an industrial group is not always obvious to outside observers. Group membership is based on networks of ownership, banking relationships, shared board members and product relationships. Dodwell Consulting's biannual listing of the membership of all Japanese industrial groups provides this data.⁸ Some firms have dual membership. For example, in 1996 there are 757 firm listings in the 8 horizontal groups and 285 firm listings in 35 vertical groups. There are 1,250 independent firms listed in 1996. Ninety-one horizontal group members are also members of vertical groups and one horizontal firm is also a member of two separate vertical groups. Two horizontal group members are members of two separate horizontal groups. Each firm that has dual membership has a separate data point for each membership. This creates a final sample of 2,292 firms.

The tests reported include all available datapoints; thus some firms have multiple datapoints for the same year reflecting dual membership in industrial groups. Dodwell Consulting's listing does include a measure for how deeply entrenched the firm is within each industrial group. Each firm with dual membership in keiretsus has been identified as to which keiretsu is their primary membership based on the measure of entrenchment. Virtually, all significant results hold when

⁸ The current data does not reflect Dodwell Consulting's latest publication, which is most appropriate for the 1997 and 1998 data. Currently, an older version is used for the 1997-8 data. Keiretsu membership tends to be stable so this is not expected to influence results reported in this version.

the secondary memberships are excluded from the analysis. Those results that change are discussed in the paper. The full results have not been reported in the paper in the interest of brevity.

4.2 Descriptive Statistics

Table 1 lists the descriptive statistics for the variables that will be used later in the paper. Over the sample period, members of vertical keiretsus tend to have higher market-to-book ratios than both members of horizontal groups and independent firms. Horizontal and vertical group members tend to be in industries with higher median market-to-book ratios.

Total asset growth is used as a proxy for investment rather than capital expenditures. This is done for two reasons. First, using asset growth captures all investment activities of the firm whether they are expansion into new lines of business, expansion of the current lines of business, or the purchase of an existing business. Secondly, Worldscope is missing data on capital expenditures for 7,311 of the 12,136 firm years in the sample. This limited sample of firms that have capital expenditures data could introduce a bias to the sample. Firms that have capital expenditure data are smaller, have higher market-to-book ratios, and have higher cash flow-to-asset levels than firms that do not have capital expenditure data.

Horizontal group members are significantly larger than both independent firms and members of vertical groups. Vertical group members have a significantly higher level of operating cash flow relative to their asset base than both independent firms and horizontal group members. Independent firms and horizontal group members have similar levels of operating performance.

In horizontal groups, higher cash flow to total asset firms tend to be smaller, while in vertical groups higher cash flow-to-total asset firms tend to be larger. This is shown, by examining the

other cash flow variable. The data point for each firm is an aggregation of the cash flows and assets for all other firms in the keiretsu. Thus, the cash flow-to-asset ratios of large firms will dominate the cash flow to asset ratios of small firms. The other cash flow variable demonstrates that vertical groups have higher aggregate levels of cash flows relative to their aggregate asset base relative to horizontal groups. Similarly, the other market-to-book ratio shows that in horizontal groups, the higher market-to-book firms tend to be smaller. In vertical groups the higher market-to-book firms tend to be larger.

5. Empirical Tests

5.1 *Are the internal capital markets of the keiretsu active?*

Table 2 explores whether the internal capital markets of Japanese industrial groups are active. The tests investigate whether influences from the rest of the keiretsu influences investment. Specifically, does available capital and growth opportunities of other firms in an industrial group influence investment behavior? The methodology employed here is similar to Shin and Stulz (1998). The dependent variable for all models in table 2 is asset growth from year -1 to 0, which is used to measure firm investment. Each regression includes variables for firm cash flow, firm growth opportunities and firm level fixed effects.

$$\% \Delta \text{Assets} = \beta_0 + \beta_1(\text{OWN EBIT/TA}) + \beta_2(\text{Median Market/Book for Industry}) + \beta_3(\text{Other EBIT/TA}) + \beta_4(\text{Other Market/Book}) + \beta_5(\text{Size}) + \beta_{6...n}(\text{firm fixed effects})$$

where:

$$\% \Delta \text{Assets} = (\text{Total book assets, year 0} - \text{Total book assets, year -1}) / (\text{Total book assets, year -1})$$

$$\text{OWN EBIT/TA} = (\text{EBIT}) / \text{Total book Assets in t-1.}$$

Median Market/Book for Industry = Median M/B for most specific SIC designation with at least 5 firms. Else, 2-digit SIC is used; where, $M/B = (\text{Mkt. Value of equity} + \text{Bk. of debt}) / \text{Bk. Value of Assets}$.

Other EBIT/TA = EBIT of all other firms in the same group/ total assets of all other firms in the same group in t-1.

Other Market/Book = (Mkt. Value of equity of all other firms in the same group + Bk. of debt of all other firms in the same group)/ Bk. Value of assets of all other firms in the same group.

Size = $\text{Ln}(\text{total book assets in t-1})$.

Median market-to-book for the industry and firm size are used to control for the influence of each firm's growth opportunities.⁹ Market-to-book for the firm, is often used in the literature as a proxy for firm growth opportunities. The literature has also documented, albeit disputed, inefficient investment policies associated with internal capital markets. Assuming efficient markets, the market value of a firm reflects any market perceived inefficiency in a firm's anticipated investment policy. Thus, market-to-book could be a biased proxy for available growth opportunities. In order to mitigate this issue, I use the median market-to-book for the narrowest SIC level that includes at least 5 firms. If 5 firms are not available, the two-digit SIC level is used.

Earnings before interest and taxes (EBIT) denominated by the book value of total assets is included as a measure of internally generated investment capital within a firm. In all of the models, operating cash flow has a positive coefficient and is significant at the 1% level. One interpretation of this result is that the firms have liquidity constraints. This presumes that

⁹ Market-to-book is an estimation of marginal Tobin's q calculated in the same manner as used by Shin and Stulz (1998). Estimate of Tobin's q = $(\text{Market value of equity} + \text{Book value of total assets} - \text{Book value of equity}) / \text{Book value of assets}$. This provides an estimate of average Q, which is used as an estimate of marginal Q.

operating cash flow is an appropriate measure of liquidity, and liquidity creates a binding constraint on firm investment. This argument is disputed by results in Kaplan and Zingales (1997). It is also plausible that operating cash flow is highly correlated with growth opportunities and it is also unlikely that median market-to-book for the industry and firm size completely capture the influence of growth opportunities in these models. Thus, the influence of growth opportunities could be partially reflected in the coefficient for operating cash flow to the extent that median market-to-book and firm size do not fully capture growth opportunities. These explanations are not mutually exclusive.

Evidence of the presence of active internal capital markets is shown in models D and E. The variables of interest are other cash flow and other market-to-book. The investment of both horizontal and vertical group members is positively related to the cash flow of the other firms' in the keiretsu. This evidence is consistent with active internal capital markets. This finding is consistent with Shin and Stulz's (1998) evidence of active internal capital markets in U.S. conglomerates, Shin and Park's (1999) evidence of active internal capital markets in Korean industrial groups and Perotti and Gelfer's (1999) evidence that the internal capital markets of Russian industrial groups are active.

Chevalier's (2000) evidence suggests that using an industry-based measure of market-to-book may be inappropriate in tests of active internal capital markets and for tests of cross-subsidization within conglomerates. Chevalier shows that investment for a division within an industrial group only appears to be related to cash flows from the rest of the conglomerate due to improperly specified measures of growth opportunities. Chevalier argues that using an industry market-to-book measure biases the results. Fortunately, industrial groups have separate market values for each member of the industrial group allowing for a direct test using a firm based

measure. In table 3, an estimate of average firm Q is used rather than an industry median estimate of average Q that was used in table 2.

The evidence of active internal capital markets appears robust to using a firm level estimate of Q. In models D and E, the other cash flow coefficient is significant at the 5% confidence level for horizontal group members and 1% confidence level for vertical group members. Firm market-to-book appears to be a better predictor of investment than industry median market-to-book for vertical group firms. All coefficients for market-to-book are positive and is significant.

If internal capital markets are active and efficient, the industrial group should undertake the highest net present value projects. This suggests that asset growth will be positively related to the firm's growth opportunities and negatively related to the growth opportunities of other firms in the keiretsu.¹⁰ The coefficients on growth opportunities for group firms are inconsistent with this prediction. All coefficients are insignificant with the exception of model E where the coefficient for median market-to-book is significantly negative for vertical group members. Thus, the regression models in table 2 fail to support the proposition that the internal capital markets of group firms increase investment efficiency relative to independent firms.

In table 3, both horizontal and vertical group members have a negative coefficient for the other market-to-book variable and it is significant at the 1% confidence level for vertical group members. However, if only the primary membership is included in the regression for vertical group members, then the other market-to-book variable is no longer significant. This evidence is consistent with efficient allocation of capital; however, it is certainly not conclusive. Section 5.2 further explores whether group members increase investment efficiency.

¹⁰ As discussed earlier, this statement presumes that internal capital is less costly.

Investment levels for group firms appear to be more influenced by cash flow while investment levels for independent firms appear to be more influenced by growth opportunities. The coefficients for operating cash flow of both horizontal and vertical firms are approximately twice those of independent firms using either estimate of growth opportunities. The t-statistic for the difference between the coefficients for own cash flow between models A and B is 5.99 in table 2 and 6.40 in table 3. The t-statistic for the difference between the coefficients for own cash flow between models A and C is 5.59 in table 2 and 4.86 in table 3.

Conversely, the coefficient for independent firms' median industry market-to-book is much greater for independent firms than for either horizontal or vertical group firms. The t-statistic for the difference between the coefficients for own cash flow between models A and B is -3.89 in table 2 and -4.80 in table 3. The t-statistic for the difference between the coefficients for own cash flow between models A and C is -4.48 in table 2 and -9.35 in table 3. The significant differences for the coefficients for both cash flow and growth opportunities seem robust to using alternative proxies of marginal Q in the models.

The findings in tables 2 and 3 suggest that group firms have a less efficient investment policy relative to independent firms. One hypothesized advantage of internal capital markets is its ability to transfer capital from business units with more cash flow than available positive net present value projects available to business units that have not enough cash flow to invest in their available value creating projects. The higher level of sensitivity to operating cash flow for group members and a lower level of sensitivity for growth opportunities for group members does not appear to be consistent with the presumption of efficient capital transfers between firms in the industrial groups. Scharfstein (1998) finds that high Tobin's q segments in U.S. conglomerates invested less than their pure play peers while in low Tobin's q segments the reverse was true.

The evidence of investment patterns from industrial groups as shown in tables 2 and 3 is consistent with the investment patterns of U.S. conglomerates documented by Scharfstein.

It is possible that independent firms investment is too sensitive to growth opportunities, i.e. independent firms with good growth opportunities over-invest and vice-versa. Thus, the significantly smaller coefficients for the proxy of growth opportunities of group firms may indicate a more efficient investment policy. This does not seem probable especially since the coefficient for horizontal group members is not statistically different than 0; however, further tests are needed to discount this possibility.

These coefficients for operating cash flow and median industry market-to-book are inconsistent with the evidence presented by Hoshi, Kashyap and Scharfstein (1991). Hoshi, Kashyap and Scharfstein provide evidence that an independent Japanese firm's investment level is more affected by liquidity than their keiretsu member counterparts. Their evidence suggests that there is a headquarters like function within a keiretsu that creates an internal capital market allocating investment capital to the member firms mitigating liquidity issues. Their results show that investment patterns of independent firms are more likely to reflect available growth opportunities while group firms are more influenced by liquidity.

The samples in this paper and Hoshi, Kashyap and Scharfstein (1991) are significantly different. Hoshi, Kashyap and Scharfstein defined independent firms as a firm not in one of the largest 6 horizontal groups. Thus, a portion of the firms listed in this paper as horizontal, all of the vertical group members, and all of the independent firms are classified as independent in their study. Their sample included 121 group firms and 24 independent firms from 1977 to 1982.

5.2 Do the internal capital markets increase investment efficiency?

Tables 2 and 3 provide evidence that the internal capital markets of the Japanese keiretsu are active. This evidence suggests that investment policies for group firms are different from the investment policies of independent firms. Table 4 investigates whether industry adjusted investment levels for group firms are different than for independent firms.

Each firm-year comprises a separate data-point as in tables 2 and 3. Industry-adjusted investment levels are calculated as the difference in each firm's asset growth and the median asset growth of independent firms in the narrowest SIC level with at least five firms. For example, the two-digit SIC level is used if five independent firms are not available at the three-digit SIC level. Group firms are excluded from the analysis if there are no independent firms at their two-digit SIC level. Table 4 shows univariate statistics for industry adjusted investment levels. Independent firms and horizontal firms have similar levels of industry-adjusted investment levels. Vertical group members do appear to invest at higher levels than their independent industry peers. This is inconsistent with Shin and Park's (1999) evidence of higher investment levels for Korean chaebol firms relative to their independent firm counterparts.

If the reallocation of capital in industrial groups does not alter the overall level of investment, does it increase or decrease investment efficiency? To further investigate the effectiveness of group investment policy, I construct two measures of investment efficiency similar to Rajan, Servaes and Zingales' (2000) measure of relative value added although the setup and calculation is somewhat different. Relative value added (RVA) is calculated in the following manner:

$$\text{RVA (1)} = (\% \Delta \text{Assets} - \text{Median } \% \Delta \text{Assets for entire population, by year}) * (\text{Median market-to-book by industry} - \text{Median industry market-to-book for entire population, by year})$$

$$\text{RVA (2)} = (\% \Delta \text{Assets} - \text{Median } \% \Delta \text{Assets for entire population, by year}) * (\text{Firm market-to-book} - \text{Median market-to-book for entire population, by year})$$

Each firm-year observation has a RVA calculated. RVA (1) produces a positive value for firms that are in above the median growth opportunity industries and also increases their asset base at an above the median rate. Additionally, a positive value is generated for below the median opportunity firms that also invest below the median. If one of these conditions does not hold, then this measure returns a negative value for RVA. In light of Chevalier's (2000) evidence, I also calculate a similar measure utilizing firm level measure of Q. The calculation is shown above in RVA (2). RVA (2) has the problem discussed earlier in the paper that market-to-book not only reflects the growth opportunities available to the firm but it also reflects the efficiency of the firm's investment policy. Thus, this measure may be biased in a systematic manner. For example, if group firms invest less efficiently than independent firms, their market-to-book ratio would underestimate the actual growth opportunities available to group firms, biasing the result.

While Rajan, Servaes and Zingales (2000) use a similar measure to estimate allocation of capital within a conglomerate, I use the measure for a firm-by-firm level look at investment efficiency. Specifically, I use RVA to further ascertain whether industrial groups tend to allocate more capital to firms that appear to have more growth opportunities and less capital to firms with fewer growth opportunities relative to their independent firm peers.

Table 5 reports the univariate results for these measures. Horizontal firms do have a lower mean and median than for independent firms but not significantly lower. Vertical group members' measure of RVA (1) is significantly higher mean but the median is insignificantly

lower. When secondary memberships are excluded the mean is no longer significantly higher. RVA (2) also does not appear to provide clear evidence of whether group firms invest more or less efficiently. Horizontal firms have a significantly lower mean for RVA (2) but has a significantly higher median relative to independent firms. Vertical firms do insignificantly better than independent firms.

This measure is influenced by both a firm's growth opportunities, as proxied by either industry level or firm level estimate of Q, and the investment level of the firm. This study attempts to isolate the choice of investment policy for independent firms relative to group firms. Table 6 controls for the influence of growth opportunities and attempts to isolate the effect of a firm's choice of investment level on these measures of investment efficiency.

This is done in the following manner:

$$RVA = \beta_0 + \beta_1(\text{Group indicator}) + \beta_2(\text{proxy for marginal Q}) + \beta_3(\text{Size}) + \beta_{4\dots n}(\text{firm fixed effects})$$

Table 6 includes median market-to-book and size in the models A and B to attempt to control for growth opportunities to isolate the effect of the choice of investment level. Firm market-to-book and size is included in the models C and D for this purpose. Models A and C in table 6 tests whether horizontal group members allocate capital more efficiently by this measure and in models B and D the same is done for vertical group members. The indicator variable for horizontal group members is significantly negative in explaining RVA (1) as shown in model A. Model A provides evidence that horizontal firms tend to invest in a less efficient manner than

independent firms. In model B, the indicator variable for vertical group members is insignificantly positive.

Models C and D in table 6, utilize the firm level proxy for growth opportunities. The coefficients for the indicator variables are insignificant in these models. One caveat is that it is plausible that any cross sectional differences between group and independent firms associated with RVA (2) is captured in firm market-to-book. If so, this measure may not illuminate any differences in investment efficiency in the indicator variable since investment efficiency is controlled for in firm market-to-book.

Is RVA a proxy for investment efficiency? The fact that RVA (1) is lower for the average horizontal group member relative to independent firms is meaningless unless RVA translates into value. RVA should be directly related to a measure of value if it is a good proxy for efficient investment policies. Table 7 tests whether the weighted average RVA for an industrial group influences an industrial group's excess value. The weighted average RVA is used to calculate the cumulative effect of RVA for the industrial group. The weights for RVA are based on total book assets.

Excess value is the dependent variable. Following previous convention¹¹, a firm's imputed value is estimated by asset multiples of independent firms in the narrowest SIC with at least five independent firms available. If 5 firms are not available, the two-digit SIC level is used. Group firms are not included if there are no independent firms at the two-digit SIC level. Group fixed effects are included in the model.

$$\text{Group Excess Value} = \beta_0 + \beta_1(\text{Group RVA}) + \beta_2(\text{Group Size}) + \beta_{3\dots n}(\text{group fixed effects})$$

¹¹ Most notably, Berger and Ofek (1995).

where:

$$\text{Group Excess Value} = \sum_i (\text{Firm Excess Value}_i * (\text{Firm Book Assets}_i / \text{Group Book Assets}))$$

$$\text{Group RVA} = \sum_i (\text{Firm RVA}_i * (\text{Firm Book Assets}_i / \text{Group Book Assets}))$$

$$\text{Firm Excess Value} = \ln((\text{Mkt. Value of equity} + \text{Bk. of debt}) / \text{Imputed Value})$$

$$\text{Imputed Value} = \text{Median Market-to-Book for Industry} * \text{Book Value of Assets}$$

Group RVA is significantly positively related to group excess value for horizontal firms. This test is consistent with Rajan, Servaes and Zingales' (1999) result for U.S. conglomerates. They show that, in U.S. conglomerates, as diversity of the firm increases, their measure of RVA decreases, and their measure of RVA is directly related to the excess value of the conglomerate. The results in table 6 show that horizontal group members have lower RVA while table 7 shows that the weighted average of RVA is directly related to group excess value. This relationship does not hold for vertical group members.

6. Summary

This study explores the effects of group membership on the investment policies of Japanese firms. First, I find evidence that both vertical and horizontal industrial groups have active internal capital markets. Investment for firms in both horizontal and vertical groups is positively related to the cash flow of other firms in their respective keiretsus. This evidence is analogous to evidence of active internal capital markets in U.S. conglomerates. Second, I study the determinants of investment of group and independent firms and whether this translates into value. Horizontal group members' investment is less sensitive to a proxy of growth opportunities and more sensitive to operating cash flow than is the investment levels of independent firms. I employ a measure of investment efficiency, the product of relative

investment level and relative level of growth opportunities. The average horizontal firm's investment is less efficient relative to their independent firm peer's investment, by this measure. This measure of investment efficiency is positively correlated with excess value of horizontal industrial groups.

The Japanese keiretsu provide further evidence that industrial groups transfer investment capital between member firms. The Japanese, Korean and Russian industrial groups all appear to have active internal capital markets despite differences in organization. The keiretsu have a more informal and secretive structure than the Korean industrial groups. The Korean industrial groups are more formally structured and thus, they are a more close analogy with U.S. conglomerates. The Russian industrial group evidence, as the Perotti and Gelfer (1999) note, is somewhat difficult to interpret, as the governance structures in Russia have been in a state of transition since the dissolution of the Soviet Union.

It can be argued that the evidence presented in this paper on investment efficiency is caused by factors other than active internal capital markets. It is possible that the influence of the active internal capital markets documented in this paper is small or is overwhelmed by other factors such as other governance or ownership issues that are more responsible for the overall level of investment efficiency of group firms. However, it does seem logical that active internal capital markets do alter investment patterns. And the investment patterns for Japanese group firms appear to be similar to evidence of investment patterns in U.S. conglomerates. These findings, taken at face value, suggest that the reallocation of capital within keiretsu firms is inefficient.

The results presented here increase our understanding of internal capital markets in two areas. First, the corporate governance structure of an industrial group utilizes both internal monitoring of the industrial group similarly to conglomerates, but also may benefit from

monitoring from the external market. Since the findings in this paper are somewhat analogous to findings in previous studies of internal capital markets in the U.S., it appears that either the external market is not engaged in monitoring of firms in industrial groups, or to the extent that there is external market monitoring, it is ineffective. Secondly, this study avoids the specification issue raised by Chevalier (2000). The evidence here is in support of the hypothesis that the other members of their broader organization influence a business unit's investment.

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Table 1

Univariate statistics for sample firm-years. Sample is divided into horizontal group members, vertical group members and independent firms. Group membership is derived from Dodwell Consulting's, "Industrial Groupings in Japan". All statistics for the firms are from Worldscope. Market/Book = (Mkt. Value of equity + Bk. Value of debt)/ Bk. Value of Assets. Median Market/Book for Industry = Median M/B for most specific SIC designation with at least 5 firms. Else, 2-digit SIC is used. Total Asset Growth = (TAt - TAt-1)/(TA t-1). Total Assets = total book assets in billions of Yen. EBIT/TA = (EBIT)/ Total book Assets in t-1. Other EBIT/TA = EBIT of all other firms in the same group/ Total Assets of all other firms in the same group in t-1. Other Market/Book = (Mkt. Value of equity of all other firms in the same group + Bk. of debt of all other firms in the same group)/ Bk. Value of Assets of all other firms in the same group. Means are listed in first row and medians are listed in second row for each variable. In parentheses, the group that the statistic is significant from is listed. Two sided, two-population t-test are used to test differences in means. Mann-Whitney, two-population sign-rank test used to test differences in medians. *** and ** denote significance at the .01 and .05 levels, respectively.

	Independent		Horizontal		Vertical	
Number	6458		4134		1544	
Market/Book	1.194	***(Ver.)	1.195	***(Ver.)	1.259	***(Ind., Hor.)
	1.054	***(Hor., Ver.)	1.100	***(Ind.)**(Ver.)	1.129	***(Ind.)**(Hor.)
Median Market/Book for Industry	1.161	***(Hor., Ver.)	1.187	***(Ind.)	1.197	***(Ind.)
	1.125	***(Hor., Ver.)	1.155	***(Ind.)	1.164	***(Ind.)
Total Asset Growth	1.08%	**(Ver.)	1.03%	**(Ver.)	1.73%	**(Ind., Hor.)
	0.65%	**(Ver.)	0.55%	*** (Ver.)	1.12%	*** (Ind.)*** (Hor.)
Total Assets	464	*** (Hor.), ** (Ver.)	883	*** (Ind.), ** (Ver.)	591	*** (Ind., Hor.)
(bils of yen)	57	*** (Hor., Ver.)	94	*** (Ind.), ** (Ver.)	106	*** (Ind.)** (Hor.)
EBIT/TA	3.27%	*** (Ver.)	2.93%	** (Ver.)	3.20%	*** (Ind.), ** (Hor.)
	3.18%	*** (Hor.)	2.85%	*** (Ind.), ** (Ver.)	3.06%	** (Hor.)
Other EBIT/TA	na		1.35%	*** (Ver.)	3.08%	*** (Hor.)
			1.28%	*** (Ver.)	2.93%	*** (Hor.)
Other Market/Book	na		1.107	*** (Ver.)	1.243	*** (Hor.)
			1.101	*** (Ver.)	1.170	*** (Hor.)

Table 2

OLS regressions with asset growth as the dependent variable. Sample is divided into horizontal group members, vertical group members and independent firms. Group membership is derived from Dodwell Consulting's, "Industrial Groupings in Japan". All statistics for the firms are from Worldscope. Asset Growth = $(TA_t - TA_{t-1}) / (TA_{t-1})$. OWN EBIT/TA = $(EBIT) / \text{Total book Assets in } t-1$. Median Market/Book for Industry = Median M/B for most specific SIC designation with at least 5 firms. Else, 2-digit SIC is used; where, $M/B = (\text{Mkt. Value of equity} + \text{Bk. of debt}) / \text{Bk. Value of Assets}$. Other EBIT/TA = $EBIT \text{ of all other firms in the same group} / \text{Total Assets of all other firms in the same group in } t-1$. Other Market/Book = $(\text{Mkt. Value of equity of all other firms in the same group} + \text{Bk. Value of debt of all other firms in the same group}) / \text{Bk. Value of Assets of all other firms in the same group}$. Size = $\text{Ln}(\text{total book assets in } t-1)$. All models control for firm level fixed effects. P-values of each coefficient are listed below the coefficient.

Observations	6458	4134	1507	4134	1507
Type	Independent	Horizontal	Vertical	Horizontal	Vertical
Dependent Variable	Asset Growth	Asset Growth	Asset Growth	Asset Growth	Asset Growth
Model	A	B	C	D	E
Independent Variables:					
Constant	8.0286 0.000	8.0058 0.000	7.9550 0.000	8.0233 0.000	7.8777 0.000
OWN EBIT/TA	0.4109 0.000	0.7969 0.000	0.8705 0.000	0.7910 0.000	0.8067 0.000
Median Ind. M/B	0.0450 0.000	0.0009 0.915	-0.0194 0.124	-0.0012 0.911	-0.0317 0.032
OTH EBIT/TA				0.5014 0.070	0.6431 0.000
M/B(OTH)				0.0011 0.982	-0.0121 0.504
SIZE	-0.3904 0.000	-0.3775 0.000	-0.3727 0.000	-0.3787 0.000	-0.3680 0.000
Adjusted R-squared	0.323	0.2636	0.3164	0.265	0.326

Table 3

OLS regressions with asset growth as the dependent variable. Sample is divided into horizontal group members, vertical group members and independent firms. Group membership is derived from Dodwell Consulting's, "Industrial Groupings in Japan". All statistics for the firms are from Worldscope. Asset Growth = $(TA_t - TA_{t-1}) / (TA_{t-1})$. OWN EBIT/TA = $(EBIT) / \text{Total book Assets in } t-1$. M/B = $(\text{Mkt. Value of equity} + \text{Bk. of debt}) / \text{Bk. Value of Assets}$. Other EBIT/TA = $\text{EBIT of all other firms in the same group} / \text{Total Assets of all other firms in the same group in } t-1$. Other Market/Book = $(\text{Mkt. Value of equity of all other firms in the same group} + \text{Bk. Value of debt of all other firms in the same group}) / \text{Bk. Value of Assets of all other firms in the same group}$. Size = $\text{Ln}(\text{total book assets in } t-1)$. All models control for firm level fixed effects. P-values of each coefficient are listed below the coefficient.

Observations	6458	4134	1507	4134	1507
Type	Independent	Horizontal	Vertical	Horizontal	Vertical
Dependent Variable	Asset Growth	Asset Growth	Asset Growth	Asset Growth	Asset Growth
Model	A	B	C	D	E
Independent Variables:					
Constant	7.8311 0.000	7.9262 0.000	7.4353 0.000	7.9684 0.000	7.6135 0.000
OWN EBIT/TA	0.3528 0.000	0.7738 0.000	0.7630 0.000	0.7641 0.000	0.7056 0.000
OWN M/B	0.0435 0.000	0.0084 0.158	0.0190 0.032	0.0095 0.147	0.0226 0.020
OTH EBIT/TA				0.5651 0.039	0.5721 0.000
M/B(OTH)				-0.0271 0.519	-0.0442 0.010
SIZE	-0.3796 0.000	-0.3737 0.000	-0.3461 0.000	-0.3748 0.000	-0.3549 0.000
Adjusted R-squared	0.3318	0.2640	0.3114	0.2645	0.3269

Table 4

Univariate statistics of industry adjusted investment. Industry adjusted investment = (actual asset growth - median independent firm asset growth by industry). Where actual asset growth = $(TA_t - TA_{t-1}) / (TA_{t-1})$. Median independent firm asset growth by industry = median independent firm for industry with the most specific SIC designation with at least 5 firms. Else, 2-digit SIC is used. Independent firms are standardized to reflect median=0.

Industry Adjusted Investment

	Median	Mean	Quartiles		Observations
			1st	3rd	
Independent Firms	0.0000	.00584	-0.0352	0.0350	6458
Horizontal Group Members	-0.0010	.00517	-0.0441	0.0418	3135
Vertical Group Members	0.0038**	.01122	-0.0400	0.0499	1132

Univariate tests are conducted on independent firms relative to horizontal group members and independent firms relative to vertical group members.

Two sided, two-population t-test are used to test differences in means. Mann-Whitney, two-population sign rank test used to test differences in medians. ***, ** and * denote significance at the .01, .05 and .10 levels, respectively.

Table 5

RVA(1) = (%ΔAssets – Median %ΔAssets for entire population, by year) * (Median market-to-book by industry – Median industry market-to-book for entire population, by year)
 RVA(2) = (%ΔAssets – Median %ΔAssets for entire population, by year) * (Firm market-to-book – Median market-to-book for entire population, by year)

Group membership is derived from Dodwell Consulting's, "Industrial Groupings in Japan". All statistics for the firms are from Worldscope. %ΔAssets = (TAt - TAt-1)/(TA t-1). Median Market/Book for Industry = Median M/B for most specific SIC designation with at least 5 firms. Else, 2-digit SIC is used; where, M/B = (Mkt. Value of equity + Bk. of debt)/ Bk. Value of Assets.

		<u>Independent</u>	<u>Horizontal</u>	<u>Vertical</u>
RVA (1)	Mean:	0.0020	0.0017	0.0033
	Median:	0.00191	0.00017	0.00041
Two sided, two-population t-test relative to independent firms			-0.768	2.218**
Mann-Whitney sign rank test for medians relative to independent firms			-1.465	-1.149
<hr/>				
RVA (2)	Mean:	0.0131	0.0067	0.0134
	Median:	0.00069	0.00070	0.00115
Two sided, two-population t-test relative to independent firms			-2.592***	0.079
Mann-Whitney sign rank test for medians relative to independent firms			1.828*	1.416

Two sided, two-population t-test are used to test differences in means. ***, ** and * denote significance at the .01, .05 and .10 levels, respectively.

Table 6

OLS regressions with relative value added (RVA) as dependent variable. $RVA(1) = (\text{asset growth} - \text{median asset growth}) * (\text{median industry market-to-book} - \text{median industry market-to-book})$. $RVA(2) = (\text{asset growth} - \text{median asset growth}) * (\text{firm market-to-book} - \text{median market-to-book})$. Where: $\text{Asset Growth} = (TA_t - TA_{t-1}) / (TA_{t-1})$; median asset growth is the median asset growth for entire sample by year; Median Market/Book for Industry = Median M/B for most specific SIC designation with at least 5 firms. Else, 2-digit SIC is used; where, $M/B = (\text{Mkt. Value of equity} + \text{Bk. Value of debt}) / \text{Bk. Value of Assets}$. Median market to book = median market to book for entire sample by year. HDUM = 1 if firm is a member of a horizontal group, 0 otherwise. VDUM = 1 if firm is a member of a vertical group, 0 otherwise. Size = $\ln(\text{total book assets})$. All models control for firm level fixed effects. P-values of each coefficient are listed below the coefficient.

Observations	10592	8002	10592	8002
Type	Independent & Horizontal	Independent & Vertical	Independent & Horizontal	Independent & Vertical
Dependent Variable	<u>RVA (1)</u>	<u>RVA (1)</u>	<u>RVA (2)</u>	<u>RVA (2)</u>
Independent Variables:				
Constant	0.1242 0.000	-0.0135 0.726	2.2947 0.000	2.0202 0.000
HDUM	-0.0168 0.002		-0.0075 0.834	
VDUM		0.0023 0.552		0.0023 0.932
Med. Industry M/B	0.0056 0.000	0.0084 0.000		
Firm M/B			0.0764 0.000	0.1091 0.000
SIZE	-0.0067 0.000	0.0003 0.886	-0.1297 0.000	-0.1175 0.000
Adjusted R-squared	0.1300	0.2020	0.1713	0.1993

Table 7

OLS regression on group excess value. Sample is divided into horizontal group members, vertical group members and independent firms. Group membership is derived from Dodwell Consulting's, "Industrial Groupings in Japan". All statistics for the firms are from Worldscope. Excess value = ln (actual value/imputed value). Where actual value = market value of equity + book value of debt. Imputed value = median industry market to book ratio * book value of assets. Median industry market to book ratio for Industry = Median market to book for most specific SIC designation with at least 5 firms. Else, 2-digit SIC is used; where, market to book = (Mkt. Value of equity + Bk. Value of debt)/ Bk. Value of Assets. Imputed values are standardized to reflect independent median = 1. All measures are aggregated for total group values by using a weighted average based on book asset value. All models control for group level fixed effects. P-values of each coefficient are listed below the coefficient.

Observations	48	213	48	213
Type	Horizontal	Vertical	Horizontal	Vertical
Dependent Variable	<u>Group Excess Value</u>	<u>Group Excess Value</u>	<u>Group Excess Value</u>	<u>Group Excess Value</u>
Independent Variables:				
Constant	0.9678 0.002	0.2168 0.524	0.7587 0.018	0.2262 0.504
Group RVA (1)	2.2437 0.029	-0.6391 0.395		
Group RVA (2)			1.2565 0.303	0.4446 0.149
Group Size	-0.0388 0.002	-0.0041 0.795	-0.0303 0.019	-0.0048 0.756
Adjusted R-squared	0.364	0.7795	0.03314	0.7812