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ECONOMIC PERSPECTIVES

A review from the
Federal Reserve Bank
of Chicago

Stock market dispersion and business cycles

The cyclicality of cash flow and investment in U.S. manufacturing

Japan's corporate groups

FEDERAL RESERVE BANK
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Stock market dispersion and business cycles

Prakash Loungani, Mark Rush and William Tave

Do stock market movements predict business cycles? Opinions differ. Focusing on the link between movements in the Standard and Poor's (S&P) 500 and the economy, Fisher and Merton (1984, p. 72) find that "stock price changes are the best single variable predictor of the business cycle." And Barro (1988, p. 1) concludes that "considering how difficult it is to make accurate macroeconomic forecasts, the explanatory power of the stock market is outstanding." Other economists are not so impressed. Samuelson (1966) aptly sums up the opposing view: "The stock market has predicted nine of the last five recessions." More recently, Stock and Watson (1988) find the forecasting ability of aggregate stock market indices to be uneven and they exclude them from their new index of leading economic indicators.

This article looks at another way to analyze stock price data that can help forecast business cycles. This kind of analysis is motivated by Black (1987, p. 113-114) who argued that the behavior of an industry's stock price can be used to forecast the industry's subsequent investment expenditures. Increases in an industry's stock price are generally followed by an increase in that industry's expenditures on plant and equipment. If stock prices are increasing in some industries but declining in others, it suggests that in subsequent years capital and labor will have to be reallocated from the contracting industries to the expanding ones. While beneficial in the long run, this reallocation of resources imposes short-run costs, that is, temporary declines in real activity as the resources move across industries. The greater the divergence in the fortunes of different industries, the more resources must be moved, and so the larger will be the resulting unemployment and fall in output.

As Black suggests, stock market data provide a way of measuring the extent of this divergence, or dispersion, in industry fortunes. In a well-functioning stock market, stock prices represent the discounted sum of present and expected future industry profits. As stock market participants forecast the contraction of some industries and the expansion of others, the price of stocks in the contracting industries will fall, while stock prices in the expanding industries will rise. The greater the predicted difference in the industries' prospects, the greater will be the dispersion in these industries' stock prices. Thus, an increase in the dispersion of stock prices should be followed by an increase in unemployment and a decline in real economic activity.

The stock market dispersion index

The stock market dispersion index measures the divergence in industrial fortunes. The basic data we used to construct the index are

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yearly average indices of various industries' stock prices, as constructed by S&P (1988).[1] We calculate the growth rate (g) of each industry's stock price, and then define the dispersion index as

$$SW = [(\Sigma\, c_i(g_{it} - g_t)^2)/n_t]^{1/2}$$

where g_{it} is the growth rate of stock prices for industry i at time t, g_t is the average growth rate of the whole set of stock prices at time t, n_t is the number of industries in the sample period, and the summation is taken over all the industries in the sample period. The weights, c_i, are based on the average share of industry i's employment in average total employment.[2]

Obviously, *SW* is simply the standard deviation of the growth rate of the industries' stock prices. If the stock prices of all industries rose (or fell) by the same amount in a given year, *SW* for that year would be zero. Similarly, a high value for *SW* in a given year would reflect uneven growth in stock prices across industries that year.

Our analysis shows that stock market dispersion was generally high in the 1970s, a decade of high unemployment and below-normal GNP (see Figure 1). This gives us some preliminary evidence that dispersion is negatively correlated with economic activity.

Relationship to other measures of dispersion

Our work is closely related to earlier work by Lilien (1982). In particular, our stock market dispersion index is motivated by Lilien's innovative use of cross-industry *employment* dispersion to capture the divergence in industry fortunes. Lilien constructed an index of employment dispersion as

$$\sigma_t = [\Sigma\, c_i(e_{it} - e_t)^2]^{1/2}$$

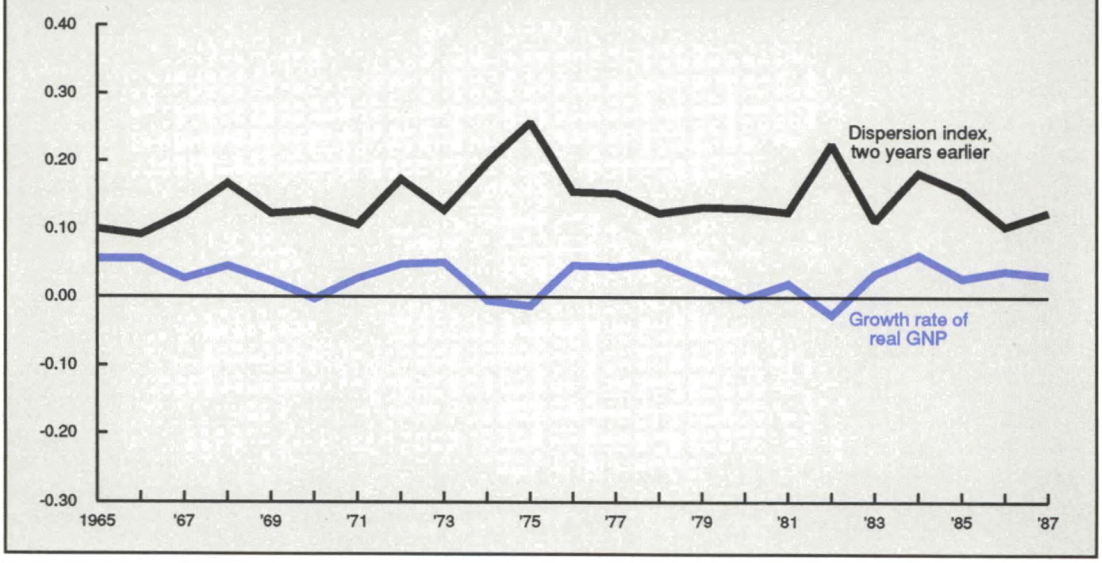
where e_{it} is the growth rate of employment in industry i at time t, e_t is the growth rate of aggregate employment at time t, and c_i is the weight attached to industry i. Lilien found a strong positive correlation between σ_t and the aggregate unemployment rate, U_t.

Rissman (1986) extended Lilien's analysis by constructing a dispersion measure that distinguishes *permanent* shifts in the distribution of employment across industries from temporary shifts. Her point was that the reallocation of labor across industries was more likely to occur in response to permanent shifts in the fortunes of industries.

We follow an alternate, but complementary, strategy by using stock market data. The use of stock market data provides a natural way of separating temporary shocks to an

FIGURE 1

Stock market dispersion and real GNP growth



industry's fortunes from permanent ones. The industry stock price represents the present value of expected profits over a long horizon. The impact of an innovation in industry profits on its stock price will depend on the persistence of the shock. If the shock is purely temporary—in the sense that it will soon be reversed—the innovation will have little impact on the present value of expected profits and, hence, will have little impact on the industry's stock price. On the other hand, if the shock is expected to persist for a long time, the innovation will have a significant impact on expected future profits and will lead to a large change in the industry stock price. Furthermore, it is these sorts of persistent shocks that motivate reallocations of labor and capital across sectors. Hence, a dispersion index constructed from industries' *stock prices* automatically assigns greater weight to permanent shifts over temporary shifts.

The dispersion index and the S&P 500: which moves first?

We next investigate the relationship between the stock market dispersion index and the S&P 500.[3] From Figure 2, it appears that increases in the dispersion index tend to predict declines in the S&P 500 by two years.

To do a formal test of whether the dispersion index leads the aggregate index, or vice versa, requires regression analysis. The results reported in Table 1 are based on annual observations from 1948 to 1987. Equation (1) regresses the growth in the S&P 500, which we label ΔSP, on three lags (that is, past values) of *SW*. This regression tells us the extent to which movements in the S&P 500 are *preceded* by movements in the dispersion index. As shown by the R^2 statistic, past values of *SW* account for nearly 30 percent of the variation in ΔSP. The impact of *SW2* on ΔSP is particularly strong, suggesting that an increase in the dispersion index is followed by a marked decline in the S&P 500 two years later. In equation (2) we add three lags of ΔSP to the equation. This allows for the possibility that movements in the S&P 500 are due to its own past movements. The relationship between *SW2* and ΔSP continues to hold.

Equations (3) and (4) are analogous to (1) and (2), but test the reverse relationship, namely, whether movements in the S&P 500 lead to any significant movements in *SW*. As our results indicate, there is no evidence that the reverse relationship holds. Thus, our dispersion index is *not* preceded by a general movement of stock prices. This suggests that any correlation between the dispersion index and real GNP must arise from an economic channel *separate* from the more conventional effects measured by the aggregate index.

Predicting real GNP movements: is dispersion better than the S&P 500?

To examine the relationship between stock market dispersion and economic activity

FIGURE 2

Stock market indicators: Dispersion index and S&P 500

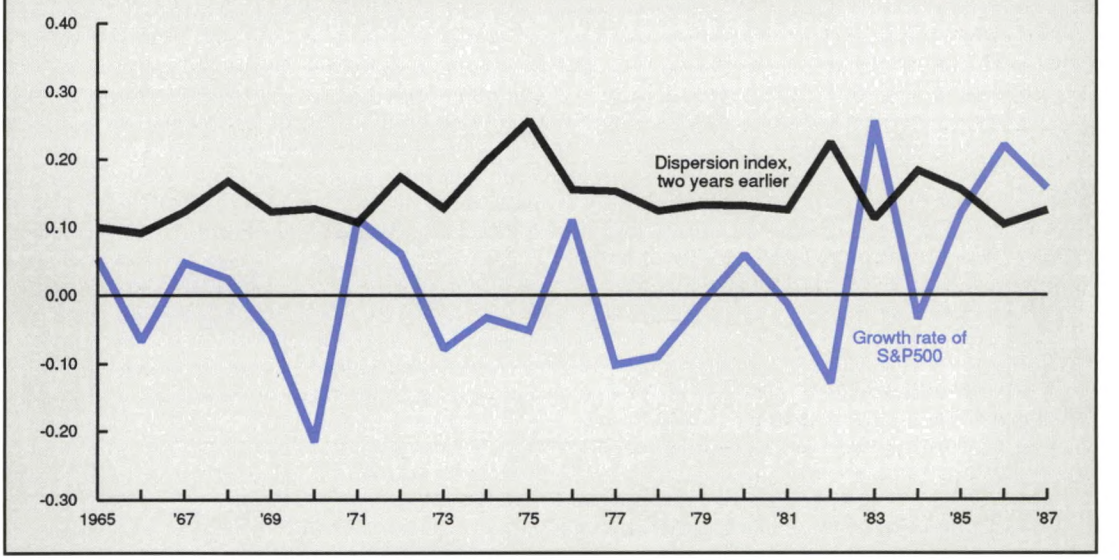


TABLE 1

Relationship between dispersion index and S&P 500

	(1) ΔSP	(2) ΔSP	(3) SW	(4) SW
Constant	0.268**	0.260	0.138**	0.116*
	(0.106)	(0.135)	(0.006)	(0.042)
SW1	-0.804	-0.785	.	0.133
	(0.535)	(0.554)		(0.080)
SW2	-1.723**	-1.716**	.	0.080
	(0.536)	(0.578)		(0.179)
SW3	0.802	0.832	.	0.051
	(0.528)	(0.618)		(0.191)
ΔSP1	.	0.093	-0.039	-0.032
		(0.162)	(0.042)	(0.050)
ΔSP2	.	-0.144	-0.021	-0.018
		(0.148)	(0.042)	(0.046)
ΔSP3	.	0.056	-0.064	-0.060
		(0.150)	(0.042)	(0.046)
R^2	0.2974	0.3235	0.0877	0.1137
D.W.	1.715	1.889	1.723	2.017

NOTE: *Denotes that the coefficient is significant at a 5% level.
**Denotes that the coefficient estimate is different from zero at a 1% level of significance.
D.W. = Durbin-Watson statistic.

formally, we start with the simplest framework. The first equation in Table 2 regresses the annual growth rate of real GNP, which we call ΔY, on three lags of *SW* and three lags of ΔY.[4] This simple specification can explain roughly 19 percent of variation in output growth. Moreover, the coefficient on dispersion lagged two years, *SW2*, is negative, and has a p-value of 0.01. This means that an increase in the dispersion index is followed by a statistically significant decline in real GNP growth two years later.

We next compare the ability of the dispersion index to predict real GNP growth with that of the S&P 500. The results are shown in equation (2). Here we see that the coefficient on $\Delta SP1$ is positive and has a p-value of 0.03. This means that an increase in the S&P 500 is followed a year later by a statistically significant decline in real GNP growth.[5] This equation explains about 22 percent of the variation in output growth, slightly more than the amount explained by the dispersion regression. The results from equations (1) and (2) suggest that if we wanted to use a *single* indicator to predict real GNP growth, the S&P 500 and the stock market dispersion index perform about equally well. Of course, the dispersion index offers the advantage that it predicts real GNP growth two years in advance.

Obviously, there is no reason not to use both stock market indicators simultaneously. As shown in equation (3), by doing so we can explain 34 percent of the variation in real GNP growth. When compared to equation 2, the coefficient estimate of $\Delta SP1$ drops considerably (accompanied by a slight rise in its standard error) so that it is no longer significantly different from zero at conventional levels of significance: the p-value is 0.11. On the other hand, the coefficient on *SW2* still has a p-value of 0.03. Hence the relationship between the aggregate stock market index and output growth is attenuated by the inclusion of the dispersion index.

The remaining two equations in Table 2 re-examine the conclusions reached in Table 1 about the relationship between the S&P 500 and dispersion. Equation (4) shows that the inclusion of past values of GNP growth does not alter the conclusion that an increase in the dispersion index has a dampening effect on the S&P 500 after a lag of two years. Equation (5) shows that, as before, movements in the S&P 500 do *not* lead to significant movements in dispersion.

To summarize, the analysis reported in Tables 1 and 2 suggests:

(1) Stock market dispersion measures explain a significant fraction of the variance of output growth. The increase in dispersion occurs two years in advance of the decline in output growth.

TABLE 2

Dispersion, S&P 500, and real GNP growth

	(1) ΔY	(2) ΔY	(3) ΔY	(4) ΔSP	(5) SW
Constant	0.056	0.031**	0.057	0.348*	0.117*
	(0.007)	(0.029)	(0.030)	(0.140)	(0.046)
SW1	0.028	.	0.008	-1.087	0.131
	(0.127)		(0.127)	(0.561)	(0.185)
SW2	-0.331**	.	-0.290*	-1.782**	0.094
	(0.129)		(0.127)	(0.588)	(0.194)
SW3	0.103	.	0.087	0.634	-0.074
	(0.135)		(0.140)	(0.648)	(0.214)
ΔSP1	.	0.080*	0.060	0.191	-0.033
		(0.034)	(0.038)	(0.170)	(0.056)
ΔSP2	.	-0.030	-0.038	-0.033	-0.023
		(0.036)	(0.036)	(0.164)	(0.054)
ΔSP3	.	-0.034	-0.038	-0.046	-0.060
		(0.036)	(0.034)	(0.159)	(0.052)
ΔY1	0.190	-0.016	0.072	-1.783*	-0.008
	(0.176)	(0.186)	(0.192)	(0.888)	(0.294)
ΔY2	-0.149	-0.033	-0.100	0.172	0.052
	(0.104)	(0.097)	(0.102)	(0.470)	(0.155)
ΔY3	0.051	0.029	0.064	0.127	-0.028
	(0.096)	(0.095)	(0.094)	(0.432)	(0.143)
R^2	0.1899	0.2232	0.3434	0.4122	0.1176
D.W.	1.998	1.920	1.946	1.878	2.009

NOTE: *Denotes that the coefficient is significant at a 5% level.
**Denotes that the coefficient estimate is different from zero at a 1% level of significance.
D.W. = Durbin-Watson statistic.

(2) Movements in the dispersion measure cannot be attributed to past movements in the S&P 500; on the other hand, a significant fraction of the variation in the S&P 500 can be attributed to changes in dispersion.

(3) Additionally, movements in dispersion are unrelated to past output growth. Thus, there is little evidence in favor of the "reverse causation" argument that aggregate business cycle factors, by affecting industries differentially, lead to increases in dispersion.

Controlling for policy influences on real GNP growth

Finally, we augmented the regressions reported above by extending the analysis to include the effects of fiscal and monetary policy variables. To capture the impact of variations in government spending, the equation includes the growth rate of real federal purchases, ΔLF and two lags of this variable. To capture the impact of monetary policy, we use the growth rate of the monetary base, ΔB, and two lags of this variable.[6]

The first equation in Table 3 is a regression of real GNP growth on three lagged values of the growth rate of the S&P 500 and the monetary and fiscal variables. Although none of the variables quite attains standard levels of statistical significance, several of the variables—ΔSP, ΔB, and $\Delta B1$—are close to significance with p-values of about 0.09. Moreover, the regression explains a large fraction of the variance in output growth, slightly over 40 percent.

The second equation replaces the S&P 500 by the dispersion index. We see that this does not lead to any loss of explanatory power, with the R^2 remaining about .41. Also, as in Table 2, *SW2* is highly significant with a p-value of 0.01.

Equation (3) is our most general specification. It allows for both stock market indicators as well as monetary and fiscal policy to influence growth. Once again we obtain results similar to those from Table 2: When both the S&P 500 and the dispersion index are included simultaneously, only the dispersion effect remains statistically significant.

Finally, there may be concerns about the possible endogeneity of the contemporaneous values of the monetary and fiscal variables; in view of this, we exclude them from the regression. As shown in equation (4), this has no appreciable impact on our results.

TABLE 3

Controlling for policy influences on real GNP growth

	(1) ΔY	(2) ΔY	(3) ΔY	(4) ΔY
Constant	0.033**	0.067**	0.080**	0.063*
	(0.007)	(0.023)	(0.026)	(0.029)
SW1	.	0.016	0.001	0.002
		(0.116)	(0.107)	(0.122)
SW2	.	-0.324**	-0.327**	-0.252**
		(0.118)	(0.113)	(0.125)
SW3	.	0.043	-0.023	0.075
		(0.125)	(0.137)	(0.141)
ΔC1	0.057	.	0.025	0.059
	(0.033)		(0.036)	(0.040)
ΔC2	-0.029	.	-0.044	-0.041
	(0.030)		(0.029)	(0.034)
ΔC3	-0.044	.	-0.055	-0.044
	(0.029)		(0.029)	(0.032)
ΔB	0.286	0.246	0.280	.
	(0.168)	(0.184)	(0.175)	
ΔB1	-0.335	-0.182	-0.237	-0.104
	(0.194	(0.203)	(0.191)	(0.161)
ΔB2	-0.005	-0.065	-0.067	-0.042
	(0.171)	(0.161)	(0.162)	(0.186)
ΔLF	0.036	0.078	0.063	.
	(0.045)	(0.048)	(0.044)	
Δ LF1	-0.004	-0.041	-0.026	-0.024
	(0.044)	(0.049)	(0.045)	(0.042)
Δ LF2	0.006	0.020	0.013	0.004
	(0.023)	(0.022)	(0.021)	(0.022)
R^2	0.4143	0.4126	0.5572	0.3641
D.W.	2.149	2.062	2.281	1.746

NOTE: *Denotes that the coefficient is significant at a 5% level.
**Denotes that the coefficient estimate is different from zero at a 1% level of significance.
D.W. Durbin-Watson statistics.

Conclusion

We interpret our results as providing support for the contention that stock market dispersion is a potentially important factor for predicting business cycles. Our confidence in this claim is bolstered by results in a series of related papers: Our 1990a paper uses a long sample period, 1926 to 1987, and shows that increases in dispersion are followed by increases in unemployment two or three years later. In Loungani, Rush and Tave (1990b) we extend the analysis to quarterly data for the post-WWII period. The evidence in that work is broadly consistent with the annual results reported here

and in the 1990a paper. Finally, Loungani and Rush (1990) examine the very high unemployment that Britain experienced between 1920 and 1938, a period that is widely regarded as constituting a macroeconomic puzzle. But, it turns out that stock market dispersion can resolve part of the puzzle since a dispersion index explains a fairly large fraction of the unemployment over this period.

FOOTNOTES

[1]The industries, which are defined by S&P, range in size from 2 firms to 14 firms and the indices are computed by weighting each firm's stock price according to the firm's market value. S&P began compiling these data in 1926; at various times additional industries have been added (and others subtracted) so that currently S&P compiles indices for about 85 industries. We used a subsample of 45 indices, including virtually all that start before 1943. The list of industries used, the motivation for selecting them, and additional details on constructing the index are provided in Loungani, Rush, and Tave (1990a).

[2]The weights are from the period 1968 to 1972, which is roughly the mid-point of our sample.

[3]To control for the effects of inflation, the S&P 500 is deflated by the GNP deflator.

[4]Results similar to those reported in Table 2 (and later in Table 3) hold if we regress the log of real GNP on a time trend, a lagged dependent variable, and the other variables of interest.

[5]There is a lack of consensus on why this correlation arises. One explanation, consistent with the work of Fama (1981), is the movements in the stock market index proxy for underlying shifts in the economy-wide prospective return to capital. Thus a decline in the stock market signals a reduction in the return to investment in new capital equipment. This leads to a fall in investment, which, subsequently, lowers GNP. Other explanations, however, do not assign any such structural interpretation but simply treat stock market movements as a leading indicator of economic activity.

[6]The lagged output growth variables were always insignificant in these regressions and their inclusion did not affect the other coefficient estimates. Thus, we exclude them from the regressions that follow. Our results are also insensitive to the choice of the monetary policy variable. In other papers we have used the unexpected component of the monetary base as well as interest rate spreads to capture the impact of monetary policy and obtained results similar to those reported here.

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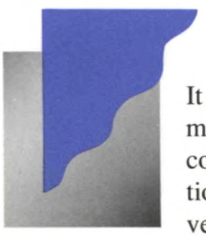
The cyclicality of cash flow and investment in U.S. manufacturing

Bruce C. Petersen and William A. Strauss



It is well-known that investment is the most cyclical component of GNP. In addition, the procyclicality of investment is extremely important in accounting for the ''shortfalls'' of GNP during downturns in the economy.[1] What is not well-understood is why investment is so cyclical. A number of theories have been proposed to explain the cyclicality of investment, and in this study, we bring some empirical evidence to bear on one in particular, the ''cash flow'' theory.

The cash flow theory maintains that, because capital markets are not perfect, many firms rely heavily on internal finance for investment purposes; since cash flow tends to be very procyclical, investment also is procyclical. While the theory has been around for years, it recently has garnered renewed attention in both the financial pages of the newspaper and in academic journals. Business forecasters and analysts are particularly interested because of the current sharp decline in corporate profits and the problems in credit availability.[2] In the academic world, theoretical work on the imperfections in capital markets—especially asymmetric information between firms and suppliers of finance—provides support for why credit rationing may occur and why external finance may be considerably more expensive than internal finance. In addition, there has been considerable recent effort in macroeconomics to link business cycle fluctuations to fluctuations in the available internal finance of firms in the economy.[3]

The primary aim of this study is to examine the relation between short-run fluctuations in investment and cash flow at the industry level. We build on our earlier study, Petersen and Strauss (1989), which focused on investment in the 20, two-digit Standard Industrial Classification (SIC) manufacturing industries. We found that a great deal of difference in the degree of cyclicality exists within manufacturing. In particular, we found that industries producing durable goods tended to exhibit much more cyclical investment behavior than industries producing nondurable goods.

To investigate the pattern of cyclicality of cash flow and investment in manufacturing, we use data from a panel of 261 industries covering the time period 1959 to 1986. Very little attention has been given to examining investment at this level. The lack of information about industry behavior is probably due to the fact that investment studies employing firm data typically do not have enough data points to produce estimates of cyclicality across a wide range of industries.

We find that cash flow is indeed more procyclical in the durable goods sector than in the nondurable goods sector. We estimate that the cash flow elasticity with respect to GNP is, on average, more than twice as great for durable goods industries as for nondurable goods industries. While we do not explore the

Bruce C. Petersen and William A. Strauss are economists at the Federal Reserve Bank of Chicago. The authors thank Judith Goff, Charles Himmelberg, Kenneth Kuttner, Dorothy Petersen, Steve Strongin, and Paula Worthington for helpful comments.

causes of this differential pattern in cash flows, there are several very plausible explanations. One obvious explanation is that consumers engage in greater intertemporal substitution of durable goods purchases than nondurable good purchases; for example, uncertainty concerning future incomes should cause consumers to postpone the purchase of durable goods. In addition, greater uncertainty will cause firms to postpone the purchase of durable goods when these investments are irreversible.[4]

We consider a number of regressions of the first difference of investment regressed on the first difference of cash flow for individual industries. We find that the cash flow coefficient is statistically significant for most two-digit industries, and that, on average, the cash flow coefficient is larger for durable goods industries. In addition, movements in cash flow appear to "explain" more of the movements in investment over the cycle in durable goods industries. Thus, we find not only that cash flow is more cyclical in durable goods industries, but also that there is a higher correlation between movements in investment and cash flow in durable goods industries. The results in this study are therefore consistent with our previous findings and broadly support the view that fluctuations in cash flow may be an important determinant of fluctuations in investment.

The remainder of the article proceeds as follows. The next section briefly summarizes our previous findings on the pattern of investment cyclicality within manufacturing. The following section reviews the arguments for why capital market imperfections may cause firms to rely heavily on internal finance for investment. The final two sections report our findings on the cyclicality of cash flow and the statistical relationship between movements in cash flow and investment within manufacturing industries.

Summary of earlier results

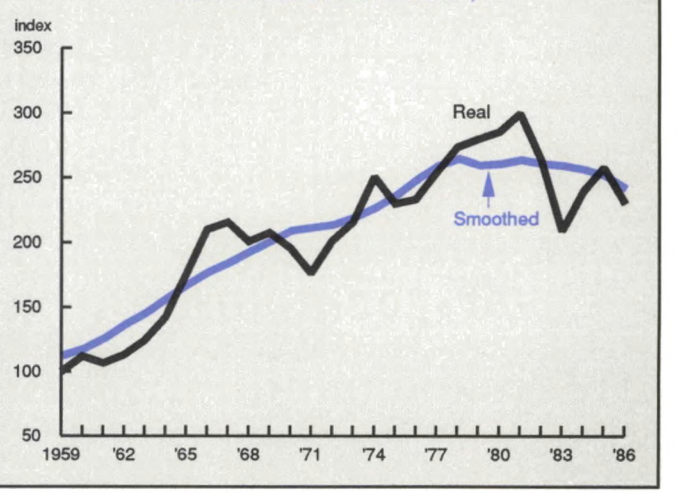
In our previous paper, we presented evidence on the volatility and the cyclicality of investment across the 20 two-digit SIC industries that make up the U.S. manufacturing sector. For each industry, we constructed a nine-year centered moving average investment series.[5] This series was compared to the actual investment figures to obtain a measure of the degree of cyclicality for each industry over the business cycle.

Figure 1, which is from our first study, plots the relationship between "smoothed" investment and actual investment for all manufacturing industries in our study over the period 1959-1986. Clearly, actual investment tends to be above smoothed investment during expansionary periods and below smoothed investment during contractions. In addition, although not reproduced here, we presented graphs showing that durable goods industries such as nonelectrical machinery and transportation equipment exhibited a more pronounced procyclical investment pattern than nondurable goods industries such as food products and chemicals

We also ran more formal tests on the data by regressing the ratio of actual to smoothed investment in each industry on various measures of the business cycle, such as the ratio of actual to potential GNP.[6] We found a procyclical investment pattern for all industries, with the exception of food products and tobacco products. What is particularly interesting is that, again, the investment pattern of durable goods industries was considerably more cyclical than that of nondurable goods

FIGURE 1

Total manufacturing
(Real indexed investment and real indexed smooth investment)



industries. The industries exhibiting the most cyclical investment series are transportation equipment, primary metals, nonelectrical machinery, instruments, and fabricated metals—all durable goods industries.

Cash flow as a determinant of investment

In a world of perfect capital markets, firms would, in theory, make investment decisions independent of their finance decisions. In other words, the availability of cash flow would not matter because firms could raise external finance at a cost equal to the opportunity cost of internal finance. This is the main message of the Modigliani and Miller (1958) theorem which has had such a dominant impact on investment studies for the last thirty years.

Only recently have economists begun to raise serious challenges concerning the general applicability of this theorem; some of its crucial underlying assumptions may in fact be seriously at odds with the real-world conditions that most firms face in financial markets.[7] For example, one of the key assumptions in the Modigliani and Miller theorem is that all information known by the firm is also known by potential suppliers of finance. However, it is likely that most firms are better informed about themselves than are potential investors. If this is the case, these firms may have incentives to act strategically at the expense of potential outside suppliers of finance, resulting in problems known as adverse selection and moral hazard.[8] Since outside investors are aware that such conflicts of interest exist, they rationally adjust the price they are willing to pay for the securities of firms who may be in a position to behave strategically.

When capital markets are not perfect, either because of asymmetric information or because of high transaction costs of new share and bond issues, then external finance may cost the firm considerably more than internal finance. Clearly, internally financed projects are not subject to problems of strategic behavior, and, of course, transaction costs are zero. Thus, many researchers have argued that there are compelling reasons to hypothesize that the investment levels of some firms may be sensitive to fluctuations in their internal finance levels. That is, because of the additional expense of external finance, some firms will not be willing to offset fluctuations in internal finance with either new share issues or debt.

Recently, many empirical tests have found support for this proposition.[9] For example, studies have shown that investment patterns of firms that exhaust all of their internal finance appear to be much more sensitive to fluctuations in cash flow than that of firms that do not exhaust all of their internal finance (that is, they pay dividends). These results are potentially important for macroeconomics, since well over half of all publicly traded corporations do not pay dividends.

Companies that pay dividends have more flexibility when it comes to dealing with a sudden shock to their cash flow: they can cut dividends instead of investment. But, if stockholders view dividends as a "signal" of the overall profitability of the firm, then cutting dividends is likely to depress stock prices, even though the fundamentals of the firm have not changed.[10] Therefore firms may find it optimal to react to a temporary decline in cash flow with some mix of cuts in both dividends as well as investment. There is empirical evidence that this is indeed how dividend-paying firms react. Future studies will no doubt pin down the trade-off firms face concerning cutting dividends or reducing investment or obtaining additional external finance.

In summary, a growing body of evidence suggests that some firms face financing constraints. Since most of these studies have worked with a relatively small sample of firms, the magnitude of the importance of financing constraints in explaining cyclical movements in aggregate investment remains unknown. We make some progress on this question in the following sections by providing evidence, at the industry level, for the entire manufacturing sector on the cyclicality of both investment and cash flow.

The data

The primary data sources we use are the *Census of Manufactures* and the *Annual Survey of Manufactures* (U.S. Department of Commerce). The advantages of these data sources for examining the cyclicality of investment at the industry level are discussed in our previous study.[11] *The Census of Manufactures* currently contains approximately 455 four-digit industries, of which 261 are included in our panel. Since, it is either impossible or

inconvenient to work with the entire population of Census industries, we excluded industries for any of the following three reasons. First, because we wished to examine a balanced panel of industries covering as many business cycles as possible, we excluded all industries for which the *Census of Manufactures* began gathering data later than 1958. Second, we excluded a number of industries having large gaps in the data. Finally, we excluded industries with inconsistencies in the industry classification or definition over time.

Table 1 provides a summary of the breakdown of our sample of Census industries. The first column lists the identity of the 20 industries that make up the *Census of Manufactures*. The second column lists the total number of four-digit industries that made up each of the two-digit industries in 1986 while the third column reports the breakdown of our sample of industries across the two-digit industries.[12] (A comparison of these two columns shows that our panel covers about 57 percent of all manufacturing industries.) The fourth column states the average real investment for our panel of two-digit industries. As reported in our previous study, the industries in the panel account for about 77 percent of total manufacturing investment. The last column reports the average real cash flow for our panel.

We measure cash flow in this study as sales less materials costs and all labor expenses. We are missing some elements of cost, such as interest expense. This is un-

TABLE 1

Database summary

	Total four-digit industries in 1986	Four-digit industries in FRB database	FRB database	
			Average investment (1958-1986)	Average cash flow (1959-1986)
			(millions of 1982 dollars)	
Total manufacturing	455	261	43976.0	204441.2
Nondurable manufacturing	224	125	20837.9	99262.7
Durable manufacturing	231	136	23138.2	105178.5
SIC				
20 - Food and kindred products	47	38	4463.2	27747.8
21 - Tobacco products	4	4	314.3	3659.9
22 - Textile mill products	30	19	1375.3	4952.4
23 - Apparel and related products	33	13	296.0	4130.2
24 - Lumber and wood products	17	4	984.7	2578.6
25 - Furniture and fixtures	13	7	258.1	2122.1
26 - Paper and allied products	17	11	3602.9	8755.2
27 - Printing and publishing	17	8	1348.8	11812.9
28 - Chemicals and allied products	33	16	4585.7	21064.6
29 - Petroleum and coal products	6	4	2971.9	8622.6
30 - Rubber and plastic products	6	4	1705.3	7070.2
31 - Leather and leather products	11	2	42.2	295.3
32 - Stone, clay, and glass products	27	23	2281.8	8022.9
33 - Primary metal industries	26	16	4893.5	11870.0
34 - Fabricated metal products	36	18	1953.0	11321.2
35 - Machinery, except electrical	44	29	4185.9	22290.3
36 - Electrical machinery	37	25	2848.8	18053.5
37 - Transportation equipment	18	8	4919.5	22463.6
38 - Instruments and related products	13	6	812.9	6456.2
39 - Miscellaneous manufacturing	20	6	132.3	1151.6

avoidable given the manner in which the *Census of Manufactures* collects firm level data. Thus, there is definitely measurement error in our definition of cash flow, the seriousness of which depends, in part, on how variable interest expenses are over the business cycle.

A comparison of the last two columns show that our measure of the average cash flow in each two-digit manufacturing industry is, on average, about five times greater than total physical investment. This is to be expected as there are many other types of investments that are financed by cash flow, including research and development, advertising, and working capital. In addition, a portion of cash flow, as defined here, is used to pay dividends and interest payments.

Most of the rest of our study deals with comparisons of the cyclicality of durable goods versus nondurable goods industries. As is conventionally done, the durable goods sector is taken to consist of SICs 24, 25 and 32-38. This division leads to approximately an even division of our panel of four-digit industries into the durable/nondurable categories.

The cyclicality of cash flow and investment

We turn now to the central question of this study, namely, is the cyclical pattern of cash flow, across manufacturing, consistent with the cyclical pattern of physical investment? One basic question to ask is whether in fact cash flow is more cyclical in the durable goods sector than in the nondurable goods sector. To consider this, we regress the percentage change in industry cash flow on the percentage change in GNP over the full time period covered by our panel.

Our results are reported in Table 2. We report the estimated cash flow elasticity for all industries in our panel, for the durable and nondurable sectors of our panel, and for all two-digit industries (a pooled regression of the four-digit industries making up each two-digit industry). For all industries, cash flow is very procyclical, with a cash flow elasticity of 2.29. More importantly, the next two rows show that the estimated elasticity for durable goods, 3.19, is much larger than the estimated elasticity for nondurable goods, which is 1.31, and the difference is statistically significant. The remaining rows of Table 2 indicate that all two-digit nondurable good industries have lower elasticity measures than the overall average for the durable goods industries.

TABLE 2

The cyclicality of cash flow in durable and nondurable industries

	Elasticity estimates[a]
Total manufacturing	2.29**
Nondurable manufacturing	1.31**
Durable manufacturing	3.19**
Nondurable manufacturing	
SIC	
20 - Food and kindred products	-0.44
21 - Tobacco products	3.11
22 - Textile mill products	2.68**
23 - Apparel and related products	1.60**
26 - Paper and allied products	1.47**
27 - Printing and publishing	1.61**
28 - Chemicals and allied products	2.44**
29 - Petroleum and coal products	1.88
30 - Rubber and plastic products	2.40**
31 - Leather and leather products	0.58
39 - Miscellaneous manufacturing	1.69**
Durable manufacturing	
SIC	
24 - Lumber and wood products	4.21**
25 - Furniture and fixtures	2.50**
32 - Stone, clay, and glass products	2.75**
33 - Primary metal industries	4.77**
34 - Fabricated metal products	2.50**
35 - Machinery, except electrical	3.26**
36 - Electrical machinery	3.01**
37 - Transportation equipment	4.02**
38 - Instruments and related products	2.06**

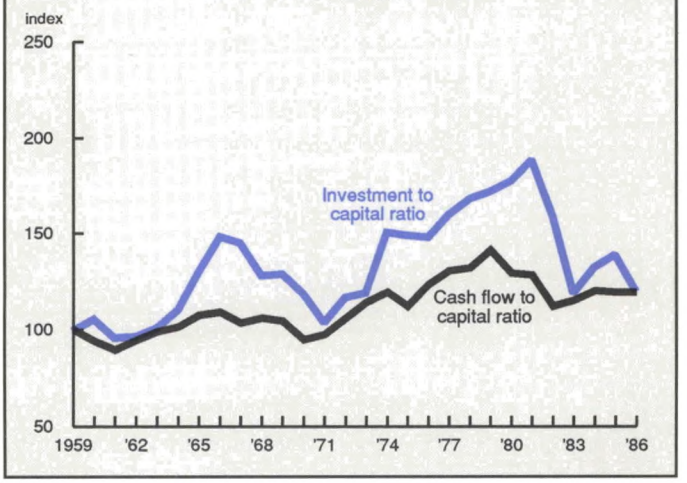
**Significant at the 1 percent level
*Significant at the 5 percent level
[a]Estimates of elasticity of cash flow with respect to GNP

To illustrate the cyclicality of cash flow, and as a lead-in to our regression results, we present graphs of cash flow and investment for all manufacturing (Figure 2) and four selected two-digit industries (Figures 3-4). Both cash flow and investment are scaled by the beginning of year stock of capital to remove trends in the data. We will use this same scaling of the data in our regressions in the next section.

Figure 2 plots the investment series and cash flow series for all manufacturing over the time period 1959-1986. Both the investment ratio and the cash flow ratio are indexed to 100 in 1959. We know from our previous study that investment for all manufacturing is quite procyclical. From Figure 2 it is apparent that cash flow is also procyclical, increasing in expansions of the economy and declining during contractions. This pattern would not surprise anyone familiar with the pattern of aggregate corporate profits in our economy.

FIGURE 2

Total Manufacturing
(Investment to capital ratio and cash flow to capital ratio)



Figures 3-4 present investment and cash flow ratios for four two-digit industries, two in nondurables (food and paper products) and two in durables (primary metal and nonelectrical machinery). These industries have a large share of total investment in manufacturing and illustrate different patterns of cash flow and investment activity. The two durable goods industries' cash flows, along with investment, appear to be quite procyclical over the business cycle. In contrast, cash flow and investment, appear to be less cyclical for the two nondurable goods industries. As will be apparent when we discuss our regression results, this pattern holds up for most industries in manufacturing.

Investment regressions

We now present some descriptive regressions on the relationship between physical investment and cash flow over the business cycle. We consider the following pooled regression of the first difference of investment on the first difference of current and lagged cash flow:

$$(1) \quad \Delta(I/K)_{it} = b_1\Delta(CF/K)_{it} + b_2\Delta(CF/K)_{it-1} + e_{it}$$

where i denotes the industry level (four-digit) and t denotes the time period. Both industry investment (I) and cash flow (CF) are scaled by the beginning of year capital stock (K) to control for heteroscedasticity. This regression captures our basic intent of seeing how cyclical variation in cash flow is correlated with cyclical variation in investment. We look at changes in both current and lagged cash flow because some time is required for firms to adjust investment plans and to install new plant and equipment.

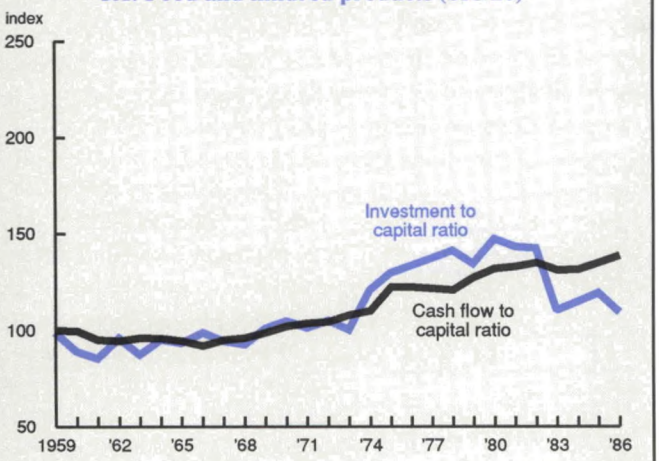
There are, of course, many other variables that one should consider in an investment study. Some, such as measures of the cost of capital, are briefly discussed later in this paper. Variables such as the rate of depreciation and the degree of imperfect competition may be important determinants of why the level of investment differs across industries. But variables such as these are likely to change very slowly over time, and as a result may be viewed as industry fixed effects. With panel data, a standard method of controlling for unobservable fixed effects is to difference the data as we have done, thereby removing the time invariant components.[13] We also included year dummies in the regression, which has only a small effect on the regression results.

We are not arguing that there is necessarily any causation running from cash flow to investment since there are fundamental variables which do vary over time, such as the industry demand curve, which may be driving both movements in industry cash flow and industry investment. While we mention such considerations at the end of the paper, they cannot readily be addressed with the data that we have at hand.[14]

FIGURE 3

Nondurables
(Investment to capital ratio and cash flow to capital ratio)

3A: Food and kindred products (SIC 20)



3B: Paper and allied products (SIC 26)

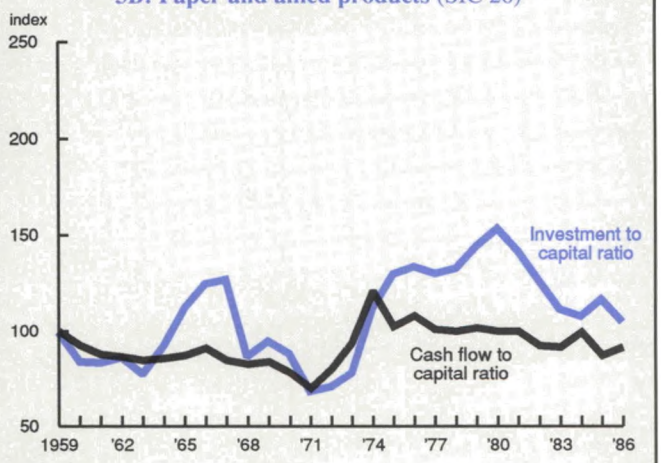


Table 3 reports the results from estimating equation (1) for the full time period (1961 to 1986).[15] The first row reports the results from pooling all 261 4-digit industries (the all manufacturing regression) while the second and third rows present results when industries are pooled according to whether they produce durable versus nondurable goods. The coefficients for current and lagged cash flow are presented, followed by the adjusted R-square. It should be pointed out that for some of the two-digit industries, as indicated in Table 1, we have only a small number of the total population of 4-digit industries—the results for these industries should be viewed with extra caution.

For the manufacturing sector as a whole over the full time period, the coefficients of current and lagged cash flow are 0.052 and 0.024, respectively, and are statistically significant at the 1 percent level. While the absolute size of these coefficients is small, recall from Table 1 that average cash flow in manufacturing is over four times larger than average investment. Thus, the coefficients on the first difference of cash flow could potentially imply large investment effects.

Of more interest to our study are the results in the next two rows which examine nondurable versus durable goods industries. The cash flow coefficient for the first difference of cash flow is 0.040 for nondurable goods and 0.072 for durable goods. The standard errors are small enough such that an F-test at any conventional level of significance will reject the hypothesis that the cash flow coefficient for durable goods is no greater than that for nondurable goods. In addition, the adjusted R-square for durable goods is nearly twice as great as the adjusted R-square for nondurable goods.

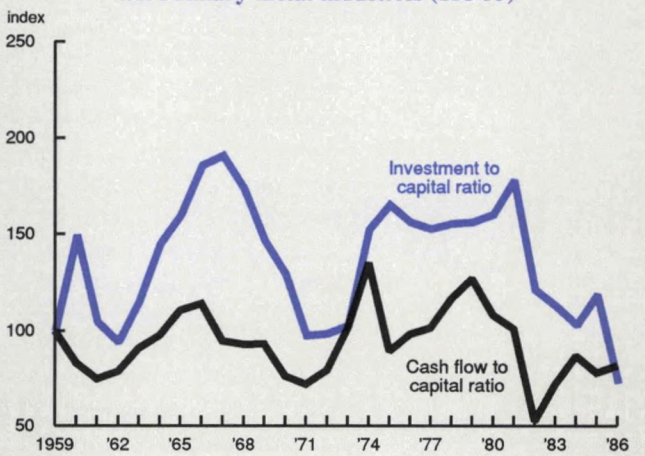
The remaining rows of Table 3 report the regression results for the individual two-digit industries. The first difference of current cash flow is significant at the 5 percent level or greater, with the exception of SIC 24 (lumber and wood products) and SIC 31 (leather and leather products). The coefficient on the lagged first difference of cash flow is also significant for some of the industries, although the size of the coefficient tends to be much smaller. It is obvious that there is a fair amount of dispersion in the estimated cash flow coefficients, although none of the results look to be unreasonable.

We considered the stability of our regression results in Table 3 by dividing our panel into an early time period (1961 to 1973) and a

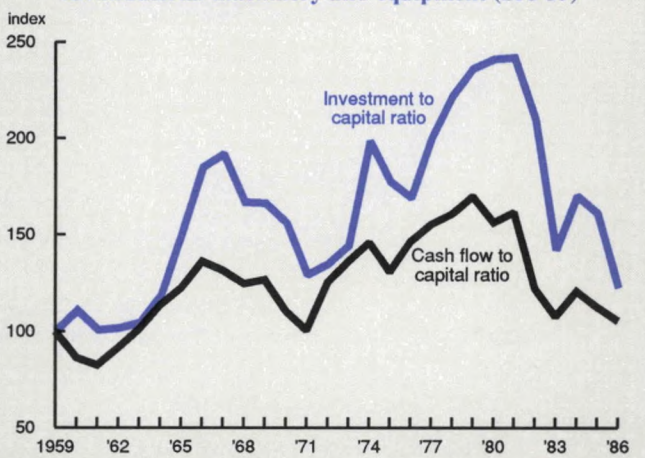
FIGURE 4

Durables
(Investment to capital ratio and cash flow to capital ratio)

4A: Primary metal industries (SIC 33)



4B: Industrial machinery and equipment (SIC 35)



late time period (1974 to 1986), the results for which appear in the Appendix. Perhaps the most noteworthy result here is the stability of the cash flow coefficients for both the durable and nondurable goods industry categories. As can been seen in rows two and three, there is very little difference in the estimates between the early and late time periods. There are, of course, some fairly large changes in the estimated coefficients for individual two-digit industries when the data are divided by time period. In particular, when the regressions are estimated over the shorter time frames, the cash flow coefficients remain significant for almost all of the durable goods industries, but this is not true for the nondurable goods industries.

We also considered a number of extensions to our basic results which we do not report here. We included the first difference of alternative measures of the cost of capital, as conventionally included in investment studies. These measures, when entered in the regression, typically had insignificant coefficients, often with the wrong sign, and had no effect on our basic results. We also considered whether there might be some asymmetry in the regression results depending on whether the change in cash flow was positive or negative: it seems plausible that firms might react differently to a downward shock in cash flow than to an upward shock in cash flow. However, our results showed little evidence of such asymmetry.

Summary of results and conclusion

This analysis extends our previous work, which found much more pronounced cyclicality of investment in durable goods industries than in nondurable goods industries. If capital markets are not perfect, then two explanations are (simultaneously) possible: (1) cash flow may be more cyclical in durable goods industries; (2) investment may be more sensitive to fluctuations in cash flow in durable goods industries.

Our results provide support for both explanations. Cash flow does appear to be more cyclical in durable goods industries than in nondurable goods industries. This is not unexpected given that demand for durable goods is likely to be more sensitive to the business cycle. In addition, we also find that cash flow coefficients are larger, indicating greater sensitivity to fluctuations in cash flow, for durable goods industries. This finding appears to be robust to various time splits of the panel of industries that we consider. Thus, the results in this study are consistent with our previous findings.

TABLE 3

Regression results for investment on cash flow

	Full time period 1961-1986		
	First difference cash flow[a]	Lagged first difference cash flow	Adjusted R-square
Total manufacturing	0.052**	0.024**	0.117
Nondurable manufacturing	0.040**	0.020**	0.084
Durable manufacturing	0.072**	0.026**	0.164
SIC			
20 - Food and kindred products	0.042**	0.021**	0.111
21 - Tobacco products	0.064**	0.051*	0.219
22 - Textile mill products	0.091**	0.030**	0.153
23 - Apparel and related products	0.025**	0.012	0.078
24 - Lumber and wood products	0.029	0.059*	0.304
25 - Furniture and fixtures	0.035**	-0.012	0.139
26 - Paper and allied products	0.097**	0.012	0.052
27 - Printing and publishing	0.046**	0.011	0.122
28 - Chemicals and allied products	0.071**	-0.003	0.101
29 - Petroleum and coal products	0.043*	0.022	0.070
30 - Rubber and plastic products	0.070**	0.006	0.090
31 - Leather and leather products	0.008	0.001	0.389
32 - Stone, clay, and glass products	0.155**	0.041*	0.151
33 - Primary metal industries	0.083**	0.015	0.137
34 - Fabricated metal products	0.095**	0.013	0.182
35 - Machinery, except electrical	0.058**	0.024**	0.241
36 - Electrical machinery	0.083**	0.040**	0.237
37 - Transportation equipment	0.051**	0.012	0.174
38 - Instruments and related products	0.095**	0.041*	0.150
39 - Miscellaneous manufacturing	0.023*	0.029*	0.093

**Significant at the 1 percent level
*Significant at the 5 percent level
[a]Year dummies were used in all regressions

It is, of course, important to point out that there are explanations other than capital market imperfections for why investment is more procyclical in durable goods industries than in nondurable goods industries. One possibility is that, as already argued, demand is more cyclical in durable goods industries, and that firms rapidly adjust their capital stocks in response to temporary changes in demand. The plausibility of this alternative explanation depends on how high the adjustment costs are to making sharp changes in the rate of investment, something that is very difficult to measure.

We hope that this paper has generated some additional facts concerning the post-war investment cycle in the United States. In addition, we hope that this paper has provided some additional evidence concerning the possible link between fluctuations in internal finance and investment. It is clear from the financial press that many forecasters put considerable weight behind this linkage as a driving force behind business cycles. Indeed, given the sharp recent decline in corporate profits and cash flows, forecasters have expressed concern over the future direction of investment and the economy, and there is evidence that this concern may be justified.

APPENDIX

Regression results for investment on cash flow

	Split time period, 1961-1973		Split time period, 1961-1973		Significant difference test between time splits
	First difference cash flow[a]	Lagged first difference cash flow	First difference cash flow	Lagged first difference cash flow	
Total manufacturing	0.055**	0.029**	0.051**	0.021**	
Nondurable manufacturing	0.045**	0.019**	0.037**	0.020**	
Durable manufacturing	0.070**	0.038**	0.072**	0.021**	
SIC					
20 - Food and kindred products	0.057**	0.055**	0.038**	0.013	**
21 - Tobacco products	0.062	0.073	0.065	0.047	
22 - Textile mill products	0.157**	0.040	0.059**	0.019	**
23 - Apparel and related products	0.035**	0.011	0.018	0.013	
24 - Lumber and wood products	-0.031	0.126*	0.042	0.045	
25 - Furniture and fixtures	0.020	-0.046	0.040	-0.005	
26 - Paper and allied products	0.140	-0.010	0.074**	0.023	
27 - Printing and publishing	0.055**	0.008	0.041**	0.013	
28 - Chemicals and allied products	0.070**	-0.005	0.072**	-0.001	
29 - Petroleum and coal products	0.077*	-0.014	0.036	0.029	
30 - Rubber and plastic products	0.047	-0.042	0.074*	0.013	
31 - Leather and leather products	0.010	0.016	0.006	-0.006	
32 - Stone, clay, and glass products	0.108**	0.027	0.171**	0.046	
33 - Primary metal industries	0.153**	0.021	0.060**	0.012	*
34 - Fabricated metal products	0.082**	0.039**	0.108**	-0.005	
35 - Machinery, except electrical	0.049**	0.028**	0.064**	0.023**	
36 - Electrical machinery	0.081**	0.063**	0.080**	0.025**	
37 - Transportation equipment	0.081**	0.044	0.040*	0.001	
38 - Instruments and related products	0.125**	-0.009	0.085**	0.055*	
39 - Miscellaneous manufacturing	0.021	0.022	0.024	0.034	

**Significant at the one percent level
*Significant at the five percent level
[a]Year dummies were used in all regressions

FOOTNOTES

[1]Robert Barro (1987) concludes that if all categories of investment are added together, fluctuations in investment account for around 88 percent of the GNP "shortfall" during recessions.

[2]See for example the "Outlook" column of the *Wall Street Journal*, April 2, 1990, for a discussion of how declines in profits can "drag" an economy into a recession. See also articles in the "Business Day" section of the *New York Times* on August 8, 1990 and September 7, 1990.

[3]Among the many recent papers are Gertler (1988), Greenwald and Stiglitz (1990), and Gertler, Hubbard, and Kashyap (1990).

[4]See, for example, the arguments and evidence in Romer (1990) and the arguments presented in Bernanke (1983).

[5]For further detail, see Equation (1) of Petersen and Strauss (1989).

[6]We reported results for the following regression:

$$I_t/\tilde{I}_t = a + bA_{t-1} + e_t$$

where I_t is actual investment in year t, $\tilde{I}_t$ is the smoothed investment series, and A is a measure of the state of the aggregate economy.

[7]For a discussion of the recent theoretical developments, see Fazzari, Hubbard, and Petersen (1988).

[8]Moral hazard problems arise when leverage gives the firm incentives to undertake riskier projects than it would without debt finance. In the presence of leverage, debt

holders will bear a portion of the downside losses resulting from high risk projects. Adverse selection refers to the situation where above-average quality firms drop out of the market for external finance because of the unfavorable terms offered by suppliers of finance who are unable to distinguish between high quality and low quality firms.

[9]This list of studies has grown dramatically in the last few years. Two of the early studies include Fazzari, Hubbard and Petersen (1988) and Hoshi, Kashyap, and Scharfstein (forthcoming).

[10]See for example Bhattacharya (1979).

[11]The origins of this data base are described in Domowitz, Hubbard, and Petersen (1986). Three of the advantages include: (1) the Census reports investment data at the four-digit level, which is very disaggregated, (2) Census data assign individual plants, rather than whole companies, to their primary SIC industry, (3) data for Census industries are available back to at least 1958, allowing for a panel of substantial length.

[12]We have nine fewer industries than our previous study because of missing information required to construct the cash flow measure.

[13]See Hsiao (l986) for a discussion of procedures for dealing with unobservable industry fixed effects.

[14]Previous studies have used Tobin's q, a measure of the stock market value of the firm to its replacement cost, in an attempt to control for changes in the demand for investment. Unfortunately, the information necessary to construct Tobin's q is not available for Census industries.

[15]Our time period begins in 1961 because we lose two years due to inclusion of both first and second differences of cash flow in the regression. We lose a third year because we need the lagged capital stock as a scale factor.

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Japan's corporate groups

Hesna Genay

In recent years, the Japanese economy has come under close scrutiny as the liberalization of both financial and nonfinancial international markets gained momentum and Japanese companies proved themselves to be successful competitors. The differences and similarities between the industrial structures in Japan and the U. S. are of interest to regulatory bodies as well as to companies that compete with Japanese companies in the international markets.

One distinctive feature of the Japanese economy that attracts considerable attention is the existence of well-diversified industrial groups, called keiretsu. The complex relationship among firms within these groups is characterized by cross-ownership of equity, close ties to the group's "main bank" (which provides the majority of the firm's debt financing), and product market ties with the other firms in the group.

Although such industrial groups are not unique to Japan (Germany, Korea, Spain, and France have similar industrial groups), Japan's corporate groups are larger. Furthermore, Japan, as the second largest trading partner of the U.S., attracts more attention and criticism. For example, during the Structural Impediments Initiative talks at the beginning of this year, the "main bank" system in Japan with its "captive" customer base was criticized for acting as a nontariff barrier, restricting entry by foreign competition.

These and similar criticisms of the keiretsu assume that its main function is to limit the activities of group firms' competitors. The results of recent studies, however, indicate that Japan's industrial groups provide other important services to their members. Therefore, understanding the characteristics of the keiretsu system has important implications for the competitiveness of American firms.

This study compares Japanese keiretsu and independent firms in terms of their ownership structure, assets, earnings per share, stock returns, dividend payments, and equity-related bond issues. The results point to significant differences between these types of firms. In addition, the study explores the implications of these differences for the U.S.

The six groups and their characteristics

The history of large industrial groups in Japan can be traced as far back as the 17th century. For around 300 years until the end of World War II, the Japanese economy was dominated by ten large industrial groups, called zaibatsu.[1] Companies belonging to these large conglomerates were vertically integrated and owned by families or holding companies. Although members of the zaibatsu spanned a wide range of industries, the most powerful tended to be banks and trading companies, which controlled the financial operations and the distribution of goods in the groups.

After World War II, under the direction of the Allied Occupation Forces, the zaibatsu were dissolved and the equity held by the

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controlling families was distributed to the public. During the restructuring of the Japanese economy in the 1950s and early 1960s, some of the old zaibatsu associations emerged in a new form, called keiretsu, and other new keiretsu were formed.

Today there are six major keiretsu in Japan: Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, and Dai-Ichi. The first three are continuations of the pre-war zaibatsu, while the last three groups were newly formed.[2] The nature of the keiretsu relationships differs somewhat from the relationships among zaibatsu companies. Unlike the zaibatsu companies, keiretsu firms are not owned by one holding company or family. Furthermore, the keiretsu are characterized by significant cross-holdings of equity among members. While zaibatsu companies were vertically integrated, with the holding company or the family standing at the top of the hierarchy, the major keiretsu firms are related through customer/supplier relationships and ownership of each other's equity.

A common feature of the old zaibatsu and the new keiretsu is the central role of financial institutions, city banks in particular.[3] These institutions provide the majority of the group firms' bank loans and also hold significant amounts of equity in the member firms. In addition, the trading companies of the groups continue to play a major role in the distribution of goods and coordination of new ventures in overseas markets.

Similarities between the pre-war zaibatsu and today's keiretsu also exist in their personnel and management ties. Major member firms strengthen their ties with affiliates by exchanging top management and directors. In addition, each group has a Presidential Council that meets every month to exchange information and resolve disputes that may exist among member firms.

One feature that distinguishes keiretsu from industrial groups in many other countries is the scope of their business. Keiretsu firms are not concentrated in one or two industries; instead, in each group, such industries as chemicals, machinery, food, transportation equipment, and communications are well-represented.

Given these general features of keiretsu firms, what are some of the specific characteristics that differentiate them from other companies in Japan? This study examines the financial aspects of a sample of keiretsu and independent firms (see box) to answer this question. The particular questions that are addressed include: How does the structure of equity ownership differ between keiretsu and independent firms? Are there significant differences between these firms in terms of their size, earnings, stock market performance, and the issues of equity-like bonds? Are the characteristic of financial firms, which are subject to a greater degree of regulation and government guidance, different from those of nonfinancial firms? In addition, particular attention is paid to the period from 1986 to 1989 to determine whether the rapid deregulation and internationalization of Japan's financial markets affected keiretsu firms differently from independent firms. In the last section, the implications of the results presented here are discussed in view of the earlier studies on keiretsu companies and their economic role.

Description of sample firms

There are 471 companies in the sample; 361 keiretsu firms and 110 independent firms. Firms belonging to the six keiretsu were identified by the information given in *Industrial Groupings in Japan 1988/1989*, *Japan Company Handbook, Spring 1989*, and Nakatani (1984). The Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, and Dai-Ichi groups have 66, 65, 64, 56, 59, and 51 companies, respectively. The sample of independent firms was obtained from a random sample of all companies listed in the Tokyo Stock Exchange (TSE), First Section in 1989 after firms identified as keiretsu companies were eliminated. The total sample size represents approximately 40 percent of all companies listed in TSE First Section.

The financial characteristics of keiretsu and independent firms

Members of keiretsu have strong financial ties. Table 1 shows the percentage of equity owned by the top ten shareholders of firms in each group in 1989, where shareholders are classified either as members of one of the six keiretsu or as independents. For keiretsu firms, the amount of equity owned by other firms in

the same group (for example, percentage of stock of a Mitsui firm owned by other Mitsui firms) ranges from 14.8 percent for the Dai-Ichi group to 26.5 percent for the Sumitomo group. Moreover, this percentage is much greater than that owned by any one group outside each keiretsu. Although the table indicates that the six keiretsu hold equity in one another, there is no evidence to suggest that these cross-holdings play an economic role. For example, while the other five keiretsu own more than 22 percent of a typical Mitsui firm, it is not clear that their role is the same as the one played by the shareholders who are affiliated with the Mitsui group.

Table 1 also shows that the Mitsui, Mitsubishi, and Sumitomo groups, direct descendants of the pre-war zaibatsu, have stronger equity ties than the Fuyo, Sanwa, and Dai-Ichi groups, which were formed after the war. Finally, an analysis of ownership from 1979 to 1989 reveals the same basic pattern as in Table 1.[4]

The central role of financial institutions in keiretsu firms is reflected in their ownership of equity in other member companies. Table 2 presents the percentage of equity owned by each group's shareholders who are also members of the same group and is broken down by financial and nonfinancial firms (for example, financial shareholders of Mitsui company that are also Mitsui group members).

In each group, holdings by financial firms are significantly smaller than holdings by nonfinancial investors; however, financial shareholders are more pervasive than nonfinancial shareholders. The disparity between the amount of shares owned by financial and nonfinancial investors probably results from the fact that the majority of financial investors are banks, which are allowed to hold a maximum of 5 percent of the equity of any one company.[5] As was the case in Table 1, the structure of ownership by financial and nonfinancial investors is very stable over time; the percentages reported in Table 2 are not very different from those in 1979 or 1984.

In addition to being the major shareholders of group firms, affiliated financial institutions also are the single largest source for the group firms' loans. In 1989, keiretsu financial firms made between 19 percent (Dai-Ichi) and 35 percent (Sumitomo) of the loans to their member firms. As before, the three groups that

TABLE 1

Keiretsu's strong equity ties

	Percent of shares owned by top 10 shareholders, 1989					
	Mitsui	Mitsubishi	Sumitomo	Fuyo	Sanwa	Dai-Ichi
Shareholder						
Mitsui	25.50	3.61	3.45	4.31	3.21	4.31
Mitsubishi	4.02	24.60	3.38	4.63	4.07	4.48
Sumitomo	3.53	3.53	26.51	4.04	3.47	4.03
Fuyo	5.47	3.72	3.84	17.24	3.22	4.28
Sanwa	5.15	4.89	5.02	4.59	18.61	5.02
Dai-Ichi	4.16	4.37	5.48	4.90	8.51	14.84
Independent[a]	9.17	8.74	8.55	12.66	12.18	15.43
Same Group[b] / Independent	0.81	0.85	0.89	0.49	0.54	0.40

SOURCE: *The Japan Company Handbook* (1979-1990).
[a]Investors that do not belong to any of the six keiretsu groups.
[b]The ratio of the amount of shares owned by firms in each group to the amount of shares owned by independent firms.

TABLE 2

Within-group ownership of equity and debt

	Equity				Debt
	Nonfinancial firms' ownership of other firms in the same group		Financial firms' ownership of other firms in the same group		Loans to other firms in the same group
	(% of total shares)	*(number of companies owned)*	*(% of total shares)*	*(number of companies owned)*	*(% of total loans)*
Keiretsu					
Mitsui	22	69	11*	170	29
Mitsubishi	15	68	15	212	33
Sumitomo	22	72	12*	182	25
Fuyo	15	32	12	155	28
Sanwa	17	35	10*	142	23
Dai-Ichi	15	42	7*	86	19

SOURCE: *The Japan Company Handbook* (1979-1990).

NOTE: *Indicates cases where the percentage of equity owned by financial shareholders is different from that owned by nonfinancial shareholders at the 5 percent significance level.

are the historical extensions of the former zaibatsu, Mitsui, Mitsubishi, and Sumitomo, on average have stronger debt ties than the newer groups.

Comparison of the performance of keiretsu and independent firms

Are the differences in the ownership structures of keiretsu and independent firms reflected in their performance? In particular, are these firms significantly different from each other in terms of their size, earnings, dividends paid, and stock market performance? Table 3 provides data on these variables and their statistical significance for the sample of keiretsu and independent firms. Financial and nonfinancial firms are examined separately because financial firms operate under stricter regulation and government guidance.

As the table indicates, nonfinancial keiretsu firms are larger than nonfinancial independent firms, as measured by their total assets. Although the asset growth rates among nonfinancial keiretsu and independent firms did not differ significantly in any one subperiod, during the overall period from 1977 to 1989, nonfinancial keiretsu firms grew at a slower rate than nonfinancial independent firms.

In contrast, total assets of financial keiretsu and independent firms are not significantly different, yet the growth rates do differ. Except for the period from 1986 to 1989, the assets of keiretsu firms increased at a greater rate. Furthermore, for both keiretsu and independent firms, nonfinancial firms had significantly lower growth rates, as well as lower levels of assets, than financial firms.

The differences between financial and nonfinancial firms can be attributed to the scope of businesses in each type of firm and the central role of financial institutions in the keiretsu. First, nonfinancial firms cover a wider range of businesses than financial firms so that the shocks they are subjected to are more varied. On the other hand, financial companies are subject to the same types of shocks, which tends to make them more uniform than nonfinancial firms. Second, the close, long-term ties between keiretsu financial institutions and other members of the group may play a role in their asset expansion. As the nonfinancial companies of the group grow, the demand for funds by these companies may result in asset growth for the financial firms. The results of a study by Dohner, Lowrey, and Terrell (1990) support this hypothesis. They compare the activities of keiretsu and inde-

TABLE 3

Financial performance

	Nonfinancial		Financial	
	Keiretsu	Independent	Keiretsu	Independent
Average total assets *(in billions of yen)*				
1977-1989	319.3*	109.5	9,458.7	6,085.6
1977-1981	254.5*	85.7	5,003.0	3,758.6
1982-1985	332.5*	117.1	9,592.3	6,328.9
1986-1989	407.8*	183.3	16,292.3	9,581.5
Average annual change in total assets *(percent)*				
1977-1989	7.22*	8.72	16.35*	12.39
1977-1981	6.80	7.86	14.69**	10.83
1982-1985	5.40	5.92	18.43*	11.81
1986-1989	8.87	9.92	16.34	14.95
Average level of earnings per share *(in yen)*				
1976-1989	16.69*	24.29	28.63	37.73
1976-1980	14.67*	23.61	21.77	30.14
1981-1985	17.21*	26.01	25.01	32.16
1986-1989	18.72	23.57	41.73	55.02
Average annual stock returns *(percent)*				
1977-1989	22.72	23.00	22.92	21.06
1977-1980	17.67*	10.02	4.91	2.10
1981-1985	14.87	14.60	31.07	25.27
1986-1989	37.22*	44.91	31.13	34.59
Payout ratios[a] *(percent)*				
1980-1989	47.77	39.99	34.47	34.22
1980-1984	46.04	42.51	40.84	37.13
1985-1989	49.48	37.46	28.11	31.21
Price-earnings ratios[a] *(in yen)*				
1980-1989	58.88	58.34	56.17*	41.97
1980-1984	28.75	27.41	34.88*	23.06
1985-1989	89.90	89.33	77.45**	61.31

SOURCE: *The Japan Company Handbook* (1976-1990); *Handbook on Stock Prices* (1976-1990).

[a]The denominator of these ratios is the five-year moving average of earnings per share.

*Denotes cases where keiretsu firms are different from independent firms at the 5% significance level.

**Denotes cases where keiretsu firms are different from independent firms at the 10% significance level.

pendent banks that operate in the U.S. They find that lending in the U.S. by keiretsu banks is sensitive to Japan's GNP, while it is not for independent banks. It is likely that keiretsu banks are sensitive to Japan's GNP because of the demand for loans by their "captive" clientele, the other keiretsu firms.

Table 3 also shows that while earnings of nonfinancial keiretsu companies in general are significantly lower than earnings of nonfinancial independent firms, there are no significant differences in earnings between financial keiretsu and independent firms.

Comparing financial and nonfinancial firms within keiretsu and independent groupings does reveal significant differences. Within keiretsu, the earnings of financial firms were significantly higher than the earnings of nonfinancial keiretsu firms during the overall period, as well as the 1986-1989 subperiod. For independent companies, the earnings of financial firms were significantly higher than those of nonfinancial firms only during the 1986-1989 period. These results suggest that financial firms benefited more from the deregulations that took place in the late 1980s than nonfinancial firms. Given that most of the liberalization occurred in the financial markets, it is not surprising that earnings of financial firms experienced greater growth than those of nonfinancial firms.

In addition, the data presented in Table 3 show that during the whole period from 1977 to 1989, there are no significant differences in the stock returns of keiretsu and independent firms—financial or nonfinancial. But an interesting pattern emerges in the subperiod comparison. From 1977 to 1980, keiretsu nonfinancial firms had significantly higher returns than independent firms. These differences disappeared in the period from 1981 to 1985 and reversed their pattern in the 1986-1989 period. During the bull market of 1986-1989, when the Nikkei 225 index rose from 13,113 to 38,916, nonfinancial keiretsu firms had significantly lower returns than independent firms. In effect, since 1981 the stock prices of independent nonfinancial firms appreciated more than the stock prices of keiretsu firms.

Table 3 also shows that the price-earnings (p-e) ratios of keiretsu financial firms are significantly higher than those of independent financial firms. There are two possible reasons for higher price-earnings ratios of keiretsu firms. First, if keiretsu financial firms have more extensive shareholdings than independent firms, then their stock prices would reflect not only the value of the firms' ongoing operations but also the value of any equity they hold. The stock prices of firms with more extensive equity holdings would capitalize the earnings of companies that they own stock in, resulting in higher p-e ratios. Second, the earnings of keiretsu financial firms may be expected to grow faster. In that case, the stock prices and the p-e ratios would reflect the higher growth potential of these firms.

To sum up, nonfinancial keiretsu firms are larger companies that have slower rates of growth and lower earnings than nonfinancial independent firms. On the other hand, financial keiretsu firms are comparable in size to financial independent firms, but have higher asset growth rates. Moreover, financial keiretsu firms have higher price-earnings ratios then independent financial firms. There are also significant differences among financial and nonfinancial firms within the keiretsu and independent groups. In general, financial firms are larger, faster growing companies with higher earnings than nonfinancial firms.

The corporate bond market

During the 1980s there have been several developments in the Japanese bond markets that have the potential to weaken keiretsu ties. Until the late 1970s, regulations severely restricted the size of the corporate bond markets in Japan. Consequently, banks were the major source of external funds for corporations. The pattern of financing, however, has changed in the 1980s.

Beginning with the relaxation of interest rate ceilings on corporate bonds in 1978, the government has steadily loosened many of the restrictions that made it difficult to raise capital in the bond markets. Probably the most important deregulatory move was in 1983 when firms were allowed to issue unsecured bonds.[6] Since 1981 Japanese firms also have been permitted to issue warrant bonds that give the investor the option to buy the company's stock at the "exercise price" during a specified period of time.[7]

During the 1980s Japanese firms also gained greater access to the offshore debt markets. Regulations requiring government permission before issuing foreign bonds were re-

moved. Consequently, funds raised overseas as a proportion of total funds raised in the capital markets increased from approximately 26 percent in 1980 to 55 percent in 1986. As Japanese firms started to issue bonds in the overseas markets in increasing numbers, the government relaxed the restrictions on the issuance of domestic bonds to attract some of the issues back to Japan.[8]

As a result, the percentage of funds raised in the bond markets, both domestically and overseas, increased from 58 percent of all funds raised in the capital markets in 1980 to 84 percent in 1987. The largest increases were in the issues of convertible and warrant bonds; the share of these equity-related bonds in all bond issues increased from 34.4 percent in 1980 to 84.6 percent in 1987.

At the same time, corporations reduced their bank borrowings. Hoshi, Kashyap, and Scharfstein (1989) report that total bank borrowing by keiretsu firms as a proportion of total debt decreased from 93 percent in 1977 to 88 percent in 1986. During the same period, the proportion of borrowing from group firms decreased from 31 percent to 29 percent of total bank borrowing.

The liberalization of financial markets in Japan during the 1980s and the resulting changes in corporate behavior might have direct implications for the keiretsu system. The decline in the importance of bank loans, coupled with the increase in the convertible and warrant bond issues, has the potential to weaken the strong keiretsu ties. First, the reduction in bank loans from group banks means that one of the most distinctive features of the keiretsu ties is loosened. Second, if convertible and warrant bonds issued by the keiretsu firms are purchased by investors outside the keiretsu system, then as the warrants are exercised, the cross-holdings of shares among keiretsu firms are diluted. If, on the other hand, these bonds are purchased by the members of the keiretsu, then the equity ties among keiretsu firms would not be altered. In that case, keiretsu firms would be changing the composition of their debt portfolio without weakening their group ties. The equity holdings of keiretsu firms over the past five years indicate that there has not been a significant decline in their equity ties.

Another interesting question is: Who benefited the most from the deregulations that took place in the bond markets? Table 4 indicates nonfinancial independent firms issued more bonds, as a percentage of assets, than nonfinancial keiretsu firms. For convertible

TABLE 4

Convertible and warrant bond issues
(Percent of assets)

	Nonfinancial		Financial	
	Keiretsu	Independent	Keiretsu	Independent
Average issues				
Convertible bonds				
1976-1989	19.20	20.27	1.85	2.05
1976-1979	6.78	7.75	0.00	0.00
1980-1984	4.24*	6.39	1.55	0.00
1985-1989	8.25*	11.23	0.32	0.47
Warrant bonds				
1980-1989	13.70*	20.69	2.55	1.69
1980-1984	2.92	2.66	1.63	1.62
1985-1989	7.37*	10.98	1.36	.98

SOURCE: *The Japan Company Handbook* (1976-1989), and *The 1989 Handbook on Bonds and Debentures* (1989).

NOTE: These figures are normalized by total assets of the firm.

*Denotes cases where keiretsu firms are different from independent firms at the 5% significance level.

bond issues, the differences were significant in all periods; for warrant bond issues, the differences were significant in all periods except for the 1980-1984 period. In contrast, there are no significant differences among financial keiretsu firms and financial independent firms with respect to their average issues of convertible and warrant bonds.

The economic role of keiretsu

Industrial groups played an important role in the rebuilding of the Japanese economy after WW II. Group banks were the major source of funds for member firms when capital was in short supply. Trading companies were instrumental in the overseas expansion of group firms by obtaining imported raw materials and developing overseas markets for group firms. In other words, the industrial groups were important in developing Japan's infant industries during a period when the Japanese economy was highly regulated and was isolated from the international markets. Today, Japan is one of world's strongest economies and Japanese companies are some of the most competitive in their field. Therefore, it is unlikely that the current economic role of keiretsu is the same as it was during the high growth period.

The keiretsu system can play three possible roles. First, the keiretsu system may be a cartel-like organization that limits competition. Group firms may act in concert to maximize joint profits and earn monopoly rents. For example, they may organize a network of buyer-supplier relationships and differentiate between group firms and outsiders in their business deals. Such a cartel-like organization requires a high degree of coordination and enforcement, since some of the firms would be hurt by the arrangement, at least some of the time.

The keiretsu system may also serve to diversify industry-specific shocks. In a group where members are from a wide range of industries and hold each other's equity, the costs of a negative industry-specific shock would be shared by all firms in the group, minimizing the cost to any one company. If keiretsu firms minimize the costs of such industry-specific shocks, then their earnings will be more stable. Managers of firms may prefer more stable earnings if their performance is judged not only on the level of earnings but on their variance also. Furthermore, volatile earnings, through the uncertainty they create, may lead to higher transaction costs for the firm.

Finally, the results of recent studies indicate that the keiretsu system may play an important role in reducing costs associated with capital market imperfections. In perfect capital markets, all agents would have the same information so that they can write enforceable contracts that are contingent on all possible actions of the agents. In reality, however, some agents are better informed than others which increases the cost of transactions. The agency theory of firms, for example, predicts that shareholders of a leveraged firm have incentives to transfer wealth from debt-holders to themselves by taking on excessively risky projects.[9] Recognizing the potential for transfer of wealth, debtholders would require a higher return on their investment; that is, they would raise the cost of capital to borrowers.

Kim (1990) shows that in a financial system where debtholders can also hold equity, the optimal contract between a firm and its creditors is one that comprises both debt and equity holdings. With the optimal contract, creditors can monitor the activities of the firm more effectively. Through their role as shareholders, creditors can be better informed about the decisions of the management. In addition, if lenders hold equity, then the incentives for wealth transfers by other shareholders are reduced, since the lender would share the benefits of any such transfer.

Prowse (1990) presents evidence on the effectiveness of the keiretsu system in reducing agency costs. He argues that the financial organizations in keiretsu avoid agency costs by taking both equity and debt positions in group firms. Prowse finds a strong correlation between variables that proxy for measures of agency costs (such as R&D expenditures and amount of assets that are not tied up in fixed plant and equipment) and the amount of wealth invested in group firms in the form of equity and debt. Prowse's results also indicate that agency costs are reduced to a greater extent in Japan than in the U.S.

In addition to the incentive problems emphasized by the agency theory, there are information asymmetries between managers of a firm and investors in the market, a capital market imperfection first emphasized in Myers and Majluf (1984). Sometimes, the managers, who are better informed about the prospects of

the firm, may feel that the equity of the firm is underpriced. Such information asymmetries, along with potential conflicts of interest between debtholders and shareholders, would raise the cost of external finance relative to internal sources of funds. In such instances, a firm's investment would be highly sensitive to its cash flow.

The results of two recent studies show that the keiretsu system may be effective in circumventing such problems associated with information asymmetries. Hoshi, Kashyap, and Scharfstein (1990a) examine the investment behavior of keiretsu firms and independent firms. The authors find that investment by independent firms is more sensitive to liquidity than investment by keiretsu firms, suggesting that information asymmetries are important and that industrial groups are effective in avoiding problems associated with such capital market imperfections.

In a second study, Hoshi, Kashyap, and Scharfstein (1990b) analyze the investment behavior of keiretsu firms that recently loosened their ties with the group's main bank. They find that investment by these firms has become more sensitive to cash flow since they left the group. This result supports the authors' earlier conclusion that a keiretsu firm's ties with its ''main bank'' may mitigate information problems.

Furthermore, the data on bonds in Table 4 offer additional support. If independent firms are more cash constrained than keiretsu firms because they lack the close ties to the group banks, then it is not surprising that independent firms issue more bonds. It is likely that before the deregulation of the bond markets, the cost of funds for independent firms was higher. So they had more to gain from deregulation and took better advantage of it.

Hoshi, Kashyap, and Scharfstein (1990c) also examine the role of the keiretsu system in ameliorating the problems of member firms that are in financial distress. They argue that transaction costs in renegotiating the terms of financial instruments, information asymmetries, and free-rider problems among the different claimholders (suppliers, customers, and so forth) all work to exacerbate the cost of financial distress. The authors point out that the ties among keiretsu firms may help reduce the costs of distress. Since group banks hold both equity and debt in affiliated firms, they may not have the same information problems as the debtholders of unaffiliated firms. In addition, the financial institutions of keiretsu hold the majority of the group's debt. The concentration of debt among a small number of investors reduces the transaction costs of renegotiating. Furthermore, cross–holdings of equity among member firms that also have product market ties may reduce free-rider problems. Hoshi, et al. (1990c), analyze investment and sales in financially distressed keiretsu and independent firms to determine the costs of financial distress. They find that investment and sales of keiretsu firms are higher than those of firms that have dispersed claimholders. This result also holds true for independent firms that have small numbers of debtholders.

Given that Japan's ''main bank'' system provides important services to its members, what are the implications for the U.S.?

There are explicit and implicit restrictions on the ability of American firms to form groups like keiretsu. The most explicit restriction is the Glass-Steagall Act, which separates commercial and investment banking. The Act prohibits American banks from owning equity for their own accounts. (Although Article 65 of Japan was explicitly patterned after the Glass-Steagall Act, it allows a Japanese commercial bank to own up to 5 percent of any one company's equity.) Likewise, regulations limit the types of stock the large institutional investors, such as insurance companies and pension funds, can own.

Furthermore, there are implicit costs if debtholders of U.S. firms actively participate in the management of a company. For example, under U.S. law, creditors that participate in the management of a company lose their priority in the bankruptcy proceedings.[10] Similarly, creditors that are involved in the management of a company may be held liable for the actions of the management. These implicit costs may limit the ability of American banks to monitor the activities of the management.

Because of U.S. laws that impose explicit and implicit costs for holding both debt and equity in a firm, U.S. firms tend to face higher costs of debt and are likely, therefore, to have lower debt-equity ratios than Japanese firms in general, and keiretsu firms in particular. During the 1980s, however, the patterns of financing have been changing for both countries.

Increasingly, firms in the U.S. rely on private capital markets, where the ownership of equity is concentrated in a few institutions or manager/owner/creditors of leveraged buy-outs. In addition, American firms increasingly prefer private placement of their debt, as opposed to going directly to capital markets, which concentrates the debt of these firms in the hands of a few bondholders.

Japanese firms, by contrast, have been moving away from concentrated bank loans toward diffuse bond financing. However, it is not clear that the trend toward increased bond financing during the 1980s has led to the weakening of keiretsu ties. Furthermore, the form of financing is still changing in both countries. During the first ten months of 1990, the stock prices in Tokyo (as measured by the Nikkei 225 index) have declined by approximately 36 percent. At the same time, Japanese issues of equity–related bonds have declined significantly and, for the first time since 1986, the level of bank loans have increased.

Conclusions

This study examined the differences between Japanese firms that are affiliated with the six major industrial groups called keiretsu and those that have no group affiliations. The results showed that keiretsu firms own a significantly higher percentage of group shares than independent firms. The financial institutions of the groups, which in 1989 supplied 28 percent of the total bank loans to group firms, were major shareholders in the other group firms, typically holding 21 percent of equity.

The study also found significant differences between nonfinancial keiretsu and independent firms with respect to their size (keiretsu firms are larger than independent firms), earnings (nonfinancial independent firms had significantly higher earnings per share), and stock returns. In effect, during the 1980s, the role of the independent firms in the Japanese economy has been increasing.

Moreover, the financial firms in each group display characteristics different from those of nonfinancial companies. Although asset size was similar between keiretsu and independent financial firms, keiretsu firms had significantly higher asset growth rates. In addition, financial keiretsu firms had significantly higher price-earnings ratios than financial independent firms.

The data also showed that within each group there are significant differences between financial and nonfinancial keiretsu firms. In general, financial firms are larger, faster growing companies with higher earnings.

The data on the convertible and warrant bond issues of these firms showed that keiretsu firms have been less quick to take advantage of the deregulation in these markets than independent firms.

In contrast to the popular belief that the only role of the keiretsu system is to restrict competition, the results of other studies reviewed here indicate that the keiretsu system, with its close financial ties among members, is effective in mitigating the agency costs and problems associated with asymmetric information. It is likely that the keiretsu system plays an important role in explaining the differences in the financial and investment behavior of Japanese and American firms.

FOOTNOTES

[1] The ten groups are Mitsui, Mitsubishi, Sumitomo, Yasuda, Nissan, Asano, Furukawa, Okura, Nakajima, and Nomura.

[2] The newer groups, however, include some of the companies from the former zaibatsu. For example, some of the Yasuda zaibatsu companies belong to the Fuyo group and Furukawa group companies are associated with the Dai-Ichi group.

[3] The Japanese financial system is highly compartmentalized into groups that traditionally have segmented business activities. There are four types of banks: city banks, long-term credit banks, trust banks, and regional banks. City banks supply short-term capital to large companies and have limited deposit activity. Long-term credit banks, on the other hand, provide long-term loans to business and raise funds through debentures. Regional banks provide funds to small to medium-size enterprises and have the most extensive retail deposit network. Trust activities are provided by the trust banks that also provide long-term credit to companies. For a detailed description of the Japanese banking system, see Federation of Bankers Associations of Japan (1989).

[4] See Genay (1990), where all the analyses here were also carried out for the years 1979 and 1984.

[5] For each group, the number of top ten shareholders that are banks is 104, 118, 110, 98, 91, 50, and 161 for the Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, Dai-Ichi, and Independent groups, respectively.

[6] Prior to 1983, all bond issues had to be collateralized by the assets of the issuing firm. Furthermore, the banks guaranteed all of the issues and were forced to buy all outstanding bonds at par in cases of reorganization.

[7] The warrants on these bonds have been detachable since 1985, although the secondary market for them is small and illiquid.

[8] For a concise description of the issue requirements, see Karp and Koike (1990) and Kaneko and Battaglini (1990).

[9] See Myers (1977) and Jensen and Meckling (1976).

[10] See, for example, Prowse (1990) p. 10.

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