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From 1990 to 1993, the typical firm on the Tokyo Stock Exchange lost more than half of its value, and banks experienced severe adverse shocks. We show that firms whose debt had a higher fraction of bank loans in 1989 performed worse from 1990 to 1993 and also invested less than other firms did. This effect holds when we control for variables that affect firm performance. We show further that exogenous shocks to banks during the negotiations leading to the Basle Accord affected bank borrowers significantly.

I. Introduction

The banking literature emphasizes the benefits of bank relationships. These relationships enable firms to raise capital that they otherwise would not be able to obtain through public markets. This is because they can convey information to banks that they cannot credibly communicate to the capital markets and because banks learn information through interactions with firms that they can use to monitor borrowers.[1] Some have argued

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1. See Fama (1985). In Diamond (1991) the distinguishing feature of bank loans in contrast to public debt is that they are monitored loans. See, also, Hoshi, Kashyap, and Scharfstein (1993) for a model of choice between bank debt and public debt.

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that, as a result of the benefits of bank relationships, corporate governance systems that are bank centered can have substantial advantages in solving information asymmetry and agency problems.[2]

Banking relationships have a dark side, however. As a firm works more closely with a bank, it finds it harder to raise funds through other means and may be held up by the bank. In Rajan (1992) this implies that banks earn quasi rents from their existing borrowers. Part of the problem is simply that if a firm is known to obtain funds from a bank, the fact that it is trying to raise funds away from the bank could mean that the bank does not want to provide the funds because it has adverse information about the firm. Even if this is not an issue, however, the fact that the firm has had a close relationship with a bank means that it has not cultivated alternative financing channels, and, therefore, these channels may not be available. This suggests that there are benefits to firms in diversifying their financing sources. However, this is harder to do in economies where alternatives to bank financing are restricted and not well developed.

In this article, we explore the dark side of bank relationships by studying how borrowers in Japan are affected when banks experience large shocks. We show how a firm's bank dependence in 1989 affected its performance during the asset price deflation of the early 1990s. Japan is an interesting country because banks play a more important role in the financing of corporations than they do in the United States, so that we should be better able to identify the impact of shocks to the banking sector on firms than if we looked at countries where banks are less important. Before the 1980s Japanese corporations were almost exclusively bank financed. They were less so at the beginning of the 1990s, but banks still played a more important role for Japanese firms than they do for U.S. firms.

In the early 1990s the Japanese banking sector started facing considerable problems limiting its ability to renew loans and extend new loans to firms. These difficulties even led to an infamous Japanese premium on the Euro-markets, where Japanese banks had to pay a premium for their funding compared to other banks. If strong reliance on bank finance makes it harder to access alternate sources of funding, one would expect firms more dependent on bank finance before 1990 to be forced to contract investment more and to have more adverse stock price performance than firms that relied less on bank finance before 1990. We show that firms that were more bank dependent suffered significantly larger wealth losses during the first 3 years of the 1990s when the Japanese stock market fell dramatically. One way to understand the importance of this effect is as follows. The typical firm on the Tokyo Stock

2. See, e.g., Thurow (1993).

Exchange (TSE) experienced a loss of about 57% from 1990 to 1993. Keeping all other firm characteristics unchanged, we find that the return of a firm with no bank loans exceeded the return of a firm with only bank loan financing by about 26%. It is important to note that this is not a leverage effect. What matters for the performance of Japanese firms in the early 1990s is the fraction of their financing in the form of bank loans, rather than their leverage.

An obvious concern with our approach is that we might confuse cause and effect. First, it could be that banks and firms suffered from a common shock and that bank dependence proxies for exposure to that common shock. Second, it could be that firms that are more bank dependent are firms that are more exposed to the business cycle, so that they do better in boom periods and worse in recessions. Third, because of the deregulation of the Japanese financial system, it could be that the firms that were most bank dependent in 1989 were bad firms that suffered during the asset deflation because they were fragile from the start. We explore these three possible explanations for our results. We present evidence showing that these three alternative explanations are not sufficient to explain our evidence. We also provide auxiliary evidence showing that news about negotiations concerning the Basle Accord on capital requirements affected bank borrowers in Japan. None of the three alternative explanations discussed here can explain this striking result.

In an earlier article Gibson (1995) explores the impact of main bank health on investment of Japanese firms for the period from mid-1991 to mid-1992. His study focuses on the impact of the identity of the main bank rather than on the importance of bank loans for firms. He shows that a firm with a main bank rated AA− invests 30% less than one with a main bank rated AA+. However, this effect does not seem to be tightly associated with the financial health of the main bank as captured by its credit rating. The lowest rating in his sample is AA−. For instance, two banks rated AA−, Daiwa Bank and Asahi Bank, have significant effects on investment of equal magnitude but opposite sign. We take the view that the whole banking sector in Japan experienced difficulties, so that high bank dependence was costly for a firm irrespective of main bank identity. We show that firms that were more bank dependent cut investment back more substantially during the 1990–93 period. In research showing that bank relationships have costs as well as benefits, Weinstein and Yafeh (1998) show that Japanese firms with a main bank had higher costs of funds during their sample period.

The article proceeds as follows. In Section II we explain our main experiment and the conditions that must be met for the experiment to allow us to investigate the dark side of banking relationships. In Section III we provide an empirical model that helps us understand the cross-sectional variation in stock performance in Japan from 1990 to 1993,

ignoring bank debt. In Section IV we then extend our model to take into account the role of bank debt. In Section V we investigate whether bank financing affected investment directly. In Section VI we provide confirmatory evidence investigating the abnormal returns associated with adverse announcements of the Basle Accord negotiations, and Section VII presents concluding remarks.

II. Banks, the Crash, and Firm Value

The hypothesis we want to test is that bank performance affects firms that rely heavily on banks for their financing. We test this hypothesis for Japan, which is a bank-centered system. In a bank-centered system, poor bank performance should be more costly simply because firms have fewer alternatives to bank financing. In such a system, firms obtain most of their external financing from banks with which they have established a relationship. These banks are particularly knowledgeable about their borrowers and can monitor these borrowers closely because they provide other financial services to them. If banks are forced to curtail lending for whatever reason, their borrowers will have to turn to more expensive sources of external finance. If the banking sector as a whole faces difficulties, firms can only turn to the capital markets for funding.

Using the capital markets for external funding presents several difficulties. First, although the banks that finance the firm may be doing poorly, investors cannot be absolutely certain that the firm is not financed by the bank because the bank must curtail lending rather than because the bank has adverse information. Second, capital market investors will not have access to the information that the bank has and are, therefore, likely to discount firm value to protect themselves. Third, as the firm changes its mix of financing, the decrease in monitoring by banks may not be replaced by an increase in monitoring from other capital providers. Fourth, the firm may be highly leveraged because the flexibility of bank financing enables it to restructure debt easily if it experiences difficulties and hence decreases the costs of financial distress associated with leverage. However, capital market financing does not have the same flexibility. This means that the firm's existing level of leverage may be excessive if the firm has to rely on capital market financing in the future.

With these arguments, firm value should fall when a firm's banks experience difficulties that force them to contract credit growth. Our hypothesis that bank distress is costly to borrowers has the following implication for Japan. Banks became progressively weaker during the 1990–93 period. One would expect, therefore, that more bank-dependent firms, everything else being equal, lost more value during that period because the weakness of banks made it harder and more expensive for these firms to raise funds. Our test of the hypothesis is, there-

fore, that greater bank dependence is associated with poorer stock market performance over the period where banks experienced adverse shocks that sharply decreased their value. It is important to emphasize that our experiment does not imply the existence of a profitable trading strategy. With efficient markets the successive adverse shocks that affected Japanese banks were not forecastable during the period that we studied. Hence, the losses in borrower value that we document could not be anticipated.

There is an important difficulty with our approach. Suppose that a negative shock occurs that reduces future cash flows for nonfinancial firms. With this shock, borrowers become less creditworthy, bank loans lose value, and banks reduce lending because there are fewer good projects to finance. If firms that are more bank dependent are more exposed to this negative shock, one would find the result that firms that are more bank dependent perform less well than other firms, but this result would have nothing to do with the value of bank relationships. We call this problem the ''spurious correlation problem.'' One might be tempted to dismiss this problem by arguing that shocks to firms should be unrelated to their bank dependence, so that there would be no correlation between bank dependence and firm performance. This need not be true, however. It could be that firms more sensitive to the business cycle have more bank loans for at least two reasons. First, because bank loans can be renegotiated more easily than public debt, firms that are more vulnerable to the business cycle might find it optimal to use bank loans. Generally, younger firms rely more on bank loans, and these might be the most vulnerable firms. Second, financial deregulation in Japan meant that better firms were allowed to access capital markets, while weaker firms were not. As a consequence one has to worry that the firms that were more bank dependent in the early 1990s were weaker firms from the start. Such firms would have greater leverage, so that a shock to cash flows would have a greater impact on equity value.

With the spurious correlation problem banks would perform poorly because they are affected by the same shock that affects bank-dependent firms. There is evidence that exogenous factors forced banks to contract credit. Credit growth fell dramatically from an average annual growth rate of 17% from 1986 to 1990 to an annual growth rate of 6.7% from the fourth quarter of 1990 to the fourth quarter of 1991. For manufacturing firms, bank credit fell from 1990 to 1991. While one might argue that credit fell in Japan because of poorer prospects of Japanese firms, this seems at best a small part of the story in the early 1990s. Peek and Rosengren (1997) show that Japanese banks reduced credit in the United States and that this reduction is explained by difficulties of the banks at home. Hickock and Osler (1994) argue that ''the catalyst for the showdown in credit growth in 1991 . . . was

a tightening in monetary policy'' (p. 438). A major source of banking problems was the fall in land prices that seems to have been a largely exogenous phenomenon. Hickock and Osler (1994) argue that ''problems with credit losses from 1989 on, many associated with real estate loans, badly hurt bank balance sheets and, therefore, bank credit availability. Estimates of the magnitude of the problem loans eventually ranged as high as . . . 16 percent of total bank credit outstanding to the private sector'' (p. 439). The last problem facing the banking industry was the introduction of the Bank for International Settlements (BIS) capital adequacy rules adopted in 1988.[3] The BIS capital adequacy rules were implemented in Japan by the end of March 1993. With these standards, Japanese banks could count a fraction of the unrealized capital gains on their long-term holdings of shares of nonfinancial firms. Losses on these shares therefore forced banks to either raise new capital or contract their lending. Ito and Sasaki (1998) argue that ''banks with a lower capital ratio made less bank loans'' (p. 31). It is therefore plausible to view the Japanese experience as one where banks experienced a negative external shock that decreased their ability to lend to firms. With this view and the above arguments, firms that were more bank dependent suffered more from bank difficulties.

Although the evidence on the exogenous shocks affecting Japanese banks is helpful to our interpretation of our results, it is not sufficient to dismiss the spurious correlation problem. This is because banks could have chosen to lend less to more bank-dependent firms simply because these firms were weaker. Throughout the article, we therefore must pay close attention to the spurious correlation problem. We provide two types of evidence that we believe makes our interpretation of the evidence convincing. First, we control for exposure to shocks extensively, so that we are less likely to confuse the impact of bank dependence with the impact of adverse shocks to firms unrelated to bank performance. Such a way to deal with a spurious correlation problem suffers from the argument that there are shocks for which we do not control because we do not know what they are, and if we knew what they were, our results would change. This seems an unconvincing concern, but to put it to rest we provide an experiment where this concern is completely implausible. We investigate the performance of borrowing firms around announcements concerning the negotiations of the Basle Accord. This second experiment is not as economically dramatic as is the first, but it has two important advantages that make it interesting. First, this second experiment clearly includes only events that are exogenous. It would be completely implausible to argue that the perfor-

3. Marsh and Paul (1997) argue that the BIS rules were the major determinant of the loan problems of Japanese banks. Ito and Sasaki (1998) provide references to a number of studies evaluating the impact of the BIS rules on Japanese banks.

mance of Japanese firms on event days caused the announcements concerning changes in capital requirements! Second, this second experiment takes the form of an event study, so that the results are less likely to be affected by misspecifications of the model of expected returns.

III. The Cross-Sectional Determinants of Firm Performance during the Japanese Crash

Throughout the study we use the Pacific-Basin Capital Markets Research (PACAP) database. We eliminate utilities and financial companies. Our main sample consists of 1,380 firms for which return data are available for the period 1986–93. In addition, we require each firm to have stock prices available in monthly files for at least 24 months from 1986 to 1989 and at least 24 months from 1990 to 1993. Requiring data to be available for the whole period creates a survival bias. However, for Japan, this is essentially a nonissue because so few firms drop out of the exchanges. From 1986 to 1993, only 30 firms delisted from the TSE. This is a trivial number in comparison to our sample of 1,380 firms. We use buy-and-hold returns.

The 1,380 firms in our sample experienced an average loss in equity value of 51.72% and a median loss in value of 57.03% during the 1990–93 period (the crash period). In other words, the typical firm lost slightly more than half of its value. This large wealth loss followed an equally large increase in value during the second half of the 1980s. From the beginning of 1986 to the end of 1989 (the boom period), the average wealth gain was 238.08% and the median wealth gain was 208.06%. As a result, the typical firm doubled in value from 1986 to 1989 and lost slightly more than this wealth gain from 1990 to 1993.

It is interesting to note that there is less cross-sectional variation in the 1990–93 period than in the 1986–89 period. From 1986 to 1989, the firm with the lowest return lost 48.47% and the firm with the highest gain had a return of 2,034.97%. The standard deviation of returns is 188.91%, which is 79% of the mean return. In contrast, from 1990 to 1993, the worst loss was 98.11%, and the largest gain was 160.25%. The standard deviation for returns is 24.49%, which is about 47 percent of the average return. This is consistent with the existence of important common factors across firms during the 1990–93 period.

In the remainder of this section, we attempt to understand better the cross-sectional variation in returns during the 1990–93 period. We therefore pursue the strategy of regressing returns during the 1990–93 period on variables observed in 1989 that are expected to affect firm returns differently during that period.[4] We consider two alternative ex-

4. Throughout the article variables observed in 1989 are observed at the end of the firm's fiscal year in 1989. Since the fiscal year for most Japanese firms ends in March, this means that for most firms the variables are observed at the end of March 1989.

planations of the crash that can be investigated cross-sectionally. One explanation is the bubble explanation. With this explanation, for some reason, stock prices increased too much in the 1980s, and the crash was a correction. This explanation implies that there should be a relation between a firm's stock price increase in the second half of the 1980s and the fall of the stock price in the beginning of the 1990s. The second explanation is that there was a shock to investment opportunities, so that investments made in the second half of the 1980s ceased to be profitable. With this hypothesis, expected cash flows fell unexpectedly and/or discount rates increased unexpectedly. This hypothesis implies a larger fall for more highly leveraged firms and for firms that invested more in the 1980s; in contrast, firms with more cash would have a lower drop in the value of their equity. We turn first to the bubble hypothesis, which implies a reversal. It is important to note, however, that firms that did better in the second half of the 1980s could do worse subsequently simply because of the contrarian effects in stock returns that have been emphasized in the asset pricing literature. The first regression in table 1 regresses crash returns on boom returns. The coefficient on past returns is quite significant. However, this effect explains a relatively small fraction of the cross-sectional variation of returns. The R^2 is 6.19%. To put things in perspective, consider the impact of a return that is 1 SD greater than the mean during the late 1980s. As we just saw, the standard deviation was 188.91%. This amounts to an additional loss of 6%. Such an effect is not strong evidence of a bursting bubble, but it is perfectly consistent with the contrarian literature.

One might argue that our result is perfectly consistent with the Capital Asset Pricing Model (CAPM) using the Japanese stock market as the market.[5] During 1986–89 the market performed well, so that high beta stocks had better performance on average than low beta stocks. Hence, when we regress returns during the period 1990–93 on past returns, we effectively regress returns on beta. If the beta is constant over time, since the market performed poorly during the period 1990–93, one would expect high beta stocks to perform poorly. To see whether the CAPM interpreted this way explains our results, we reestimated the regression controlling for the beta of stocks during the period of 1986–89 estimated with monthly returns. The coefficient on beta is −0.02 with a t-statistic of −1.74. The coefficient on the 1986–89 returns is unaffected and so is the adjusted R^2.

In the next regressions, we examined this reversion effect at the industry level. It turns out that for most industries, the reversal effect explains little. However, there are spectacular exceptions. Past returns

5. The assumptions that have to be met for using the CAPM this way are discussed in Stulz (1995).

TABLE 1 Cross-Sectional Implications of the Bubble Hypothesis

Sample (Sample Size)	Constant (*t*-statistic)	1986–89 Returns (*t*-statistic)	1989 Book-to-Market (*t*-statistic)	1989 Price-Earnings Ratio (*t*-statistic)	Adjusted R^2
All (1,380)	−.44	−.03	...	...	.06
	(−42.84)	(−9.54)			
Agriculture, forestry, etc. (16)	−.50	−.05	...	...	.29
	(−7.20)	(−2.68)			
Construction (110)	−.31	−.03	...	...	.04
	(−6.31)	(−2.37)			
Manufacturing (927)	−.45	−.03	...	...	.05
	(−36.07)	(−7.10)			
Real estate (19)	−.47	−.09	...	...	.55
	(−11.64)	(−4.84)			
Wholesale and retail (148)	−.39	−.05	...	...	.13
	(−11.74)	(−4.86)			
Service (38)	−.47	−.04	...	...	.05
	(−8.11)	(−1.71)			
Transportation and communication (80)	−.49	−.03	...	...	.31
	(−19.58)	(−5.98)			
All with data available for independent variables (1,305)	−.58	−.02	.42	−.00003	.11
	(−28.06)	(−5.50)	(8.10)	(−1.29)	

NOTE.—The data for this table are obtained from the PACAP database. Financial firms and utilities are excluded from the sample. Firms are required to be in the database from 1986 to 1993. The returns are buy-and-hold returns. The industry classification is the PACAP classification.

explain a large proportion of cross-sectional variation for agriculture, real estate, and transportation.[6] Real estate is the industry where past returns explain the most. The adjusted R^2 of the regressions is 55.42%. The R^2 for agriculture and transportation are, respectively, 29.14% and 30.56%. Somewhat surprisingly, the R^2 for construction is quite low, even though it is an industry related to real estate. Nevertheless, it seems from these results that land prices may have been more subject to a reversal effect than were stock prices. To pursue further the hypothesis that the negative returns were the result of possible irrational exuberance during the 1980s, we add two valuation variables observed in 1989, namely, the price-earnings ratio and the book-to-market ratio, which is the book value of equity divided by the market value of equity. The median price-earnings ratio for our sample at that time is 56.94. The median book-to-market ratio is 0.25. The regression shows that the price-earnings ratio is not statistically significant. Further, the coefficient is extremely small. The coefficient shows that a firm with double the median price-earnings ratio would have had lower returns of less than .20%. In contrast, the book-to-market coefficient is extremely significant, and its economic significance is similar to the economic significance of past returns in the earlier regression. One standard deviation of the book-to-market coefficient is 0.13. Consequently, a firm that has a higher book-to-market coefficient by 1 SD has a higher return of 5.5%.

We now turn to the second possible explanation. This explanation does not focus on reversal but, rather, on a shock to either expected cash flows or their discount rate. With this explanation, firms that have greater leverage should experience a greater loss in equity value. This is because the whole firm loses value, but the impact of this loss in a levered firm is more severe on equity as leverage increases. We therefore use debt to total assets as a measure of leverage. We also control for a forecast of cash flow, using past cash flow divided by total assets. If firms lose valuable investment opportunities, then firms where assets in place are more important should experience a less negative return. We have data on security holdings for investment purposes. To the extent that these holdings are shares, we would expect security holdings to affect stock returns adversely, since with this explanation share prices fall more than the present value of cash flows from operations. We control for the firm's ownership as a further control for whether the firm holds shares of other firms. We would expect some symmetry in share holdings, so that firms that hold more shares of other firms also have more of their shares held by other firms. We therefore control for ownership by other corporations as well as ownership by financial

6. Agriculture includes forestry, fishery, and mining. Transportation includes communications.

TABLE 2 Change in Fundamentals and Stock Returns

Explanatory Variable	Mean (Standard Deviation)	Estimated Coefficient (*t*-statistic)
Constant	. . .	−.73
		(−8.58)
Equity return for 1986–89	2.38	−.02
	(1.88)	(−4.60)
Keiretsu membership dummy variable	.49	−.04
	(.50)	(−2.50)
Logarithm of total assets	11.06	.02
	(1.34)	(3.91)
Ownership by other corporations	.32	−.10
	(.18)	(−1.63)
Ownership by financial companies	.34	−.11
	(.16)	(−1.42)
Debt to total assets	.65	−.08
	(.18)	(−1.36)
Book-to-market ratio	.26	.32
	(.13)	(4.76)
Price-earnings ratio	100.3	.00001
	(314.2)	(−.52)
Cumulative cash flow from 1986 to 1989 to total assets	.18	.20
	(.11)	(2.53)
Investment securities to total assets	.07	−.36
	(.06)	(−2.63)
R^2	. . .	.15

NOTE.—The data for this table are obtained from the PACAP database. All accounting variables are from the fiscal year ending in 1989. Financial firms and utilities are excluded from the sample. Firms are required to be in the database from 1986 to 1993. The returns are buy-and-hold returns. We use a broad definition of *keiretsu*, so that both horizontal and vertical *keiretsus* are included. Debt includes both public debt and loans.

institutions. It is often argued that *keiretsu* membership makes firms less sensitive to adverse shocks. We include an explanatory variable for *keiretsu* membership in 1989. This variable is extremely broad since it includes both vertical and horizontal *keiretsu* membership. Finally, we control for total assets. One would expect larger firms to be more established so that they might suffer less from a shock to investment opportunities. It is obvious that one might find other motivations for firm size and some of the other variables we use, and we will discuss some of these later. Our main objective in including these various variables is to capture as much of the cross-sectional variation as possible. We also include as explanatory variables the variables used in table 1.

Table 2 shows the means and standard deviations of the explanatory variables as well as the estimated regression. The explanatory variables generally have the expected sign, but not all of them are significant. In particular, debt to total assets, corporate ownership, and financial ownership are not significant. In contrast, *keiretsu* membership in 1989 has a significantly negative coefficient. It turns out that the definition

of the *keiretsu* matters for the inferences one draws from the regression. When we use the narrower definition of bank-oriented *keiretsu, keiretsu* is no longer significant, but both ownership measures are significant. Whereas the various variables are generally significant, their overall effect in explaining the cross section of returns is limited. The R^2 of the regression is 0.15 in contrast to 0.11 in the earlier regression. Further, a standard deviation change in the explanatory variables never accounts for more than a 5% change in the return and in most cases accounts for about half that.

So far, we have not taken into account bank dependence. The most successful variables in our analysis are variables associated with value: firms with equity that appreciated the most and that are valued the most relative to book are the firms with the worst performance in the period from 1990 to 1993. These "value" variables explain about 11% of the cross-sectional variation in returns. In addition to the regressions reported in table 2, we investigated a number of different variables. If recent investment opportunities are those that lost value, then firms that invested more recently should lose more value. We therefore computed a measure of investment over 1986–89, namely, the change in total assets. This variable did not have a significant coefficient. We also included ownership by individual investors since firms with more individual investors might have been more affected by sentiment than other investors. We also controlled for the market value of equity to control for the size effect but, again, with no success. Finally, we considered the issue that firms with more export sales might have suffered from the unexpected appreciation of the yen and controlled for export sales. Export sales is not significant. We also reestimated the regression in table 2, controlling for beta. Beta is not significant, and the variables that are significant in table 2 continue to be significant when we control for beta.

IV. The Role of Bank Dependence

In this section we explore the impact of bank dependence in 1989 on stock returns from 1990 to 1993. Firms can have nonbank debt as well as bank debt. As shown in table 2, debt to total assets is 0.65 on average with a standard deviation of 0.18. The median is not very different from the mean, since it is 0.66. When we turn to the part of debt that is made of loans, we find that loans to total assets has a mean of 0.21 and a median of 0.16. The PACAP database reports loans as opposed to bank loans, but most loans for Japanese firms are bank loans. To check this, we looked at other data sources to obtain bank loans directly for a subsample of firms, and, generally, the reported bank loans are similar to the loans reported by PACAP. The standard deviation of loans to total assets is 0.19 and is about the same as the standard devia-

TABLE 3 Comparison of Returns from 1990 to 1993 for Firms with Loans and without Loans in 1989

	Firms with Loans (%) (*t*-statistic)	Firms without Loans (%) (*t*-statistic)	Difference (%) (*t*-statistic)
1986–89	245.47	172.05	73.42
	(44.42)	(12.65)	(5.00)
1990–93	−53.07	−40.36	−12.71
	(−77.61)	(−17.24)	(−5.21)

NOTE.—The data for this table are obtained from the PACAP database. Financial firms and utilities are excluded from the sample. Firms are required to be in the database from 1986 to 1993. The returns are buy-and-hold returns. The sample comprises 1,198 firms with loans and 141 firms without loans. The *t*-statistic for the comparison assumes unequal variances since the equality of variances for the two subsamples is rejected.

tion of debt to total assets. The fact that the standard deviation of loans to total assets is so large indicates that there is a large spread in that ratio across firms with many firms that have little bank debt and also many firms that have a large amount of bank debt. While all the firms have positive debt, so that the lowest ratio of debt to total assets is 0.10, a number of firms, including firms with more debt, are also likely to be firms with more bank debt. The ratio of loans to debt has a mean of 0.28 with a standard deviation of 0.22. This ratio has a minimum of zero and a maximum of 0.96. The correlation of bank loans to total debt is 0.59 with debt to total assets.

We first consider the effect of bank loans by comparing firms with bank loans to firms without bank loans. In other words, we use firms without bank loans as the control group for firms with bank loans. Table 3 provides this comparison both for the boom and the crash periods. In both periods the stock return performance of firms without bank loans is significantly different from the stock return performance of firms with bank loans. The difference is also economically significant. During the crash firms without bank loans earn 12.71% more than firms with bank loans. At the same time, however, firms with bank loans had substantially higher returns during the boom period. Since we saw earlier that firms that did better during the boom period perform worse later, multivariate regressions are necessary to assess better the relation between performance and bank loans during the crash period.

The fact that firms with bank loans performed well during the boom period and poorly during the crash period raises the concern that these firms might have high beta coefficients. We therefore control for beta in our multivariate regressions. Another concern is that firms with bank loans might simply be firms with real estate holdings financed with bank loans. Since real estate crashed dramatically in Japan, this suggests that one might want to find a way to control for real estate exposure. We have no good way to do that with the accounting data avail-

able to us. There is, however, a way to control for the correlation of stock returns with real estate returns. To do that, we regress firm monthly returns from 1986 to 1989 on the return of the market and the return of the real estate industry (using the Topix value-weighted real estate industry index). We then control in our multivariate regressions for the market beta and the real estate beta.[7]

Table 4 shows multivariate regressions. In the first regression of table 4 we replace debt to total assets by loans to total assets in the regression of table 2. There is a strongly significant negative relation between returns and loans to total assets. The coefficient is −0.24, with a *t*-statistic of −5.29 in contrast to the coefficient on debt to total assets, which was −0.08 and insignificant. Note that this coefficient implies that a 1-SD increase in loans to total assets represents a worsening of performance of slightly less than 5% over the 3-year period. In contrast, the effect of a 1-SD change of the book-to-market ratio is slightly less than 4%. The R^2 of the regression is 0.18 rather than 0.15 in table 2. The other regression coefficients are roughly unchanged. If we add debt to total assets to that regression, both variables are significant, but debt to total assets has a positive sign. We do not reproduce this regression.

To further explore the impact of possible credit constraints on firm value, we show a regression where we add a measure of liquid assets. Liquid assets are defined as cash plus tradable securities. In that regression, loans to total assets has a significant negative coefficient, and debt to total assets has a positive significant coefficient. Since the coefficient of loans to total assets is fairly similar to what it is in the first regression, it is reasonable to think that the results indicate that public debt has a different impact on firm returns than does bank debt. We will consider this issue in more detail later. The positive (but marginally significant) coefficient on liquid assets seems to indicate that firms did suffer from credit constraints, so that firms that had more liquid assets before the crash were better able to cope with the difficulties in obtaining funds. An alternative approach is to control for leverage and then to consider the effect of the ratio of bank debt to total debt on returns. This is the third regression in table 4. In that regression, loans to total debt is highly significant. The other regression coefficients differ little from those of the first regression. This regression shows that the composition of debt matters strongly. We also estimated the regressions in table 4 controlling for industry effects using dummy variables for the industries used in table 1. In the last column of the table we report estimates controlling

7. Gibson (1998) used a dataset with land holdings to investigate whether land holdings could explain our results. His data set is the Japan Development Bank Corporate Finance Data Bank. He finds that land holdings divided by total assets is not significant and does not affect our bank dependence variable.

TABLE 4 The Role of Bank Debt

Explanatory Variable	Estimated Coefficient (*t*-statistic)			
Constant	−.73	−.87	−.79	−.81
	(−7.96)	(−8.07)	(−7.32)	(−7.05)
Equity return for 1986–89	−.02	−.02	−.02	−.02
	(−4.05)	(−3.86)	(−3.79)	(−4.24)
Keiretsu membership	−.04	−.04	−.04	−.04
	(−2.74)	(−2.64)	(−2.59)	(−2.16)
Logarithm of total assets	.03	.02	.02	.02
	(3.63)	(2.40)	(2.08)	(2.01)
Ownership by other corporations	−.07	−.12	−.12	−.11
	(−1.13)	(−1.87)	(−1.90)	(−1.77)
Ownership by financial companies	−.10	−.11	−.12	−.09
	(−1.29)	(−1.42)	(−1.45)	(−1.14)
Debt to total assets	...	.26	.18	.13
		(3.55)	(2.61)	(1.86)
Loans to total assets	−.24	−.33	...	...
	(−5.29)	(−5.78)		
Loans to total debt	...	...	−.25	−.21
			(−6.08)	(−4.82)
Book-to-market ratio	.30	.42	.43	.38
	(4.63)	(5.75)	(5.85)	(5.09)
Price-earnings ratio	−.00	.00	.00	.00
	(−.07)	(.70)	(.73)	(.75)
Cumulative cash flow from 1986 to 1989 to total assets	.12	.24	.23	.32
	(1.67)	(2.78)	(2.69)	(3.52)
Investment securities to total assets	−.35	−.23	−.20	−13
	(−2.63)	(−1.52)	(−1.31)	(−.84)
Liquid assets to total assets	...	.11	.09	.11
		(1.55)	(1.25)	(1.49)
Market beta	.00	.01	.01	.02
	(.17)	(.41)	(.47)	(.87)
Real estate beta	.01	.02	.03	.00
	(.25)	(.53)	(.69)	(.10)
R^2	.18	.19	.19	.21

NOTE.—The data for this table are obtained from the PACAP database. Financial firms and utilities are excluded from the sample. Firms are required to be in the database from 1986 to 1993. The returns are buy-and-hold returns. We use a broad definition of *keiretsu*, so that both horizontal and vertical *keiretsus* are included. Debt includes both public debt and loans. Loans include both bank loans and nonbank loans. All variables except stock returns are from 1989.

for industry effects. We leave out the coefficients for the industry dummy variables. Only one of the industry dummy variables, the one for manufacturing, is significant. It has a coefficient of 0.14 with a *t*-statistic of 2.59. The coefficient estimates for the other variables are similar when we control for industry effects.

In table 5 we estimate a regression where we add a proxy for access to capital markets. Since controlling for the market beta or the real estate beta does not affect our results, we report regressions that do not control for these beta coefficients in that table. In Japan, most public debt financing takes the form of convertible debt. Firms that have is-

TABLE 5 The Role of Bank Debt When Controlling for Convertible Debt and Exports

Explanatory Variable	Estimated Coefficient (*t*-statistic)		
Sample size	861	861	437
Constant	−.80	−.77	−.88
	(−8.22)	(−8.07)	(−6.38)
Equity return for 1986–89	−.02	−.02	−.02
	(−3.81)	(−3.89)	(−2.27)
Keiretsu membership	−.03	−.04	−.01
	(−2.09)	(−2.62)	(−.36)
Logarithm of total assets	.02	.02	.01
	(3.13)	(2.24)	(1.24)
Ownership by other corporations	−.14	−.12	−.15
	(−2.09)	(−1.93)	(−1.39)
Ownership by financial companies	−.15	−.12	−.14
	(−1.78)	(−1.51)	(−1.05)
Debt to total assets	.02	.19	.33
	(.31)	(2.67)	(2.97)
Loans to total debt	...	−.26	−.29
		(−6.14)	(−3.93)
Book-to-market ratio	.38	.38	.48
	(5.37)	(5.47)	(3.91)
Price-earnings ratio	−.00	.00	.00
	(−.09)	(.70)	(.66)
Cumulative cash flow from 1986 to 1989 to total assets	.24	.25	.20
	(2.74)	(2.87)	(1.36)
Investment securities to total assets	−.31	−.17	−.12
	(−2.03)	(−1.11)	(−.51)
Liquid assets to total assets	.10	.10	.21
	(1.37)	(1.38)	(1.71)
Exports to sales	...	...	.006
			(.08)
Convertible debt to total assets	.28	.04	−.07
	(2.23)	(0.35)	(−.40)
R^2	.15	.19	.13

NOTE.—The data for this table are obtained from the PACAP database. Financial firms and utilities are excluded from the sample. Firms are required to be in the database from 1986 to 1993. The returns are buy-and-hold returns. We use a broad definition of *keiretsu* so that both horizontal and vertical *keiretsus* are included. Debt includes both public debt and loans. Loans include both bank loans and nonbank loans. All variables except stock returns are observed in 1989.

sued such debt before the crash period are presumably firms with greater access to capital markets. We therefore use the ratio of the book value of convertible debt to total assets as an explanatory variable. In the first regression we use convertible debt to total assets but not loan to total debt. Convertible debt has a significant positive coefficient that is quite large. As a consequence, firm performance during the crash period is an increasing function of the ratio of book value of convertible debt to total assets. In the next regression, we allow for an effect of bank loans. Bank loans are significant, but convertible debt loses its significance. Obviously, bank loans and convertible debt are negatively

related. A firm whose debt is all in the form of bank loans cannot have convertible debt. Yet, what these regressions suggest is that convertible debt in the first regression seems to proxy for bank loans. Since the yen appreciated dramatically at the beginning of the 1990s, part of the difficulties of the firms might have been associated with their decreased competitiveness on export markets. We have information on exports for a subset of 437 firms. The coefficient on exports to total sales is not significant. Controlling for convertible debt or exports has no impact on the coefficient on bank loans to total debt.

In Section II we argued that we have to worry about spurious correlation due to common shocks affecting firms that rely on bank financing more than other firms do. In our multivariate regressions we control in a number of ways for exposure to common shocks. The most obvious concern is that firms with more bank loans are more exposed to shocks to aggregate economic activity. Firms more exposed to aggregate economic shocks should have a higher beta, should have higher stock returns from 1986 to 1989, and should have higher cash flow over that period. It seems unlikely that these variables would not capture higher exposure to macroeconomic activity, but our regressions control for all these variables. Another source of spurious correlation is that firms with more bank loans are more exposed to real estate shocks or have higher holdings of shares of other firms. Firms more exposed to real estate shocks should have a higher real estate beta and should have performed better from 1986 to 1989; firms with higher holdings of shares should have performed better prior to the asset price deflation and should have more security holdings on their balance sheet. Again, we control for all of these variables.

Another source of possible spurious correlation is the impact of financial deregulation on Japanese firms. Firms that became eligible to issue convertible bonds were better firms in that their balance sheet (and eventually their ratings) had to meet strict standards. Viewed from this perspective, the firms relying most on bank loans could turn out to be the losers. Hoshi, Kashyap, and Scharfstein (1993) have a model that makes predictions about which types of firms will decide to access public markets. They argue that the best and the worst firms are those that should have accessed the public markets because the best firms do not benefit from bank monitoring, and the worst firms do not want it. Their arguments suggest, therefore, that the firms that continue to rely on bank finance are not the losers. They find empirical support for their model. For our sample it is interesting to note that from 1986 to 1989 the 1,051 firms in our sample that were eligible to issue convertible debt in 1990 based on the accounting criteria had average returns of 223.59%, while the 297 firms that were not eligible to issue such debt in 1990 earned average returns of 292.63%. In other words, the firms that were not eligible to issue convertible debt in 1990 performed much

better during the late 1980s than did the firms that were eligible. At the same time, however, the firms that were not eligible to issue have a lower book-to-market ratio, a higher price-earnings ratio, more bank loans relative to debt, higher leverage, and lower assets than did firms that were eligible to issue. It is plausible, therefore, that firms that are more bank dependent are more sensitive to the business cycle. The question that we face is whether the coefficient on the ratio of loans to debt picks up this greater sensitivity, rather than the impact on bank-dependent firms of the difficulties of the banks. To examine this question we first estimated our regressions in table 4, controlling for whether a firm is eligible to issue convertible debt. The added dummy variable does not have a significant coefficient, and the coefficient on the ratio of loans to debt is unaffected in these unreported regressions. We then estimated our regressions in table 4 for the subset of firms that were eligible to issue convertible debt. Our results hold for that subset. Hence, our results are not due to a subset of poorly performing firms that did not meet the accounting ratio standards required to issue convertible debt.

Gibson (1995) shows that the identity of the main bank matters for investment and that firms whose main bank has a weaker rating invest less than those whose main bank has a strong rating. We investigated whether our results could be explained by the main bank affiliation of firms. We identified the main bank as the bank that lent the most to the firm as of 1986.[8] Adding dummy variables for main banks had no noticeable impact on the regression coefficient of bank loans to debt. Some of the main bank dummy variables are significant, but most are not. We also estimated regressions, adding a dummy variable for the worst main bank (Long-Term Credit Bank) to the regressions of table 4 and allowing that dummy variable to interact with the loans-to-debt ratio. Neither the dummy variable nor the interaction term are significant. In a similar vein, Gibson (1998) shows, using a different dataset, that the coefficient on loans to debt is not affected by adding a dummy variable for the main bank rating to the regression. All these results together show that the significance of our coefficient on the loans-to-debt ratio cannot be explained by the circumstances of a firm's main bank.

An important issue is whether the fact that the coefficient on loans to debt is not explained by a firm's main bank casts doubt on our interpretation of the evidence. This is a legitimate concern because we would expect such a result if loans to debt were a proxy for greater firm exposure to common factors while main banks were not. If we

8. Gibson (1995) discusses the various ways to identify the main bank for a firm. He argues that (1) main banks are stable and (2) different identification methods lead to similar results.

interpreted the worse performance of bank-dependent firms as resulting from the loss of the firm-specific information that the main bank has, then the regressions with main bank dummies would make that interpretation untenable. However, this is not an appropriate interpretation of our results. The firm-specific information that the main bank had was not threatened in the early 1990s by the poor performance of banks because at that time banks were not expected to collapse. As a consequence our study should not be viewed as the equivalent for Japan of the study by Slovin, Sushka, and Polonchek (1993) that investigated the impact on borrowers of the near failure of Continental Illinois Bank and of its rescue by the Federal Deposit Insurance Corporation. In our study the poor performance of banks makes it harder for firms to finance projects with bank loans and, hence, hurts firms that, for whatever reason, find obtaining funds on capital markets too expensive. Even if a firm's main bank is performing worse than another firm's main bank, it is still possible for the firm to benefit from its main bank relationship. In particular, the main bank can use its information to convince other banks to provide credits to the firm. However, when bank finance is limited, loans are harder to get, and, hence, firms for which access to public markets is not possible or is expensive cannot invest in projects in which they would otherwise invest. If this interpretation of our results is right, however, then bank dependence should affect investment, which we investigate next.

V. Does Bank Dependence Have Real Effects?

So far, we have seen that firms with greater bank dependence suffered greater losses during the Japanese crash. The effect is both statistically and economically significant. We now consider whether bank dependence had an effect on investment during that period of time. If the weakening of banks caused firms that were highly bank dependent to be credit constrained, then bank dependence should be negatively related to investment from 1990 to 1993. We are limited in our choice of proxies for investment by data constraints. We use the growth in fixed assets from 1990 to 1993 normalized by fixed assets in 1990. We first regress our investment proxy on the book-to-market ratio, cumulative net income from 1990 to 1993 divided by fixed assets in 1990, sales growth from 1988 to 1989, and liquid assets divided by fixed assets in 1989. This regression is reported in table 6. We then add loan to debt as an explanatory variable in the second regression. Loans to debt is significantly negative at the 10% level, indicating that investment is related to the composition of debt. This evidence is consistent with the view that more bank-dependent firms had to contract investment more. To investigate the robustness of the result, we report a third regression where we control for leverage. Leverage has a surprisingly

TABLE 6 Investment and Bank Dependence

Variable	Estimated Coefficient (*t*-statistic)		
Constant	.29	.35	.05
	(7.56)	(6.73)	(.51)
Book to market	.06	−.02	.22
	(.51)	(−.12)	(1.49)
Net income/fixed assets	.04	.03	.03
	(4.84)	(4.53)	(4.49)
Sales growth	.61	.61	.60
	(5.87)	(5.86)	(5.77)
Liquid asset/fixed assets	.001	.001	.0003
	(.39)	(.57)	(.13)
Loans to debt	...	−.13	−.28
		(−1.69)	(−3.20)
Debt to total assets	...	...	.45
			(3.78)
Adjusted R^2	.05	.05	.06

NOTE.—The data for this table are obtained from the PACAP database. Financial firms and utilities are excluded from the sample. Firms are required to be in the database from 1986 to 1993. Loans include both bank loans and nonbank loans. The proxy for investment is fixed assets in 1993 minus fixed assets in 1990 divided by fixed assets in 1990. Sales growth is sales in 1989 minus sales in 1988 divided by sales in 1988. Liquid assets are cash and marketable securities holdings in 1989. Loans to debt ratio is the loans to debt ratio in 1989. Net income over fixed assets is for the period from 1990 to 1993. The book-to-market ratio and the debt to assets ratio are for 1989. There are 1,061 observations.

significant positive coefficient. We also investigated the impact on our main result of various alternative specifications and found that they do not affect our main result. In particular, we added depreciation to net income for the subset of firms for which depreciation is available. We used sales growth from 1986 to 1989 instead of sales growth from 1988 to 1989. We controlled for *keiretsu* membership and found that *keiretsu* membership has a negative insignificant coefficient. Finally, we controlled for the main bank. Doing so does not affect the coefficient on loans to debt but weakens slightly its significance. As one might expect, given the results of Gibson (1995), some main banks have significant coefficients.

VI. Reconsidering Exogeneity: The Road to the Basle Accord

One concern that we have reiterated several times is that our results would also hold if bank dependence is correlated with some characteristic of firms that made them more vulnerable to the collapse of the so-called bubble economy. This raises the question of whether bank-dependent firms perform more poorly on days that banks perform poorly. To address this question, we consider events before the collapse of the bubble economy associated with the negotiations leading to the Basle Accord. Wagster (1996) estimates the stock returns on portfolios of banks across the world for 18 such events. For each of his events,

TABLE 7 Bank Dependence and Basle Accord Negotiations

Event	Bank Portfolio Abnormal Return (%)	Slope Coefficient for Nonbank Firms' Regressions	R^2 for Nonbank Firms' Regressions
1/16/86	−.94	−.02	.007
	(−.46)	(−2.89)	
3/17/86	−1.85	.01	.001
	(−.91)	(1.38)	
1/05/87	12.67	.03	.02
	(6.14)	(4.39)	
1/09/87	2.17	.04	.02
	(1.05)	(4.90)	
3/12/87	2.39	.01	.001
	(1.17)	(1.69)	
4/15/87	21.21	.03	.01
	(10.33)	(3.37)	
6/22/87	−7.82	−.04	.01
	(−3.74)	(−3.81)	
8/06/87	1.58	.01	−.00
	(.77)	(.75)	
9/13/87	−2.67	.00	−.00
	(−1.31)	(.14)	
9/17/87	−2.81	.03	.01
	(−1.38)	(4.07)	
10/23/87	3.00	.04	.01
	(1.36)	(4.63)	
11/09/87	1.03	−.03	.01
	(.48)	(−3.54)	
11/17/87	1.95	−.03	.01
	(.93)	(−3.90)	
11/30/87	−.07	−.00	−.00
	(−.03)	(−.92)	
3/23/88	2.52	−.00	−.00
	(1.24)	(−.18)	
4/15/88	−.72	.02	.00
	(−.35)	(1.97)	
6/24/88	.72	−.00	−.00
	(.35)	(−.39)	
7/12/88	−.73	−.02	.00
	(−.36)	(−2.34)	

NOTE.—The events and the bank portfolio returns are from Wagster (1996). For each event we then regress the market model cumulative abnormal return for days −1 to +1 of nonbank firms on a constant and the ratio of bank loans to total debt. Numbers in parentheses are *t*-statistics.

we regress the abnormal return from the market model on the ratio of loans to debt of firms. We should find a positive coefficient on days that Japanese banks benefited from the evolving negotiations and a negative coefficient on days that they were hurt. The results are reported in table 7. For each event we report the abnormal return for the Japanese bank portfolio from the Wagster (1996) study and then report the regression coefficient and the R^2 of the regression. Most events had no significant impact on Japanese banks. For more than half of these events that were not significant, the coefficient on bank loans is also insignificant. Three

events had significant abnormal returns for the bank portfolio. Our hypothesis is that on days that banks fared well (poorly) the abnormal return of nonbanking firms should be an increasing (decreasing) function of their bank dependence. Two of these events had large significant positive abnormal returns. For these two events there is a significant positive relation between firm returns and the ratio of loans to debt. One event had a large significant negative abnormal return. For this event there is a significant negative relation between firm returns and the ratio of loans to debt. One can therefore interpret these results as showing that when the Basle Accord events affected Japanese banks significantly, they affected bank borrowers in the same direction. This is exactly what one would expect with our hypothesis. Although we have only three significant events, there is no question that these events are exogenous events.

VII. Conclusion

We showed in this article that in the case of Japan there is a clear link between shocks to banks and the performance of borrowing firms. Firms that were more dependent on banks had better stock performance during the bubble period when banks were doing well and worse performance during the early 1990s when banks were doing poorly than did firms that were less bank dependent. In the early 1990s firms that relied more on bank borrowing contracted investment more than did other firms. Finally, we also find that when the negotiations leading to the Basle Accord benefited (hurt) Japanese banks, firms that relied more on banks performed better (worse). We provided evidence that the poorer performance of the firms that relied more on bank finance cannot be attributed to spurious correlation but, rather, to the difficulties these firms faced in raising funds and to the greater cost of funds that they raised when their traditional source of finance, namely, banks, was forced to limit its supply of credit.

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