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The Role of Lending Banks in Forced CEO Turnovers

This article investigates the governance role of banks exercised through the replacement of underperforming CEOs in borrowing firms. An average level of bank loans outstanding implies a 22% to 47% increase in the forced turnover probability of a borrowing firm's CEO if a firm's industry adjusted performance is one standard deviation below average. This increase is much larger, 68% to 92%, when an underperforming firm violates its loan covenants. Overall, the paper's findings suggest that banks play a key role in the governance of underperforming firms, especially when covenants are violated.

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In this paper, we investigate the governance role of banks in disciplining poorly performing CEOs of borrowing firms. Specifically, we examine the likelihood of a CEO being replaced across firms with different levels of bank loans outstanding and performance. In particular, lending banks have incentives to induce the replacement of poorly performing CEOs so as to constrain the downside risk of outstanding loans and thus their credit risk exposure. In this paper, we employ the level of bank loans outstanding as a fraction of total assets (or the intensity of bank lending) as a measure of the governance power of lending banks. That is, for a poorly performing firm, the likelihood of CEO replacement should increase with intensity of its reliance on bank loans.

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We find that a firm, with an average degree of bank financing, faces a 22% to 47% increase in the probability of being forced to replace its CEO if its industry-adjusted performance is one standard deviation below the average. In addition, this increase cannot be attributed to the firm's overall leverage. Moreover, we find that there is no relationship between the level of bank loans outstanding and *voluntary* departures of CEOs.

Lending banks can influence a board's decisions in several ways. One particularly important channel is through the legal rights lending banks obtain upon a violation of a loan covenant by a borrowing firm. We show that the effect of lending banks in forcing CEO turnovers can be explained in large part by covenant violations. The increase in a CEOs replacement probability is twice as large when a borrowing firm violates its loan covenants than when it does not.

The influence of lending banks in CEO replacement decisions appears to be as economically important as other governance mechanisms. With respect to the importance of independent board of directors, one of the key results of Weisbach (1988) is: "For outside boards the probabilities [of a CEO turnover] range from 7% for a firm in the bottom [performance] decile to 1.3% for a firm in the top decile. The difference between these probabilities is 5.7%, which is significant at the 1% confidence level. For inside boards the probabilities range from 5.7% to 3.6%, a difference of just 2.1%" (Weisbach 1988, p. 441). According to our results, the CEO replacement probabilities range from 7.1% for a firm in the bottom performance decile to 0.6% for a firm in the top decile for firms with an average level of bank loans outstanding. This range is from 10.4% to 0.3% if there is a loan covenant violation with the same level of loans outstanding. By comparison, the probabilities range from 5.5% to 1.0% for firms with no bank loans outstanding. Therefore, lending banks can be as influential as outside boards in inducing CEO replacement, especially when they obtain governance power through covenant violations.

We focus on banks rather than bondholders because while syndicated loans and private debt are held more closely (Ivashina 2009, Kahan and Tuckman 1993), a public bond issue is generally held by 40 to 100 investors (Amihud, Garbade, and Kahan 1999). Section 316 of the Trust Indenture Act of 1939 makes it costly to renegotiate bond contracts with a large number of bondholders, because majority or super majority is required for amendments to the bond indenture. This relatively high renegotiation cost leads to "lighter" (less stringent) covenant structures in bonds, and so bond covenant violations are less frequent (Chen and Wei 1993). Loan covenants, upon violation, give the bank a right to call for the immediate repayment of the loan. At this stage, the bank possesses significant bargaining power over the corporation in terms of disciplining a borrower's executives and their CEOs, for example, through their replacement.

However, the endogeneity of a CEOs choice of bank lender may bias estimates of the bank governance effect. For instance, a low-ability CEO might avoid bank financing in order to avoid close monitoring and governance pressure by lending banks. To control for such potential biases we use a variety of instruments to model the endogenous bank financing decision by borrowing firms.

We use three sources of variation to build instruments to control for loan financing endogeneity. The first one is prevailing lending conditions in the overall bank loan market. If banks have stricter lending standards at certain times, for example, during a recession,[1] firms are less likely to obtain loans, and vice versa. The second instrument is an individual firm's demand (during a given fiscal year) for funds not directly related to CEO replacement decisions. For instance, a negative idiosyncratic shock to its working capital level implies a higher demand for external financing. The idiosyncratic shock to working capital, obtained by regressing a firm's working capital on its industry's average working capital, is uncorrelated with firm characteristics, CEO characteristics, or macroeconomic conditions (captured by industry's average working capital level). The third instrument is the availability of alternative financing vehicles in the public debt market. Firms having close substitutes for bank financing are more sensitive to changes in the strictness or leniency of lending conditions of banks. However, for a given level of demand for external financing, firms with close substitutes for bank financing borrow less from banks than firms without a close substitute. Those firms with alternatives obtain financing from both public markets and banks. We interact these three sources of variation to obtain our instruments. Partial maximum likelihood estimation is carried out once bank financing is modeled and endogeneity controlled for. See Ongena and Smith (2001) for a similar approach in a banking context.

The econometric specification used in this paper derives from a simple extension of the well-known relative performance models, such as Gibbons and Murphy (1990). In our extension, banks, in addition to boards of directors, separately evaluate the relative performance of a CEO. If the CEO's relative performance is poor, lending banks may initiate a CEO replacement independent of the board's evaluation. We assume that the influence of lending banks is greater, the larger their share of loans in the company's capital structure.

To date there are relatively few studies analyzing the role of banks as governance agents. Ivashina et al. (2008) investigate the role of banks and bank debt in the market for corporate control, that is, the takeover market. They show that when a corporation has bank debt outstanding, it has a greater likelihood of becoming an acquisition target. Baird and Rasmussen (2006) discuss the corporate governance role of banks in a legal context and provide some anecdotal evidence. Regarding their effectiveness, they cite covenants as the primary means of exerting control over a corporation during periods of financial distress prior to bankruptcy. The closest paper to our study is a concurrent working paper (Nini, Smith, and Sufi 2009) that has a section that shows, among other things, that covenant violations are followed by an increase in CEO turnover. Using a probit model the authors show that covenant violations lead to a 4%–8% increase in CEO turnover. However, the authors do not fully address two important issues. The first is financing endogeneity and the second

1. Jenter and Kanaan (2008) argue that during recessions forced turnovers are more likely. We added average CEO turnover likelihood in the economy in a fiscal year as a control variable and obtained very similar results. We did not report these results, which are available upon request.

is the lending power of banks. First, covenant violations are endogeneous events given that the choice of bank financing is endogeneous, and this endogeneity should be addressed carefully.[2] Second is the scale of bank lending to the borrowing firm. If outstanding bank loans are relatively small, the CEO can refinance these loans and avoid possible adverse consequences. Therefore, we believe that covenant violations should be studied along with both the prevailing firm's performance and the level or scale of its bank loans outstanding.

In Section 1 of this paper, we discuss some examples of banks' role in CEO replacements. In Section 2, we discuss our data and sample. In Section 3, we introduce the econometric specification of the model to be tested. In Section 4, we present model estimates. Section 5 investigates the channels of influence running from bank loans to CEO turnovers, and Section 6 concludes.

1. CEO REPLACEMENT

Before discussing our statistical findings we present some examples of banks' role in forced CEO turnovers. The first case is related to Krispy Kreme Doughnuts Inc. Krispy Kreme went public on April 5, 2000. Between 1998 and 2003, the company enjoyed a high sales growth averaging 30% per annum. The stock price peaked during 2003. In 2004, sales growth slowed down because of the changing taste of the population toward low-carbohydrate diets.

In October 2003, the company got a syndicated loan of $150 million from a group of banks led by Wachovia Corp in order to improve its working capital level. In the syndicate, Wachovia's share was 29%. Robert McCoy, retired vice chairman and chief financial officer of Wachovia Corp, was elected as a board member in the next annual meeting on May 26, 2004. Before the syndicated loan agreement was signed, James H. Morgan, then former chairman and CEO of Wachovia Securities Inc. had already been a director since 2000. At the annual meeting, there was no member of the board who directly held a significant fraction of the outstanding shares.

Krispy Kreme technically defaulted on the syndicated bank loan on January 14, 2005, because the company failed to deliver its third-quarter financial statements to Wachovia on time. The provision of quarterly audited financial statements was among covenants in its loan contract.

Following this event, the board of directors met on January 17. The company issued a press release about the results of the board meeting on January 18, 2005. Krispy Kreme Chief Executive Scott Livengood was replaced as CEO by Stephen Cooper, a restructuring expert at turnaround firm Kroll Zolfo Cooper LLC and James H. Morgan, one of Wachovia's affiliated directors, was elected chairman of the board.

2. Also, some covenant violations are technical and they are not always related to the firm's performance. For instance, IOMEGA Corp. violated its "Cash Conversion Days" covenant while its relative performance was high. Cash conversion days is a measure of how high a firm's accounts receivable and inventory levels are compared to its total sales.

A second example is Iridium. Iridium sought to construct a $5 billion telephone-satellite system to provide a global communication system. The system was largely financed through syndicated loans offered by a group of banks led by Barclays Capital, Chase Securities, and Chase Manhattan Bank. In one of the loan agreements, which was a $1.55 billion refinancing deal dated December 23, 1998, there were covenants setting out certain targets to be met. In particular, Iridium agreed to meet a target of 52,000 subscribers, $4 million revenue in cash and $30 million in accrued revenue by March 31, 1999.

Iridium launched its global service on November 1, 1998 but the system was unreliable because of technical problems. The number of subscribers as of December 31, 1998 was just 3,000 rather than the 52,000 as was required by loan covenants.[3]

Thus, Iridium could not meet its subscriber and revenue covenant targets by March 1999 and asked for a 60-day extension from its lenders. The lenders granted the extension on March 30, 1999 but Chief Financial Officer Roy T. Grant resigned. A month later Iridium's CEO Edward Staino also resigned (on April 22). John A. Richardson became chairman of the board. Richardson had been a director of Iridium LLC since March 1998 and was previously the chairman and CEO of Barclays-BZW Asia.[4]

These examples clearly suggest a role of banks in forcing a CEO turnover. In both cases, covenants of the loan agreements provided the means by which banks imposed governance pressure on corporations and corporate executives even before formal loan default or bankruptcy. In the next section, we discuss our data and sample and in the following section, develop an econometric model that allows us to analyze lending banks' role in forced CEO replacement, taking full account of endogeneity issues.

2. THE DATA AND THE SAMPLE

Our sample period runs from fiscal year 1992 to 2000.[5] CEO turnover data are obtained from the Executive Compensation database of Standard & Poor's. The Executive Compensation database (ExecuComp) provides information about the top executives of firms, who are (or were) in the S&P 1500 index over the sample period. There are 2,509 companies in ExecuComp appearing from fiscal year 1992 to 2001.[6]

All accounting data come from the Annual or Quarterly Compustat Industrial files, while information on bank loans is obtained from the Dealscan database of the Loan Pricing Corporation. For each firm, the degree of lending intensity by banks is measured by *Loan Intensity*, which is the total amount of bank loans outstanding to a borrower normalized by borrowing firm's asset size. Dealscan contains information

3. See the complaint *filed for Parker Freeland vs. Iridium World Communications, Ltd., et al.*, 233 FRD 40, 47 (DDC, 2006) (2002).

4. Iridium filed for Chapter 11 protection later in August 1999.

5. The sample period starts in 1992 because ExecuComp database starts from this date. It ends in 2000 because Forced CEO Turnover data are not available beyond this fiscal year.

6. ExecuComp data for the fiscal year 2001 are necessary in order to detect turnovers from the end of the fiscal year 2000 to the end of the fiscal year 2001

on loan agreements at the time of origination. There is no company identifier that links Dealscan data to ExecuComp or Compustat other than company names and ticker symbols. Given that ticker symbols change over time, Dealscan data are linked to ExecuComp and Compustat databases through a company's name. A matching algorithm was constructed to do the matching and because of abbreviations or special characters like apostrophe (') or hyphen (−) the algorithm was also checked by hand-matching. Out of 2,509 borrower names in the ExecuComp database over the sample period, 1,810 names could be matched to a Dealscan borrower name. Unmatched companies were those companies that did not obtain syndicated loans from banks or private lenders.

Forced CEO turnover data were provided by Jenter and Kanaan (2008) for the sample period. In their sample, they searched the Factiva news database to classify CEO turnovers into forced turnovers and voluntary turnovers. Jenter and Kanaan's classification is based on Parrino (1997): specifically, "all departures for which the press reports state that the CEO is fired, forced out, or retires or resigns due to policy differences or pressure, are classified as forced. All other departures for CEOs above and including age 60 are classified as not forced. All departures for CEOs below age 60 are reviewed further and classified as forced if either the article does not report the reason as death, poor health, or the acceptance of another position (including the chairmanship of the board), or the article reports that the CEO is retiring, but does not announce the retirement at least 6 months before the succession. Finally, the cases classified as forced can be reclassified as voluntary if the press reports convincingly explain the departure as due to previously undisclosed personal or business reasons that are unrelated to the firm's activities. This careful classification scheme is necessary since CEOs are rarely openly fired from their positions. We separately identify CEO turnovers caused by mergers and spin-offs and exclude them from our subsequent analysis" (Jenter and Kanaan 2008, p. 17).

Panel A of Table 1 presents descriptive statistics of forced and voluntary turnovers. There is some time variation in both forced and voluntary turnovers. Both forced and voluntary turnovers were more common in fiscal years 1999 and 2000 than in other years. One possible reason for this increase is the recession of early 2000. On average, the unconditional probability of a forced turnover is around 3% and unconditional probability of a voluntary turnover is around 9% for the firms in the sample.[7]

We used the Federal Reserve's *Senior Loan Officer Opinion Survey* data in order to measure the strictness of lending criteria used by banks. These data are used in order to generate an exogenous variation in the bank financing practices of sample companies (Section 4.4 provides more details).

We used annual reports and quarterly reports of the borrowing companies in order to obtain the list of firm-years where a covenant violation occurred (These data items are used in the analysis of Section 5 and more detail about these items are provided there). Financial companies with SIC codes between 6000 and 6999 are eliminated. In

7. The number of firms in (fiscal) year 1992 is substantially smaller because ExecuComp database was extended in the calendar year 1994 to cover S&P 1500 companies.

TABLE 1
SUMMARY STATISTICS

Panel A. Descriptive statistics of forced and voluntary turnovers

Fiscal Year	Number of firms	Number of forced turnovers	Percentage of firms with a forced turnover	Number of voluntary turnovers	Percentage of firms with a voluntary turnover
1992	362	6	1.66%	24	6.63%
1993	969	16	1.65%	80	8.26%
1994	1,299	37	2.85%	113	8.70%
1995	1,357	30	2.21%	118	8.70%
1996	1,334	41	3.07%	106	7.95%
1997	1,370	41	2.99%	132	9.64%
1998	1,385	41	2.96%	129	9.31%
1999	1,448	64	4.42%	147	10.15%
2000	1,423	51	3.58%	157	11.03%
1992–2000	10,947	327	2.99%	1,006	9.19%

Panel B. Summary statistics of variables

Variable	Obs	Mean	Median	St. dev.
Residual Stock Return, $\hat{\upsilon}_{stock}$	9,697	−0.0224	−0.0720	0.4654
Residual Return-on-Assets, $\hat{\upsilon}_{roa}$	9,702	0.0044	−2.6e-5	0.0894
Mixed Residual Performance, $\hat{\upsilon}_{stk+roa}$	9,651	−0.0088	−0.0308	0.2454
Loan Intensity, Λ	11,709	0.0922	0	0.1559
Loan Intensity, Λ, given $\Lambda > 0$	5,566	0.2153	0.1347	0.3255
Residual Stock Return · Loan Intensity, $\hat{\upsilon}_{stock} \cdot \Lambda$	9,690	−0.0036	0	0.0890
Residual Return-on-Assets · Loan Intensity, $\hat{\upsilon}_{roa} \cdot \Lambda$	9,702	−0.0001	0	0.0155
Mixed Residual Perf. · Loan Intensity, $\hat{\upsilon}_{stk+roa} \cdot \Lambda$	9,651	−0.0018	0	0.0470

NOTES: Panel A presents the number of firms, number of forced and voluntary turnovers and percentage of firms with a forced and voluntary turnover in the sample over the sample period from 1992 to 2001. Since 2 years are necessary to determine the existence of a turnover, there are 9 fiscal years with turnover data.
Panel B presents summary statistics of key variables over the sample period. Residual Stock Return, $\hat{\upsilon}_{stock}$; Residual Return-on-Assets, $\hat{\upsilon}_{roa}$; and Loan Intensity, Λ variables are winsorized below the 2nd percentile and above the 98th percentile due to skew. Mixed Residual Performance, $\hat{\upsilon}_{stk+roa}$, is the 50%–50% linear combination of $\hat{\upsilon}_{stock}$ and $\hat{\upsilon}_{roa}$.

the next section, we develop an econometric methodology to analyze lending banks' role in CEO replacement decisions taking full account of the endogeneity of a CEOs financing decision.

3. ECONOMETRIC SPECIFICATION OF UNDERLYING MODEL

Our model is an extended version of the relative performance models[8] developed by Holmstrom (1982), Gibbons and Murphy (1990), and Jenter and Kanaan (2008). In our extended model, both the board of directors and banks observe the chief

8. For the banks and private lenders as well as the board of directors, the relative firm performance rather than absolute firm performance should be the measure of CEO performance according to the standard model. Banks are unlikely to change a relatively successful CEO even if the absolute performance of a firm is not good during a particular time period. A covenant violation usually happens as a result of a low absolute performance but decision of a waiver by the lending banks usually depends on the level of relative performance.

executive's performance and compare a firm's performance with the performance of its peer group. Based on their observations, they form expectations with respect to the level of ability of the CEO. As the conditional expected ability of the CEO decreases against a certain threshold, the likelihood of the board of directors deciding to replace the CEO increases. However, banks' ability to replace the CEO depends on the level of their influence. We assume that the influence of lending banks is larger, the larger the share of bank loans in the company's capital structure. Our econometric methodology allows the board and banks to have different performance criteria and different threshold levels.

Let the firm i's performance criterion observed by the board, y_{1i}, be modeled as:

$$y_{1i} = \alpha_{1i} + \epsilon_{1i} + \eta_1, \tag{1}$$

where α_{1i} is the ability of CEO i with respect to this performance measure, ϵ_{1i} is an idiosyncratic shock to the firm's performance, and η_1 is an industry shock common to all firms in the industry. If we assume α_{1i}, ϵ_{1i}, and η_1 are independent and normally distributed with zero means and with variances $\sigma^2_{\alpha_1}$, $\sigma^2_{\epsilon 1}$, and $\sigma^2_{\eta_1}$, respectively, Jenter and Kanaan (2008) show that[9] the conditional expectation of CEO i's ability based on firm i's own performance and the performances of $n - 1$ other firms in the same industry is given by

$$\begin{aligned} E[\alpha_{1i}|y_{11}, \dots, y_{1n}] = {} & \frac{\sigma^2_{\alpha_1}\left(\sigma^2_{\alpha_1} + \sigma^2_{\epsilon_1} + (n-1)\sigma^2_{\eta_1}\right)}{\left(\sigma^2_{\alpha_1} + \sigma^2_{\epsilon_1}\right)\left(\sigma^2_{\alpha_1} + \sigma^2_{\epsilon_1} + n\sigma^2_{\eta_1}\right)} \\ & \times \left[y_{1i} - \frac{\sigma^2_{\eta_1}}{\left(\sigma^2_{\alpha_1} + \sigma^2_{\epsilon_1} + (n-1)\sigma^2_{\eta_1}\right)} \sum_{\substack{j=1 \\ j \neq i}}^{n} y_{1j} \right]. \end{aligned} \tag{2}$$

Note that the difference term in square brackets in equation (2) can be rewritten as:

$$\begin{aligned} & y_{1i} - \frac{\sigma^2_{\eta_1}}{\left(\sigma^2_{\alpha_1} + \sigma^2_{\epsilon_1} + (n-1)\sigma^2_{\eta_1}\right)} \sum_{\substack{j=1 \\ j \neq i}}^{n} y_{1j} = y_{1i} - \beta_1 y'_{1\{-i\}} \\ & \frac{\sigma^2_{\eta_1}}{\left(\sigma^2_{\alpha_1} + \sigma^2_{\epsilon_1} + (n-1)\sigma^2_{\eta_1}\right)}(n-1) = \beta 1. \end{aligned} \tag{3}$$

9. The same expression is obtained by Gibbons and Murphy (1990). The model of Gibbons and Murphy can be extended so that the variance of ability, α_{1i}, and the variance of idiosyncratic shock, ϵ_{1i}, can be different across firms. In that extension, in order to have an identifiable specification it must be assumed that number of firms in industries is large and more importantly it must be assumed that the proportion of firm-specific variance of α_{1i} to firm-specific variance of ϵ_{1i} is constant across firms. The coefficients of y_{1j} terms in equation (2) will be inversely proportional to $\sigma^2_{\epsilon_{1j}} + \sigma^2_{\alpha_{1j}}$ and therefore firm performance y_{1i} must be regressed on each y_{1j} to get υ_{1i}. This fact is the major cost of extending the model to allow for different $\sigma^2_{\alpha_{1i}}$ and $\sigma^2_{\epsilon_{1i}}$ across firms. Analytical results of the analysis when $\sigma^2_{\epsilon_{1i}}$ and $\sigma^2_{\alpha_{1i}}$ can be firm specific are available upon request.

Above, $y'_{1\{-i\}}$ is the average industry performance calculated excluding firm i. If $\sigma^2_{\alpha_1}$, $\sigma^2_{\epsilon_1}$, and $\sigma^2_{\eta_1}$ are comparable in magnitude, β_1 is close to 1 for large n. The difference term in square brackets in equation (2) can be replaced by the residual, υ_{1i}, obtained from the regression $y_{1i} = \beta_1 y'_{1\{-i\}} + \upsilon_{1i}$ without a constant.[10] Then, $E[\alpha_{1i}|y_{11},\ldots,y_{1n}] = k_1\upsilon_{1i}$ where k_1 equals the constant multiplier in equation (2). As $E[\alpha_{1i}|y_{11},\ldots,y_{1n}]$, the board's expected value of CEO's ability, falls against a threshold, α'_1, the probability of the board deciding to replace the CEO gets larger. That is, the probability of CEO turnover increases as $k_1\upsilon_{1i} - \alpha'_1$ decreases.

Now, we extend this relative performance model by introducing banks and their relative performance evaluation. To do this we define another performance measure, y_{2i}, of firm i that is observed by lending banks. This performance measure can be the same performance measure used by the board of directors or it can be different. Assume that the performance measure evaluated by the banks at firm i can be modeled as follows:

$$y_{2i} = \alpha_{2i} + \epsilon_{2i} + \eta_2, \tag{4}$$

where α_{2i} is the ability of the CEO affecting the second performance measure, y_{2i}. ϵ_{2i} is a firm-specific shock and η_2 is an industry-wide shock for y_{2i}. Under similar assumptions the conditional expectation of a CEO's ability with respect to the second performance measure is given by:

$$\begin{aligned} E[\alpha_{2i}|y_{21},\ldots,y_{2n}] &= \frac{\sigma^2_{\alpha_2}\left(\sigma^2_{\alpha_2}+\sigma^2_{\epsilon_2}+(n-1)\sigma^2_{\eta_2}\right)}{\left(\sigma^2_{\alpha_2}+\sigma^2_{\epsilon_2}\right)\left(\sigma^2_{\alpha_2}+\sigma^2_{\epsilon_2}+n\sigma^2_{\eta_2}\right)} \\ &\quad \times \left[y_{2i} - \frac{\sigma^2_{\eta_2}}{\left(\sigma^2_{\alpha_2}+\sigma^2_{\epsilon^2}+(n-1)\sigma^2_{\eta_2}\right)} \sum_{\substack{j=1 \\ j\neq i}}^{n} y_{2j} \right]. \end{aligned} \tag{5}$$

We can write the conditional expectation of α_{2i} as $E[\alpha_{2i}|y_{21},\ldots,y_{2n}] = k_2\upsilon_{2i}$ where υ_{2i} is the residual in the regression $y_{2i} = \beta_2 y'_{2\{-i\}} + \upsilon_{2i}$ without an intercept.[11] $y'_{2\{-i\}}$ is the average of the second performance measure in the industry calculated excluding firm i. If the lending banks' expectation of the CEO's ability, $E[\alpha_{2i}|y_{21},\ldots,y_{2n}]$, decreases against an arbitrary threshold, α'_2, there is a higher probability that banks would like to see the CEO replaced. That is, lending banks increasingly want the board of directors to replace the CEO as $k_2\upsilon_{2i} - \alpha'_2$ decreases.

10. Since we assume variables in equation (1) are zero-mean, the regression appears to be one with no intercept term. If we relax the the assumption that random variables are zero-mean, the regression becomes one with an intercept term. Jenter and Kanaan (2008) provide more detail about the performance regression. Similar explanations hold for equation (4).

11. See footnote 10.

If we assume that the influence of lending banks with regard to the CEO replacement decision is proportional to the share of outstanding bank loans that finance the assets of the firm (*Loan Intensity*), Λ_{it}, we can construct the probit model given below.[12]

$$\begin{aligned} F_{it}^{*} &= (k_1\hat{\upsilon}_{1it} - \alpha'_1) + w_b \cdot \Lambda_{it}(k_2\hat{\upsilon}_{2it} - \alpha'_2) + u_{it} \\ &= -\alpha'_1 + k_1\hat{\upsilon}_{1it} - w_b\alpha'_2 \cdot \Lambda_{it} + w_b k_2 \cdot \Lambda_{it}\hat{\upsilon}_{2it} + u_{it} \end{aligned} \tag{6}$$

$$F_{it} = 1[F_{it}^{*} > 0]. \tag{7}$$

In equation (6), F_{it}^{*} is set to one if a forced turnover happens in firm i at t (from the end of fiscal year t to the end of fiscal year t+1). w_b in equation (6) is the constant of proportion and cannot be estimated separately. α'_1 is the intercept on the right-hand side and k_1, $w_b\alpha'_2$, and $w_b k_2$ are the coefficients to be estimated for $\hat{\upsilon}_{1it}$ (industry-adjusted performance observed by the board), Λ_{it} (*Loan Intensity*) and $\Lambda_{it}\hat{\upsilon}_{2it}$ (interaction of *Loan Intensity* with the industry adjusted performance observed by the lending banks), respectively.

Because of endogeneity and self selection, we cannot assert that $E[u_{it}|\upsilon_{1it}, \upsilon_{2it}, \Lambda_{it}] = 0$. That is, put simply, the *Loan Intensity* variable is potentially a choice of the firm's CEO. Consequently, instrumental variables need to be utilized in order to get consistent estimates for the coefficients in equation (6). The endogeneity issue and resulting biases are discussed further in the next section. The instrumental variables used in our analysis of equation (6) are also discussed in that section.

4. ESTIMATES AND RESULTS

4.1 Estimation of Relative Firm Performance

We focus on two measures of borrowing firm performance: its annual stock return, y_{stock}, and return on assets, y_{roa}. The performance measure that is observed by the board of directors, y_1, and the performance measure that is observed by the lending banks, y_2, in the previous section, are y_{stock}, y_{roa}, or a combination of both in our estimations under different scenarios. The board of directors and lending banks might differ in their evaluation of CEO performance.

In order to construct the industry-adjusted stock performance, $\hat{\upsilon}_{stock}$, and industry-adjusted return on assets, $\hat{\upsilon}_{roa}$, we fit an OLS regression of y_{stock} and y_{roa} on average industry performance. Industry averages are based on 49 Fama–French industries. Regression results for y_{stock} are presented in the left half of Table 2 and the results for y_{roa} are in the right half. Equally weighted industry averages and value-weighted

12. We added certain control variables for robustness as well. These results are presented in Table 5.

TABLE 2

Estimation of Residual Performance

	Dependent variable: Stock performance, y_{stock} Residuals: $\hat{\upsilon}_{stock}$		Dependent variable: Return on assets, y_{roa} Residuals: $\hat{\upsilon}_{roa}$	
	Equal-weighted industry perf.	Value-weighted industry perf.	Equal-weighted industry perf.	Value-weighted industry perf.
Constant	0.034**	0.030**	0.018*	0.011
Industry performance	1.024**	1.066**	0.947**	0.994**
Number of observations	9,697	9,697	9,702	9,702
R^2	19.1%	19.4%	7.59%	6.97%

Notes: The table presents the results of the regressions that generate estimates of the residual stock performance, $\hat{\upsilon}_{stock}$, and residual Return on Assets, $\hat{\upsilon}_{roa}$. The dependent variable is the annual stock return, y_{stock}, in the left half and the annual return on assets (*EBIT/ASSETS*), y_{roa}, in the right half. The independent variable is the industry's average performance. For each firm *i*, the firm itself is not included in the industry average. Although the model implies that equally weighted averages should be used, regressions based on value weighted averages are presented for comparison. Industry performance is based on 49 Fama–French industries. Reported statistics are based on robust standard errors clustered at the company level.
$^{**}p < 0.01$. $^{*}p < 0.05$.

industry averages yield very similar industry adjusted performances. We use equally weighted industry average in our analysis.

In the rest of the paper we have shown the results under the assumption that both the board of directors and lending banks use a 50%–50% linear combination ($\hat{\upsilon}_{stk+roa}$) of industry adjusted stock performance, $\hat{\upsilon}_{stock}$, and return on assets, $\hat{\upsilon}_{roa}$. We have documented results under alternative performance evaluation assumptions in our longer version of the paper (Ozelge and Saunders 2008). Results are qualitatively identical and quantitatively very similar.

4.2 Average CEO Turnover across Performance Groups

In Table 3, we look at the behavior of average CEO turnover rates over different ranges of residual firm performance to get an approximate idea about the effect of banks on forced CEO turnover rates. In Panel A, forced turnover rates are shown, and in Panel B, voluntary turnover averages are shown. In Panel A, as *Loan Intensity* increases from zero to the highest percentile range, the fraction of forced turnovers clearly increases for low-performance firms where the firms' residual industry-adjusted performance is in the lowest one-third percentile range. For zero *Loan Intensity*, the average forced turnover rate is 5.45%, and for the highest *Loan Intensity* range, the average forced turnover rate is 8.43%. For high-performance firms, the fraction of forced turnovers does not materially change with bank loan intensity. For voluntary turnovers in Panel B, for low-performing firms, the average voluntary turnover rate does not increase with *Loan Intensity*. There is another important insight that can be drawn from the results. In Panel A, the percentage of companies with forced turnover increases from 1.39% to 5.45% (an increase of 4.06%) if we compare best and worst performers when *Loan Intensity* is zero. However, in the fourth row with the highest loan intensities, the average forced turnover rate is 1.05% and 8.43% for the best and worst performers (difference is 7.38%), respectively. That is,

TABLE 3

Forced and Voluntary Turnovers over Different Ranges of Loan Intensity and Industry-Adjusted Performance

	Residual performance $\hat{\upsilon}_{stk+roa}$								
	Bottom 1/3			Middle 1/3			Top 1/3		
	Number of obs.	Number of turnovers	Percentage of turnovers	Number of obs.	Number of turnovers	Percentage of turnovers	Number of obs.	Number of turnovers	Percentage of turnovers
Panel A. Forced turnovers									
Loan Intensity									
0	1,522	83	5.45%	1589	31	1.95%	1587	22	1.39%
Bottom 1/3	498	25	5.02%	476	7	1.47%	477	7	1.47%
Middle 1/3	499	34	6.81%	477	13	2.73%	476	8	1.68%
Top 1/3	498	42	8.43%	476	13	2.73%	477	5	1.05%
Panel B. Voluntary turnovers									
0	1,522	152	9.99%	1589	134	8.43%	1587	113	7.12%
Bottom 1/3	498	51	10.24%	476	52	10.92%	477	29	6.08%
Middle 1/3	499	49	9.82%	477	58	12.16%	476	47	9.87%
Top 1/3	498	49	9.84%	476	42	8.82%	477	33	6.92%
Panel C. Forced turnovers with and without covenant violations									
There is a covenant violation, $cv = 1$									
Bottom 1/3	21	3	14.29%	1	0	0.00%	2	0	0.00%
Middle 1/3	61	12	19.67%	6	0	0.00%	12	2	16.67%
Top 1/3	61	20	32.79%	9	2	22.22%	9	0	0.00%
There is no covenant violation, $cv = 0$									
Bottom 1/3	477	22	4.61%	475	7	1.47%	475	7	1.47%
Middle 1/3	438	22	5.02%	471	13	2.76%	464	6	1.29%
Top 1/3	437	22	5.03%	467	11	2.36%	468	5	1.07%

Notes: The table presents the number of companies, the number of forced and voluntary turnovers and the percentage of companies with a forced or voluntary turnover over different ranges of residual firm performance, $\hat{\upsilon}_{stk+roa}$, and *Loan Intensity*, Λ. Residual firm performance $\hat{\upsilon}_{stk+roa}$ is a 50%–50% mix of residual return-on-assets performance (*EBIT/ASSETS*), $\hat{\upsilon}_{roa}$, and residual stock performance, $\hat{\upsilon}_{stock}$. The percentiles of *Loan Intensity* variable are calculated over the subsamples where *Loan Intensity* is positive and $\hat{\upsilon}_{stk+roa}$ is in a certain given percentile range. The results when *Loan Intensity* is zero are presented separately in the first rows of Panel A and Panel B. In Panel C, observations in Panel A with positive *Loan Intensity* are separated into two groups: with covenant violations and without covenant violations. The number of observations in each cell of Panel A is equal to the sum of the number of observations in Panel C for the corresponding cells with and without covenant violations.

the sensitivity of forced CEO turnover to performance increases with loan intensity. There is no such relationship in Panel B for voluntary turnovers.

4.3 Estimation of CEO Turnover Likelihood Using Probit Analysis

Next, we extend our tests by estimating a probit model of equation (6), making the initial assumption that *Loan Intensity* is exogenous. This approach is useful in benchmarking the results when we recognize that loan intensity may be endogenous for the CEO.

In Table 4, the coefficient and the marginal effect for the residual performance $\hat{\upsilon}_{stk+roa}$ is much smaller for voluntary turnovers than for forced turnovers. This

TABLE 4

Pooled Probit Estimations under Exogeneity Assumption

Coefficients			Low perf. No loan	Low perf. Avg. loan	Avg. perf. No loan	Avg. perf. Avg. loan
Forced turnover		Marginal effects and likelihoods				
Constant	-1.978^{**}					
$\hat{\upsilon}_{stk+roa}$	-1.341^{**}	Mar. eff. of $\hat{\upsilon}_{stk+roa}$	$-13.7\%^{**}$	$-22.6\%^{**}$	$-7.6\%^{**}$	$-10.1\%^{**}$
Λ	-0.096	Marginal effect of Λ	$5.7\%^{**}$	$6.8\%^{**}$	-0.5%	-0.5%
$\Lambda \cdot \hat{\upsilon}_{stk+roa}$	-2.672^{**}	Prob. of turnover	5.0%	6.2%	2.4%	2.3%
No. of obs: 9,052		Pseudo R^2: 7.1%				
Voluntary Turnover						
Constant	-1.348^{**}					
$\hat{\upsilon}_{stk+roa}$	-0.293^{**}	Mar. eff. of $\hat{\upsilon}_{stk+roa}$	$-5.2\%^{**}$	$-5.8\%^{**}$	$-4.7\%^{**}$	$-5.2\%^{**}$
Λ	-0.025	Marginal effect of Λ	0.3%	0.3%	-0.4%	-0.4%
$\Lambda \cdot \hat{\upsilon}_{stk+roa}$	-0.163	Prob. of turnover	10.1%	10.2%	8.9%	8.8%
No. of obs: 9,052		Pseudo R^2: 0.29%				

Notes: The table presents the coefficients and corresponding marginal effects for the variables in equation (6) under the assumption that both the board and lending banks use $\hat{\upsilon}_{stk+roa}$ as the performance measure. The dependent variable is the indicator variable *Forced Turnover*. The results for voluntary turnover events are reported for comparison. $\hat{\upsilon}_{stk+roa}$ is the 50%–50% linear combination of the residual stock performance, $\hat{\upsilon}_{stock}$, and the residual return-on-assets performance (*EBIT/ASSETS*), $\hat{\upsilon}_{roa}$. Λ is the *Loan Intensity* variable. Reported statistical significance levels are based on robust standard errors clustered at the company level. The marginal effects are calculated at four different points (Powers 2005). Low performance level corresponds to performance levels that are one standard deviation below mean. Average loan level is where *loan Intensity* is at the sample average given positive.
$^{**}p < 0.01$.

implies that a firm's relative performance measure is much more important for forced turnover decisions.

In addition, the coefficient of the interaction variable , $\hat{\upsilon}_{stk+roa} \cdot \Lambda$, and the marginal effect of *Loan Intensity* in low-performance cases is much larger for forced turnovers than for voluntary turnovers. Bank loans do not seem to have an effect on voluntary turnovers.

For forced turnovers, the marginal effect of the relative performance variable $\hat{\upsilon}_{stk+roa}$ is higher in low-performance scenarios than in average performance scenarios, for a given level of bank loan intensity. In addition, among low-performance scenarios, the marginal effect of $\hat{\upsilon}_{stk+roa}$ is higher when there are bank loans outstanding than when there are no bank loans. Thus, bank loans increase the sensitivity of forced CEO turnover to relative performance. In addition, the magnitude of the marginal effect of $\hat{\upsilon}_{stk+roa}$ is economically important.

In Table 4, for forced turnovers, the marginal effect of *Loan Intensity* variable Λ is significant only in low performance scenarios. Thus, outstanding bank loans increase the likelihood of forced CEO turnover only under low performance.

For forced turnovers, at a low firm performance with average bank loans outstanding, a 1% decline in $\hat{\upsilon}_{stk+roa}$ increases forced CEO turnover likelihood by 0.23% and a 1% increase in bank loan intensity, Λ, increases forced CEO turnover probability by 0.07%. These marginal effects are calculated at a poor firm performance level and an average bank loan level. According to our results, the estimated CEO replacement

TABLE 5

Robustness Check: Leverage versus Bank Loans

Robustness checks for results in Table 4						Robustness checks for results in Table 9			
Column 1		Column 2		Column 3		Column 4		Column 5	
Constant	-1.98^{**}	Constant	-1.99^{**}	Constant	-1.38^{**}	Constant	-1.63^{**}	Constant	-1.45^{**}
$\hat{\upsilon}_{stk+roa}$	-1.27^{**}	$\hat{\upsilon}_{stk+roa}$	-1.30^{**}	$\hat{\upsilon}_{stk+roa}$	-1.32^{**}	$\hat{\upsilon}_{stk+roa}$	-1.25^{**}	$\hat{\upsilon}_{stk+roa}$	-1.20^{**}
Λ	-0.08	*Leverage*	-0.02	Λ	-0.07	Λ	1.54^{**}	*Leverage*	0.68
$\Lambda \cdot \hat{\upsilon}_{stk+roa}$	-2.67^{**}	$Lev \cdot \hat{\upsilon}_{stk+roa}$	-1.31	$\Lambda \cdot \hat{\upsilon}_{stk+roa}$	-2.64^{**}	*NBL*	0.37		
NBL	0.01			Tenure	-0.02^{**}				
$NBL \cdot \hat{\upsilon}_{stk+roa}$	-0.46			CEO Equity	-0.03^{**}				
				Size	-0.08^{**}				
				B/M Ratio	0.17^{**}				
				G-Index	0.00				
Number of obs: 9,025		Number of obs: 9,025		Number of obs: 8,561		Number of obs: 212		Number of obs: 212	
Pseudo R^2: 7.1%		Pseudo R^2: 6.9%		Pseudo R^2: 11.6%		Pseudo R^2: 9.3%		Pseudo R^2: 6.8%	

Notes: The table presents certain robustness tests for the findings presented in Tables 4 and 9 regarding the effect of bank loan intensity, Λ, on forced CEO turnover likelihood. Both the board of directors and the lending banks use $\hat{\upsilon}_{stk+roa}$ as the performance measure. $\hat{\upsilon}_{stk+roa}$ is the 50%–50% linear combination of the residual stock return and residual return on assets (*EBIT/ASSETS*). Columns 4 and 5 are for robustness checks for the results presented in Table 9 where the sample is the company-years with a covenant violation.
Column 1: It is investigated whether nonbank leverage (Nonbank Debt/Total Assets), NBL, has significant explanatory power in addition to the bank loan intensity.
Column 2: Leverage is used instead of bank loan intensity, Λ.
Column 3: This column presents results for equation (6) when control variables are included. Tenure is CEO's tenure as CEO in years. CEO Equity is the equity ownership of the CEO in percentage such as 7 for 7%. Size is the natural logarithm of the company's total assets. B/M Ratio is the ratio of the book value of assets to the market value of assets. G-Index is the governance index of Gompers, Ishii, and Metrick (2003).
Column 4: It is investigated whether nonbank leverage, (Nonbank Debt/Total Assets), has significant explanatory power in addition to the bank loan intensity. Sample is the company-years with covenant violations.
Column 5: Leverage is used instead of Bank Loan Intensity. Sample is the company-years with covenant violations.
$^{**}p < 0.01$.

probability increases from 5% to 6.2% (an increase of 24%) if *Loan Intensity* increases from 0 to its mean level when a firm's industry adjusted performance is one standard deviation below average.

We next examine whether our results are due to bank debt or total debt. In order to test this, we have developed alternative specifications of our model. In the first alternative specification, we added nonbank debt to the probit specification of equation (6) along with outstanding bank loans. In the second alternative, we used total leverage instead of bank loan intensity. The results are given in Table 5 Columns 1 and 2.

In Column 1 of Table 5, the coefficient for the interaction variable of nonbank leverage and performance, $NBL \cdot \hat{\upsilon}_{stk+roa}$, is smaller in magnitude than the coefficient of the interaction variable $\Lambda \cdot \hat{\upsilon}_{stk+roa}$ for bank loan intensity. In addition, the interaction variable for nonbank leverage is statistically insignificant and its *p*-value is 69% (not shown in the table). Results in Column 1 imply that bank loans rather than nonbank debt matters in the forced removal of poorly performing CEOs. In addition, the coefficient of $\Lambda \cdot \hat{\upsilon}_{stk+roa}$ is almost the same as in Table 4 and it is not affected by the addition of nonbank leverage variable.

In Column 2, the coefficient for the interaction of leverage and performance, $Leverage \cdot \hat{\upsilon}_{stk+roa}$, is significantly smaller in magnitude than the coefficient for the interaction of bank loan intensity and performance, $\Lambda \cdot \hat{\upsilon}_{stk+roa}$, reported in Table 4. In addition, it is statistically insignificant with *p*-value of 16% (not shown in the table). Thus, from the probit results we conclude that it is bank loans outstanding rather than overall leverage that increases forced CEO turnover likelihood when there is a poor firm performance.

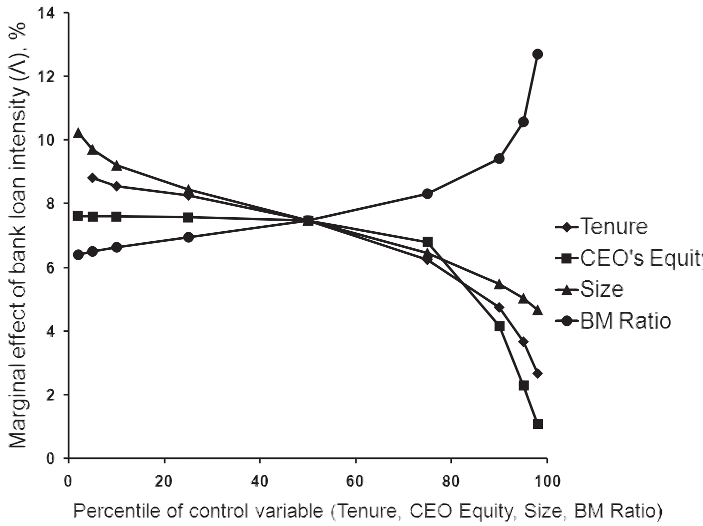

FIG. 1. Marginal Effect of Bank Loan Intensity, Λ, over Different Ranges of Control Variables.

In addition, we test whether our results are robust to inclusion of control variables. The control variables we added to the probit equation, equation (6), are tenure of the CEO, CEO's equity stake, company size, book-to-market ratio, and G-Index. Book-to-market ratio is a proxy for company growth and G-Index is the governance index of Gompers, Ishii, and Metrick (2003). According to results in Table 5 Column 3, longer tenure, higher equity stake of the CEO, larger company size and higher growth (lower book-to-market ratio) make forced CEO turnovers less likely. In addition, the marginal effect of outstanding bank loans depends on the level of the control variables. For example, the impact of bank loans outstanding on CEO turnover is less for a growth company with low book-to-market ratio than it is for a more mature company with a higher ratio. Marginal effects of loan intensity over different levels of control variables are shown in Figure 1. The G-Index variable has no impact on CEO turnover (as similarly reported in Kaplan and Minton 2010, Jagannathan and Pritchard 2007).

Next, we examine the robustness of the single equation probit model results by developing a model that allows for the endogenous choice of bank financing.

4.4 Endogeneity and Construction of Instrumental Variables

Before constructing our instruments we discuss several hypothetical scenarios in order to understand the potentially endogenous nature of *Loan Intensity*, Λ_{it}. For example, it could be argued that a CEO of lower performance ability might avoid bank loans in order to avoid being closely monitored and put under governance pressure by lending banks.

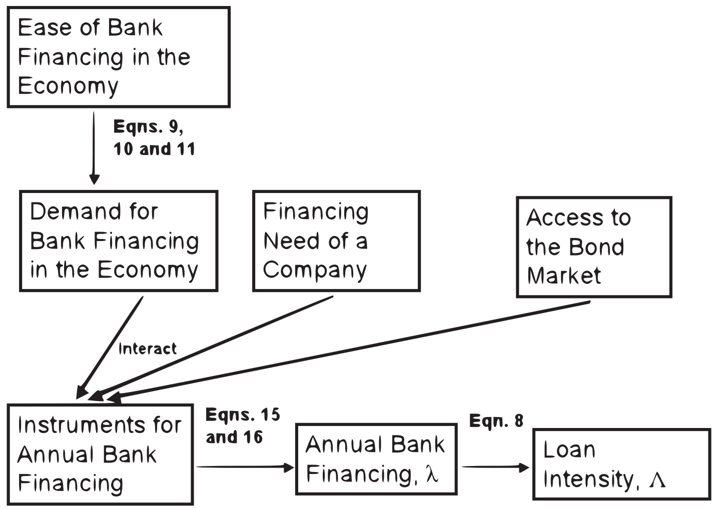

FIG. 2. Construction of Loan Intensity from Instrumental Variables.

Alternatively, CEOs with shorter tenures are more likely to be replaced. Tenure is correlated with the age. If young CEOs have more tolerance for the intense monitoring executed by lending banks, then younger CEOs are more likely to get bank loans than older CEOs.

Constructing loan intensity from annual bank financing. Rather than constructing the stock variable *Loan Intensity*, Λ_t, directly from instrumental variables, we calculate it from the flow variable *Annual Bank Financing*, λ_t, and, in turn, construct *Annual Bank Financing*, λ_t, through the use of instrumental variables. The schema in Figure 2 represents our approach. We can write the stock variable *Loan Intensity*, Λ_t, as a function of *Annual Bank Financing*, λ_t, as:

$$\Lambda_t = \lambda_t + m_1\lambda_{t-1} + m_2\lambda_{t-2}, \tag{8}$$

where Λ_t is the stock of borrower's bank financing at the end of time t and λ_t, λ_{t-1} and λ_{t-2} are the annual loan flows and m_1 and m_2 are remaining fractions outstanding.

Ease of bank financing in the economy and annual bank financing. It is reasonable to assume that if the lending practices of commercial banks become more lenient the demand for bank loans increases and it is an exogenous variation for a company. In order to construct our instrumental variables, we first estimate the level of aggregate bank loan demand in the economy derived from a measure of the leniency or strictness of lending practices. Second, we then interact this aggregate bank loan demand with external financing needs of sample companies to generate our instrumental variables (see Figure 2).

TABLE 6

COEFFICIENT ESTIMATES OF THE ARMA(4, 1) MODEL

Variable	X_q	Y_{q-1}	Y_{q-2}	Y_{q-3}	Y_{q-4}	θ	Constant
Coefficient	−0.0101	0.1356	0.1970	0.1820	−0.4389	0.4775	0.0012
t-statistic	−3.28**	0.68	1.24	1.70	−3.52**	1.81[a]	0.97
No. of observations: 60							

NOTES: The table presents the estimates of the coefficients and their *t*-statistics in the model of equation (9). The dependent variable, Y_q, is the seasonal change in *Aggregate Quarterly Bank Financing* from quarter q−4 to q. X_q is the average *Change in Tightness* in the bank loan market over the quarters q, $q-1$, $q-2$ and $q-3$. Sample data are quarterly FED survey data from 1990 onward.
[a]p-value of the moving average component, θ, is 0.07.
**$p < 0.01$.

To estimate the level of aggregate bank financing in the economy, derived from bank loan market conditions, we use the Federal Reserve's *Senior Loan Officer Opinion Survey* to obtain our independent variable: the *Net Percentage of Domestic Respondents Tightening Standards for C&I Loans* labeled as *Change in Tightness*. It ranges from −100% to +100%. −100% (+100%) means that all loan officers of participating banks reported that lending standards were loosened (tightened). Thus, for example, plus 43% means a net 43% of bank respondents reported that lending standards are being tightened.

Our dependent variable is a measure of demand for bank loan financing in the economy, *Aggregate Quarterly Bank Financing*, which is defined as the average level of bank loan financing as a fraction of total assets in any given quarter across 6,848 Compustat companies that are matched with the Dealscan database.

In order to estimate aggregate bank loan financing from lending standards, we use the following autoregressive moving average model for the period from 1990:$Q$1 to 2005:$Q$4.

$$Y_q = \alpha + \gamma X_q + \phi_1 Y_{q-1} + \phi_2 Y_{q-2} + \phi_3 Y_{q-3} + \phi_4 Y_{q-4} + \epsilon_q + \theta\epsilon_{q-1}, \qquad (9)$$

where Y_q is the seasonal difference of *Aggregate Quarterly Bank Financing* from quarter $q-4$ to quarter q (the same quarter of the previous year). We take the difference of our dependent variable to make it stationary. X_q is the average of the *Change in Tightness* measure from the Federal Reserve's survey over a 1-year period from quarter $q-3$ to q (i.e., four quarters including $q-3$). The parameter estimates of equation (9) are given in Table 6. We have up to a fourth-order lagged dependent variable in equation (9) because the fourth-order autocorrelation in the error term, ϵ, is significantly different from zero, otherwise.

The θ estimate of 0.4775 in Table 6 implies a significant moving average component in the error terms. That is, successive shocks to changes in aggregate quarterly bank financing have a high correlation coefficient of 0.39 ($=\theta/(1+\theta^2)$). The coefficient estimate, γ, for the average change in tightness, X_q, is economically important. For instance, if a net 50% of the respondents reported more lenient lending practices, we have an increase in *Aggregate Quarterly Bank Financing* of 0.5%. This is a significant amount given that a typical value for *Aggregate Quarterly Bank Financing* is 5% of assets.

With the predicted values of seasonal differences, $\hat{Y}_q$, and the initial observed values of *Aggregate Quarterly Bank Financing*, we obtain the predicted values of *Aggregate Quarterly Bank Financing* over the sample period.

Since our sample is annual, we construct *Aggregate Annual Bank Financing* from estimated *Aggregate Quarterly Bank Financing*:

$$\text{Aggregate Ann. Bank Fin.}_t = \sum_{i=1}^{4} \text{Aggregate Qtrly. Bank Fin.}_{t:Q_i}. \qquad (10)$$

Thus, to clarify, *Aggregate Annual Bank Financing* is the aggregate level of bank financing in the economy, which is estimated from lending conditions. *Annual Bank Financing*, λ, for a given firm is the level of its bank loan financing as a fraction of the firm's total assets during a given fiscal year.

Next, we normalize *Aggregate Annual Bank Financing* as:

$$Demand_t = \frac{\text{Aggregate Ann. Bank Fin.}_t - \text{Aggregate Ann. Bank Fin.}_{1990}}{\text{Aggregate Ann. Bank Fin.}_{1990}}, \qquad (11)$$

where this normalized aggregate demand variable predicted from the tightness of lending standards is the main variable that induces exogenous change in firm-level bank financing.

Access to the public debt market. While increases or decreases in the tightness of bank lending practices are likely to have an impact on a firm's bank financing, firms may react differently depending on the availability of substitutes for bank financing. For example, a firm with an investment grade bond rating will likely be very sensitive to changes in lending standards as it changes the mix of its debt. On the other hand, if a firm does not have access to the bond market it will be less sensitive to changes in the lending standards (it has to get any external financing from banks). In addition, the proportion of bank financing in total financing in a year will be lower, *ceteris paribus*, for an investment-grade firm than for a firm with no access to the public bond market.[13] Accordingly, we interact dummy variables that represent three bond rating groups (*Investment Grade*, *Speculative Grade*, and *Not Rated*) with our *Demand* variable, estimated from lending conditions, in order to build our instrumental variables as shown in Figure 2.

Financing need of a company. In addition to bank loan market conditions and access to the public debt market, a given firm's need for external financing can affect a firms's choice with respect to its bank loan financing. The greater a firm's demand for

13. This case is a perfect application field for the use of a two-tiered model rather than a regular Tobit model in the econometric specification of loan financing. We separate the decision of whether to apply for a bank loan from the decision of how much to borrow in a two-tiered decision model.

financing during a particular fiscal year, the greater its potential need for bank loan financing and the more sensitive it will be to changes in banks' lending standards. In order to predict any given firm's need for debt financing during any given period, we use a firm's cash expenditure on acquisitions, capital expenses, the amount of debt which is due within 1 year and its working capital deficit as key variables. All these variables are normalized by dividing them by a given firm's total assets. While there exists Compustat data items for the first three of these four variables, the working capital deficit requires some additional explanation.

A Firm's working capital deficit. One measure of a firm's working capital deficit is the difference between its working capital level, WC_i, and the average working capital level of the industry, $WC^{Avg}_{\{-i\}t}$[14], which firm i belongs to. However, certain firms might be more efficient. Therefore, we might have $WC_i < WC^{Avg}_{\{-i\}t}$ with no real working capital deficit. Alternatively, a firm might be financially constrained to meet its working capital deficit, and in this case a deficit does not lead to additional financing. In order to deal with these issues WC_{it} is regressed onto industry average working capital, $WC^{Avg}_{-\{i\}t}$, over the sample period and residuals of regression in equation (12) are used to measure *Transitory Working Capital Deficit* of each firm.

We use Fama–French's definitions of 49 industries. For industry averages all Compustat companies are included, except for the smallest companies in the bottom 10 percentile.

$$WC_{it} = \delta_0 + \delta_1 WC^{Avg}_{\{-i\}t} + \kappa_{it}, \tag{12}$$

If the residual in Equation (12) is negative at the end of a particular fiscal year we predict that this deficit will be financed during the next fiscal year through internal funds, bond issues, or through bank loans. We define the *Transitory Working Capital Deficit*, $TWCD_{it}$, as equal to the residual of above regression, κ_{it}, if κ_{it} is negative and zero otherwise.

TWCD is a valid instrument because the level of *TWCD* cannot be related to unobservable firm characteristics or CEO characteristics ($E[\kappa_{it}] = 0 \ \forall i$).

Instrumental variables. We interact the variables that reflect a given firm's need for external financing with aggregate bank loan demand in the economy (*Demand* variable) and bond ratings in order to construct our instrumental variables. Figure 2 provides a summary of our approach. At the end, we have the following set of instrumental variables based on the interaction of three variables, that is, the need for external financing by the firm, the aggregate bank loan demand, and the firm's bond rating. The variables that reflect a given firm's need for external financing are

14. We exclude firm i while averaging in order to eliminate a trivial part of correlation.

instruments as well.

$$z_{it} = \begin{pmatrix} Acquisitions & \textit{Debt Due in 1 Year} \\ \textit{Acq} \cdot \textit{Demand} \cdot \textit{Inv Grade} & \textit{Debt Due} \cdot \textit{Demand} \cdot \textit{Inv Grade} \\ \textit{Acq} \cdot \textit{Demand} \cdot \textit{Spc Grade} & \textit{Debt Due} \cdot \textit{Demand} \cdot \textit{Spc Grade} \\ \textit{Acq} \cdot \textit{Demand} \cdot \textit{Not Rated} & \textit{Debt Due} \cdot \textit{Demand} \cdot \textit{Not Rated} \\ \textit{Capital Expenses} & TWCD_{t-1} \\ \textit{Cap Ex} \cdot \textit{Demand} \cdot \textit{Inv Grade} & TWCD_{t-1} \cdot \textit{Demand} \cdot \textit{Inv Grade} \\ \textit{Cap Ex} \cdot \textit{Demand} \cdot \textit{Spc Grade} & TWCD_{t-1} \cdot \textit{Demand} \cdot \textit{Spc Grade} \\ \textit{Cap Ex} \cdot \textit{Demand} \cdot \textit{Not Rated} & TWCD_{t-1} \cdot \textit{Demand} \cdot \textit{Not Rated} \end{pmatrix}$$

4.5 Partial Maximum Likelihood Estimation (PMLE)

In this subsection, we discuss our PMLE estimation of a system of equations where the model for *Forced Turnover* is probit and the model for *Annual Bank Financing*, λ, is a two-tiered model (Cragg 1971). We model *Annual Bank Financing*, λ, as two-tiered because the sensitivity of firms with respect to whether they will get a bank loan can be different from the sensitivity of firms with respect to how much they will borrow from a lending bank as discussed in Section 4.4 and footnote 13.

As discussed in Section 4.4, endogenous *Loan Intensity*, Λ, is derived from *Annual Bank Financing*, λ, and *Annual Bank Financing* is estimated in a two-tiered setting from instrumental variables (see Figure 2 for a schematic summary). We cannot apply two-stage estimation in this system (Wooldridge 2002, Sections 9.5 and 15.7) since we have a probit model with a nonlinear endogenous variable *Loan Intensity* that is truncated at zero (i.e., *Loan Intensity* cannot be negative).

If we assume that both the board of directors and lending banks use $\hat{\upsilon}_{stk+roa}$ as the performance measure (defined in Section 4.1), the probit model for *Forced Turnover* with an endogenous *Loan Intensity*, Λ, variable can be written as:

$$F^*_{it} = -\alpha'_1 + k_1\hat{\upsilon}_{stk+roa,it} - \alpha'_2\Lambda_{it} + k_2\Lambda_{it}\hat{\upsilon}_{stk+roa,it} + u_{1it} \tag{13}$$

occurrence of a forced turnover

$$F_{it} = 1[F^*_{it} > 0] \tag{14}$$

$$\lambda^*_{it} = Constant + \gamma_1\hat{\upsilon}_{stk+roa,it} + \gamma_2\lambda_{it-1} + \gamma_3\lambda_{it-2} + \boldsymbol{\gamma_4 z_{it}} + u_{2it} \tag{15}$$

occurrence of bank financing during t

$$\lambda^{**}_{it} = Constant + \xi_1\hat{\upsilon}_{stk+roa,it} + \xi_2\lambda_{it-1} + \xi_3\lambda_{it-2} + \boldsymbol{\xi_4 z_{it}} + u_{3it} \tag{16}$$

amount of bank financing during t

$$\lambda_{it} = \lambda_{it}^{**} 1[\lambda_{it}^{*} > 0] \tag{17}$$

$$\underbrace{\Lambda_{it}}_{\text{loan inten. from annual bank fin.}} = \lambda_{it} + m_1 \lambda_{it-1} + m_2 \lambda_{it-2} \tag{18}$$

equation (13) reflects the probit model for forced CEO turnover events where the dependent variable is a latent variable, F_{it}^*. In equation (14), we observe the CEO turnover event, F_{it}, equal to 1 (happened) if the latent variable F_{it}^* is greater than 0 (function 1[.] is the indicator function). Equations (15), (16)[15] and (17) reflect the two-tiered model for *Annual Bank Financing*, λ_{it}. In equation (15), the dependent variable is a latent variable, λ_{it}^*, and firm i decides to get a bank loan if this latent variable is greater than 0. In equation (16), the dependent variable is a latent variable, λ_{it}^{**}, and firm i decides how much to borrow from banks in the form of loans. In equation (17), we observe *Annual Bank Financing*, λ_{it}, equal to λ_{it}^{**} if the latent variable λ_{it}^* is greater than 0. The final equation in the system, equation (18), defines *Loan Intensity* as a function of *Annual Bank Financing* as described in Section 4.4.

$\hat{\upsilon}_{stk+roa,it}$ is the industry adjusted (residual) performance variable as constructed in Section 4.1. The vector $\boldsymbol{z_{it}}$ is the vector of instrumental variables as defined at the end of Section 4.4. We add industry dummies to equations (15) and (16).

Residuals in equations (13), (15), and (16), u_{1it},u_{2it},u_{3it}, are jointly normal distributed. We allow u_{1it} to be arbitrarily correlated with both u_{2it} and u_{3it}. Our partial likelihood estimating function for the system of equations is derived and technical details about executing the estimation of the equation system are provided in the appendix of a longer version of this article (Ozelge and Saunders 2008).

The results of the *PMLE* estimation are presented in Table 7 . In Panel A, the coefficient estimates of equation (13) are given where we show the relationship between forced CEO turnover and loan intensity after controlling for firm performance. The coefficient of the loan intensity–firm performance interaction term, $\Lambda \cdot \hat{\upsilon}_{stk+roa}$, of -2.217 is statistically and economically significant. According to the econometric model developed in Section 3, the coefficient of this interaction variable reflects the influence of lending banks on CEO replacement decisions at a given level of performance. Marginal effect of *Loan Intensity*, Λ, is significant only in low-performance scenarios as expected. The likelihood of CEO replacement is 2.4% if a given firm's industry-adjusted performance is the same as average industry performance. This likelihood increases to 4.9% if the firm's industry-adjusted performance is one standard deviation below average when *Loan Intensity*, Λ, is zero. If a given firm has

15. In equations (15) and (16), lagged values of λ_{it} are included because of technical reasons rather than economic reasons. Including these two past observations of *Annual Bank Financing*, λ_{it}, into the conditioning set yields much simpler likelihood function. We can drop these two lagged variables and write the partial likelihood function in a more complicated way by introducing more parameters, namely, serial correlations in u_{2i} and u_{3i}.

TABLE 7

ESTIMATION BY MAXIMIZING PARTIAL LIKELIHOOD FUNCTION

Panel A. Estimated coefficients and corresponding marginal effects for the probit equation in Section 4.5.

Coefficients		Marginal effects and likelihoods	Low perf. No loan	Low perf. Avg. loan	Avg. perf. No loan	Avg. perf. Avg. loan
Constant	-1.985^{**}					
$\hat{\upsilon}_{stk+roa}$	-1.332^{**}	Marginal effect of $\hat{\upsilon}_{stk+roa}$	$-13.4\%^{**}$	$-21.1\%^{**}$	$-7.4\%^{**}$	$-9.8\%^{**}$
Λ	0.001	Marginal effect of Λ	$5.5\%^{**}$	$6.5\%^{**}$	0.0%	0.0%
$\Lambda \cdot \hat{\upsilon}_{stk+roa}$	-2.217^{**}	Prob. of turnover	4.9%	6.0%	2.4%	2.4%

Panel B. Estimated coefficients and z-statistics of the variables in the vectors γ and ξ in Equations (15) and (16)

Variable	Equation (15) coeff.	z-stat	Equation (16) coeff.	z-stat
$\hat{\upsilon}_{stk+roa}$	−0.143	-1.98^{*}	−0.019	−1.75
λ_{t-1}	0.762	6.57^{**}	0.127	7.38^{**}
λ_{t-2}	1.109	9.28^{**}	0.158	9.04^{**}
Acquisitions	3.099	7.33^{**}	0.586	9.67^{**}
Acq·Demand·Inv Grade	2.269	2.99^{**}	0.310	2.97^{**}
Acq·Demand·Spc Grade	2.389	3.17^{**}	0.464	4.48^{**}
Acq·Demand·Not Rated	0.856	1.17	0.258	2.45^{*}
Capital Expenses	−0.037	−0.11	0.021	0.41
Cap Ex·Demand·Inv Grade	5.115	8.18^{**}	0.646	7.03^{**}
Cap Ex·Demand·Spc Grade	3.470	5.85^{**}	0.632	7.26^{**}
Cap Ex·Demand·Not Rated	0.998	1.68	0.138	1.54
Debt Due in 1 Year	1.042	1.20	0.252	1.94
Debt Due·Demand·Inv Grade	6.364	3.90^{**}	0.402	1.68
Debt Due·Demand·Spc Grade	4.604	2.67^{**}	0.654	2.62^{**}
Debt Due·Demand·Not Rated	5.240	2.83^{**}	0.886	3.21^{**}
$TWCD_{t-1}$	−0.940	-2.35^{*}	−0.165	-2.72^{**}
$TWCD_{t-1}$*·Demand·Inv Grade*	−1.748	-2.08^{*}	−0.177	−1.45
$TWCD_{t-1}$*·Demand·Spc Grade*	−0.239	−0.30	−0.103	−0.89
$TWCD_{t-1}$*·Demand·Not Rated*	1.287	1.75	0.138	1.23
Industry Dummies	YES		YES	

Panel C. Marginal effects of the instrumental variables on the probability of *Annual Bank Financing*, λ_t, being positive and on the amount of *Annual Bank Financing*, λ_t

	Probability of annual bank financing			Amount of annual bank financing		
	Inv Grade	*Spc Grade*	*Not Rated*	*Inv Grade*	*Spc Grade*	*Not Rated*
Acquisitions (+10%)	7.87%	7.85%	7.58%	6.02%	6.11%	6.00%
Capital Expenses (+10%)	0.49%	0.30%	0.03%	0.55%	0.54%	0.28%
Debt Due in 1 Year (+10%)	3.07%	2.83%	2.89%	2.74%	2.87%	2.99%
TWCD (−10%)	2.25%	2.06%	1.86%	1.74%	1.70%	1.57%
Demand increases by 10%						
Acquisitions (+10%)	1.45%	1.22%	0.45%	0.64%	0.80%	0.37%
Capital Expenses (+10%)	1.74%	1.15%	0.36%	0.97%	0.96%	0.25%
Debt Due in 1 Year (+10%)	2.28%	1.58%	1.45%	0.73%	0.99%	1.00%
TWCD (-10%)	1.06%	0.49%	−0.12%	0.50%	0.44%	−0.03%

Panel D. Estimated correlations between error term u_1 and error terms u_2 and u_3 of equations (13), (15), and (16) and standard deviation of u_3 are presented along with their 95% confidence intervals.

σ_{12}	Confidence interval	σ_{13}	Confidence interval	σ_3	Confidence interval
−0.36	[−0.67 , 0.07]	−0.00	[−0.02 , 0.01]	0.15	[0.14 , 0.16]

(Continued)

TABLE 7

Continued

NOTE: In Panel A, the dependent variable is *Forced Turnover*. Λ stands for *Loan Intensity*. $\hat{\upsilon}_{stk+roa}$ is the 50%–50% mix of residual stock performance and residual return-on-assets performance. $\Lambda \cdot \hat{\upsilon}_{stk+roa}$ is *Loan Intensity* interacted with the estimated residual performance. All estimations in Panels A, B and D are made at the same time by maximizing the logarithm of the partial likelihood function derived in Appendix II of the longer version of this article (Ozelge and Saunders 2008). The marginal effects are calculated at four different points (Powers 2005). Low performance level corresponds to performance levels that are one standard deviation below mean. Average loan level is where *Loan Intensity* is at the sample average given positive. Number of observations is 81, 21. In panel C, the upper half of the panel shows the change in the probability and the amount of the bank loan financing when corresponding variables are increased by 10% when all independent values are at their median levels. The bottom half of the panel shows additional increase in the probability and the amount of bank loan financing when the *Demand* variable additionally increases by 10% due to more favorable bank loan lending conditions.
$^{**}p < 0.01$. $^{*}p < 0.05$.

the same level of underperformance but an average level of *Loan Intensity*, Λ, CEO replacement likelihood is 6.0% (22% higher than no-bank-loan case). These reported CEO turnover probabilities are annual probabilities.

When we do the analysis based on alternative assumptions of performance metrics used by the lending banks and the board of directors we find that an average level of bank loans outstanding increases the likelihood of a forced turnover for the CEOs of low performance firms by 22% to 47%. We reported these results in Ozelge and Saunders (2008).

4.6 Testing for Weak Instruments

In this part of the paper, we test the strength of the correlation between our instruments and the endogenous bank loan intensity variable, because a low level of correlation may result in biased estimates as demonstrated in Bound, Jaeger, and Baker (1995).

We have applied the weak-instrument tests developed for limited dependent variables like CEO turnover events by Finlay and Magnusson (2009). We report limited dependent version of Anderson-Rubin (AR) test as well as the Wald test in Table 8.

In order to apply these tests in our probit/Tobit setting, we estimate the bank loan intensity variable from our instrumental variables with a Tobit regression,[16] and then use the estimated bank loan intensity in the probit equation for the CEO turnover event.

The results of these tests are shown in Table 8. We present the results under the assumption that the performance variable is the 50%–50% mix of the stock return and the return on assets but the same conclusions hold under different assumptions for the performance variable such as the return on assets or the stock return. In Panel A, we test for the strength of all our instruments. In Panel B, we drop the instruments that utilize "cash spent on acquisitions" variable (*Acquisitions*) since "overbidding" CEOs in acquisitions might eventually be fired (Lehn and Zhao 2006).

The results in Table 8 reject the hypothesis that the coefficient of our key interaction variable $\Lambda \cdot \hat{\upsilon}_{stk+roa}$ is zero with *p*-value of less than 1% in both Panels A and B. In addition, the Pearson correlation and Spearman rank correlation between bank loan

16. We first estimate annual bank financing, λ, with a Tobit regression. Then we calculate bank loan intensity, Λ, with equation (8).

TABLE 8

Weak Instruments Tests for IV Probit Estimations

Coefficients		Weak instruments robust tests for IV probit (H_0: $\beta_{\Lambda \cdot \hat{\upsilon}_{stk+roa}} = 0$) Test	Statistic	*p-value*
Panel A. All instrumental variables of Section 4.4 are used in the estimation of bank loan intensity, Λ				
Constant	-1.983^{**}			
$\hat{\upsilon}_{stk+roa}$	-1.212^{**}	AR	$\chi^2(1) = 10.58$	0.0011
$\Lambda \cdot \hat{\upsilon}_{stk+roa}$	-3.800^{**}	WALD	$\chi^2(1) = 10.58$	0.0011
Panel B. Instrumental variables that use cash expenditures on acquisitions are dropped since they may not be truly exogenous to CEO turnover events (Lehn and Zhao 2006); the estimations and weak-instrument tests are repeated without dropped instruments				
Constant	-1.978^{**}			
$\hat{\upsilon}_{stk+roa}$	-1.140^{**}	AR	$\chi^2(1) = 16.71$	0.0000
$\Lambda \cdot \hat{\upsilon}_{stk+roa}$	-4.355^{**}	WALD	$\chi^2(1) = 16.68$	0.0000

Notes: The table presents coefficients and statistical significance for the variables in equation (13) and the weak-instruments test results. The dependent variable is the indicator variable *Forced Turnover*. $\hat{\upsilon}_{stk+roa}$ is the 50%–50% mix of the residual stock performance and return on assets. Λ is the endogenous *Loan Intensity* variable. We first estimate *Bank Loan Intensity* variable, Λ, through a Tobit model with the instrumental variables described in Section 4.4. We then use this estimated bank loan intensity variable as the single "instrument" in the probit model of equation (13) where bank loan intensity, Λ, is endogenous (*ivprobit* command of STATA is used). Finally, we apply the weak-instrument tests of Finlay and Magnusson (2009) with *rivtest* command of STATA. We had to drop not-interacted Λ variable while keeping our key interaction variable, $\Lambda \cdot \hat{\upsilon}_{stk+roa}$, because the tests of Finlay and Magnusson (2009) allow for only one endogenous variable. However, estimates of not-interacted Λ coefficient are statistically insignificant as reported in Tables 4 and 7 and dropping it out should not cause a bias. In Panel A, the number of observations is 8,571, and in Panel B, the number is 8,799.
**p $\leq$0.01.

intensity and estimated bank loan intensity are not weak with values in the range of 40% to 50%.

4.7 The Role of Lending Banks in Firm Performance

The results in the previous sections show that exogenous changes in loan intensity increases the likelihood of a forced CEO turnover following a poor firm performance. Managers in firms with high level of bank loans outstanding might be aware that they are more likely to be fired upon poor performance. This result might imply that banks play a disciplinary role on management. This suggests that there should be a causal relationship from the levels of bank loans outstanding to firm performance. In a working paper, Amihud, Ozelge, and Saunders (2009) show that outstanding bank loans increase firm performance especially for small companies. When such companies do not have access to public bond markets, the effect of bank governance on firm performance through outstanding loans is stronger. In addition, there is a self-selection in bank borrowing: large firms borrow from banks if they do not borrow from bond markets and when they expect low performance.

5. CHANNELS OF INFLUENCE

Although the results in Tables 3, 4, and 7 imply that there is a causal relationship from the fraction of outstanding bank loans in a firm's assets to the likelihood of a forced turnover under low firm performance our analysis so far does not explore the channel through which this causal relationship occurs. Next, we examine the importance of the channel from loan intensity to forced CEO turnover, via loan covenant violations.

5.1 Covenant Violations

In order to collect covenant violation data we used the method described in Chen and Wei (1993) and Beneish and Press (1993).[17] They search for certain phrases such as, "not in compliance," in 10-K reports under the headings "Management's Discussion and Analysis of Financial Condition and Results of Operations" and "Notes to Consolidated Financial Statements." This is a valid approach for detecting covenant violations because the U.S. Securities and Exchange Comission Release (1989)[18] requires companies to disclose covenant violations. These violations are reported in 10-Q reports as well as 10-K reports under these headings. For this reason, we have searched for certain phrases[19] near the word "covenant(s)" under the above headings in the annual and quarterly reports and amendments to those reports (10-K, 10-K/A, 10-Q, 10-Q/A, 10-K405, and 10-K405/A).[20]

Among 2,509 firms in ExecuComp database for any fiscal year from 1992 to 2001, 204 companies have a covenant violation during a given fiscal year.[21] The number of firm-years with a covenant violation for these 204 firms is 337. Out of 204 companies, 165 have usable loan intensity and turnover data items and do not have an SIC code between 6000 and 6999.

Assigning the calendar dates of covenant violation events to fiscal years needs some attention because of the method of the assignment of CEOs to fiscal years in

17. As discussed earlier, in a contemporaneous paper Nini, Smith, and Sufi (2009) also look at the impact of covenant violations on forced CEO turnovers.

18. There is another interpretive release of SEC on the same subject on December 29, 2003. Since the sample period of this analysis is from fiscal 1991 to fiscal 2000, it is appropriate to take 1989 release as the reference document.

19. A complete list of phrases searched is as follows: waiver of compliance, waiver was obtained, waivers were obtained, waivers of compliance, waived compliance, not in compliance, noncompliance, non-compliance, violation of, technical default(s), technically defaulted, covenant default(s), in violation, waiver was extended, waivers were extended, waiver was granted, waivers were granted, out of compliance, not be in compliance, not been in compliance, not being in compliance, in breach of, breached, covenant violation(s), technical violation(s), failed to comply with, did not comply with, could not comply with, not able to, failed to meet, discussions with, seek(ing) (an) amendment(s), seek(ing) (a) waiver(s), obtained (a) waiver(s).

20. There is a basic trade-off while collecting this kind of text data. If we set very tight filters, we cannot detect many covenant violations that actually happened. If we set loose filters, the number of false positives becomes unmanageable. Here, each phrase to be searched around the word "covenant" or "covenants" under the headings is called a filter. For this reason, we have used many filters that yield a relatively low number of false positives at the end of each search. We do not think that we missed lot of covenant violations because at the end of each additional search with a new filter, we got successively smaller number of new SEC filings describing an actual covenant violation. With some filters toward the end of data collection, we could not get a new filing that had not been generated with previous filters.

21. HassabElnaby (2006) has 185 firms with a covenant violation over the same sample period within a larger sample of firms using the same method. But we use more filters during the text search. This results in higher fraction of sample firms having a covenant violation than the fraction reported in Chen and Wei (1993) and HassabElnaby (2006).

the ExecuComp database. A CEO is assigned to a particular fiscal year if the CEO remains at the post for at least 6 months during that fiscal year. Therefore, a turnover from fiscal year t to fiscal year $t + 1$ can happen during any month in the second half of fiscal year t or in the first half of fiscal year $t + 1$. For this reason, any covenant violation during the second half of a fiscal year t or the first half of a fiscal year $t + 1$ is assigned to the end of fiscal year t. The covenant violation data item, cv, is a dummy variable that is one for a firm-year if a covenant violation is assigned to that firm-year just as described and zero otherwise.

If certain channels of influence (such as a covenant violation) make the governance influence of lending banks more powerful, then we should observe that the sensitivity of the likelihood of a forced CEO turnover to firm performance is greater when there is a covenant violation as opposed to no violation.

Table 3 Panel C presents average forced CEO turnover rates over different ranges of industry adjusted performance, $\hat{\upsilon}_{stk+roa}$, and *Loan Intensity*, Λ, when there is a covenant violation or not. In Panel C, the likelihood of a *Forced Turnover* is much higher for companies with a covenant violation especially for the lowest performance group. And, for the bottom performance group with covenant violations, the probability of a forced turnover tends to increase very significantly as *Loan Intensity* increases. For the middle and top performance groups, although the forced turnover probability is generally high for covenant violators, the small number of observations does not allow us to draw robust conclusions.

The probit model given by equations (6) and (7) can be slightly modified, as below, to allow us to test whether the existence of a covenant violation makes a difference in lending banks' effect on CEO replacement probability where cv is a 0–1 dummy that denotes a covenant violation. The specification for forced CEO turnover, (F_{it}), can be written as:[22]

$$\begin{aligned} F_{it}^{*} &= (k_1\hat{\upsilon}_{stk+roa,it} - \alpha'_1) + w_{b1}\cdot\Lambda_{it}(k_2\hat{\upsilon}_{stk+roa,it} - \alpha'_2) \\ &\quad + w_{b2}\cdot cv_{it}\Lambda_{it}(k_2\hat{\upsilon}_{stk+roa,it} - \alpha'_2) + u_{it} \\ &= -\alpha'_1 + k_1\hat{\upsilon}_{stk+roa,it} - w_{b1}\alpha'_2\cdot\Lambda_{it} + w_{b1}k_2\cdot\Lambda_{it}\hat{\upsilon}_{stk+roa,it} \\ &\quad - w_{b2}\alpha'_2\cdot cv_{it}\Lambda_{it} + w_{b2}k_2\cdot cv_{it}\Lambda_{it}\hat{\upsilon}_{stk+roa,it} + u_{it} \end{aligned} \tag{19}$$

$$F_{it} = 1[F_{it}^{*} > 0]. \tag{20}$$

Coefficient estimates[23] are given in the left part of Table 9 and marginal effects and probabilities of a forced turnover event under different scenarios are shown in the right half.

22. w_{b1} and w_{b2} are constants of proportions for the effect of *Loan Intensity*, Λ. Allowing for different magnitude for the constants of proportion is equivalent to allowing for different levels of lending banks' power in cases with and without covenant violations.

23. The structure of the coefficients implies the constraint that the proportion of the coefficients Λ_{it} and $cv_{it}\Lambda_{it}$ is equal to the proportion of coefficients $\Lambda_{it}\hat{\upsilon}_{stk+roa,it}$ and $cv_{it}\Lambda_{it}\hat{\upsilon}_{stk+roa,it}$. However, during estimations it is found that $cv_{it}\Lambda_{it}$ and $cv_{it}\Lambda_{it}\hat{\upsilon}_{stk+roa,it}$ are highly correlated. The reason is that $\hat{\upsilon}_{stk+roa,it}$ is almost always negative when there is a covenant violation, $cv_{it} = 1$. Correlation between Λ_{it} and $\Lambda_{it}\hat{\upsilon}_{stk+roa,it}$ is very low since $\hat{\upsilon}_{stk+roa,it}$ is centered around zero in the overall sample. Because of this high correlation we dropped $cv_{it}\Lambda_{it}$.

TABLE 9

EFFECT OF LENDING BANKS WITH AND WITHOUT COVENANT VIOLATIONS

Coefficients		Marginal effects and likelihoods	Low perf. No loan No viol.	Low perf. Avg. loan No viol.	Low perf. Avg. loan Viol.	Avg. perf. No loan No viol.	Avg. Perf. Avg. loan No viol.
Constant	-1.979^{**}						
$\hat{\upsilon}_{stk+roa}$	-1.373^{**}	Mar. effect of $\hat{\upsilon}_{stk+roa}$	$-14.2\%^{**}$	$-15.9\%^{**}$	$-40.5\%^{**}$	$-7.7\%^{**}$	$-8.2\%^{**}$
Λ	-0.068	Mar. effect of Λ	0.9%	0.9%	$22.8\%^{**}$	-0.4%	-0.4%
$\Lambda \cdot \hat{\upsilon}_{stk+roa}$	-0.630	Mar. effect of cv	N.A.	$3.5\%^{**}$	N.A.	N.A.	0.0%
$\Lambda \cdot \hat{\upsilon}_{stk+roa} \cdot cv$	-5.525^{**}	Prob. of turnover	5.0%	5.2%	8.7%	2.4%	2.3%
Number of obs: 9,052		Pseudo R^2: 8.0%					

NOTES:The table presents the coefficients and the marginal effects of the variables in equation (19) under the assumption that both the board and lending banks use $\hat{\upsilon}_{stk+roa}$ as the performance measure. Dependent variable is the indicator variable *Forced Turnover*. $\hat{\upsilon}_{stk+roa}$ is the 50%–50% mix of the residual stock and residual return-on-assets performance. Λ is the bank *Loan Intensity* variable. cv is a dummy variable that equals one if there is a covenant violation. Standard deviations are based on robust standard errors clustered at the company level. The marginal effects are calculated at five different points (Powers 2005). In marginal effect calculations the change in covenant violation dummy variable, cv, is from 0 to 1. The marginal effect for cv is calculated only for the scenarios where loan intensity is greater than zero and where initial level of cv is zero. Low performance level corresponds to performance levels that are one standard deviation below mean. Average loan level is where *Loan Intensity* is at the sample average given positive.
$^{**}p < 0.01$.

From these coefficient estimates and implied probabilities we can deduce that lending banks' effect on CEO replacement decisions stems mostly from the governance power they get upon covenant violations. For example, in Table 9, the coefficient of the interaction variable, $\Lambda \cdot \hat{\upsilon}_{stk+roa} \cdot cv$, is significant at 1% level and it is economically important with its magnitude of −5.525. In addition, it makes the coefficient of the interaction variable, $\Lambda \cdot \hat{\upsilon}_{stk+roa}$, smaller in magnitude and statistically insignificant. The marginal effect of loan intensity on CEO replacement is insignificant without a loan covenant violation. When there is no covenant violation and a firm has low industry-adjusted performance, CEO replacement likelihood increases from 5.0% to 5.2% if *Loan Intensity* changes from zero to average. On the other hand, when there is a covenant violation, CEO replacement likelihood increases from 5.0% to 8.7% (74% increase) when *Loan Intensity* changes from zero to average. When we conduct the analysis with other performance measures, we find that CEO replacement likelihood increases by 68% to 92% when there is a covenant violation with an average level of bank loans outstanding.

Next, we investigate the role of the amount of bank loans outstanding and nonbank leverage in forced CEO turnovers under the event of a covenant violation. Our results in Columns 4 and 5 of Table 5 show that the amount of bank loans outstanding (but not nonbank leverage) has a significant impact on turnovers under covenant violations. In Table 5 Column 4, nonbank leverage has insignificant coefficient while bank loan intensity, Λ, coefficient is significant. In Column 5, we show that the coefficient of the overall leverage is much smaller than the coefficient of the bank loan intensity reported in Column 4. In addition, the coefficient of the overall leverage is not significant at 5% level.

Our results in Tables 9 and Columns 4 and 5 of Table 5 imply that (i) bank loan covenant violations are key in forced CEO turnovers, and (ii) under a covenant violation, the amount of bank loans outstanding, not the overall leverage, has a significant impact on the likelihood of a forced CEO turnover when CEO performance is poor.

6. CONCLUSION

The corporate governance system of the United States is considered to be market oriented and it has been widely thought that creditors, unlike stock market participants, play little role. While diffused ownership of corporate bonds limits the influence of bondholders, lending banks should be expected to have an important role given the size of their exposures, their monitoring advantages and stricter loan covenants. This paper investigates the role of lending banks in the replacement of underperforming CEOs for a sample of relatively large U.S. companies. It is shown that existence of bank loans outstanding increases the likelihood of a forced CEO turnover if the CEO underperforms relative to its industry peers. It is shown that if loan choice endogeneity is taken into account, the estimated increase in the probability of a forced CEO turnover remains significant, both statistically and economically. The channel through which banks exert pressure appears to be through loan covenants. The data also suggest that lending banks are as much concerned with accounting performance as with stock return performance.

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