Financial Management

Do Lending Relationships Affect Corporate Financial Policies?

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This paper provides new evidence on how lending relationships impact firms' financing and investment decisions. I find that lending relationships have a significant impact on leverage ratios, issuance choices, and the investment structures of relationship borrowers. The influence of relationships is heightened for financially constrained firms. I find a significant decrease in leverage, net debt issuing, and investment activity in the aftermath of lender-specific shocks to lending relationships, including announcements of bank write-downs and downgrades in banks' credit ratings. My findings are robust to controlling for confounding effects that might arise due to unobserved demand and relationship changes.

Academics have recently focused considerable attention on the role of banks as relationship lenders. The literature argues that relationship lending facilitates monitoring and screening and can overcome problems of asymmetric information between the bank and the firm. There is a large body of evidence regarding the costs and benefits of lending relationships on the terms of loan contracts (Hoshi, Kashyap, and Scharfstein, 1991; Petersen and Rajan, 1994; Berger and Udell, 1995; Bharath et al., 2011). The literature also provides evidence on whether initiating or renewing a specific banking relationship creates value for the borrower (James, 1987; Lummer and McConnell, 1989; Dahiya, Saunders, and Srinivasan, 2003).

However, the dynamic impact of lending relationships on the investment and financing policies of firms is often ignored even though bank loans are the major source of external capital for corporations in many economies. While it is interesting to recognize how a given lending relationship creates value, we should understand how relationship lending affects the dynamic investment and financing decisions of borrowers through its influence on the borrowers' access to funds from the financial markets. The purpose of this study is to fill these gaps in the literature. Using a comprehensive loan sample covering a broad panel of US firms from 1990 to 2011, I provide a broad-based analysis of the effect of lending relationships on corporate investment and financing policies.[1] My main findings can be summarized as follows. Investment and financial policies are systematically related to the presence of lending relationships. Depending on the definition of lending relationships used in the empirical specifications, the estimated increase in debt ratios due

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[1] While earlier studies (Berger and Udell, 1995; Bharath et al., 2011) demonstrate that relationship lending results in better loan terms, these papers do not directly estimate the real effects of relationships on subsequent firm behavior.

to relationships ranges from 0.029 to 0.040 (i.e., between 10.8% and 14.9% of mean leverage). The evidence is also consistent with higher total investments for stronger lending relationship firms. For instance, firms with lending relationships have 2.1% greater total investments relative to non-relationship borrowers. This result represents an increase in investments of approximately 16.3% relative to the average investments of the firms in the sample.

However, there is substantial heterogeneity in these real effects with respect to the empirical proxies of credit frictions. For example, while unrated borrowers have lower leverage and investment ratios overall, the benefits of borrowing from a relationship lender are especially strong for these borrowers. More specifically, I find that a relationship borrower that is credit constrained when compared to an unconstrained borrower has, on average, a 16.7% (an increase of 0.045 from a mean of 0.268) higher book leverage ratio and a 20.1% (an increase of 0.026 from a mean of 0.129) higher total investment.

Analyzing the real effects of lending relationships poses challenging identification problems. Since the matching between borrowers and lenders is not random, failing to control for this endogeneity can confound relationship lending effects with clientele effects and could lead to incorrect conclusions. To dispel these concerns, I use an endogenous switching regression model, a generalization of the classic Heckman (1979) two-stage procedure, which also allows me to pose a "*what-if*" question. For a relationship borrower, what would the alternative investment and financing outcome be, had there been no such commitment? The resultant analysis provides estimates of the (unobserved) counterfactual outcomes that are useful for the basic issue at hand. I find that the counterfactual book leverage (total investments) for a relationship borrower would have been 4.7% (2.2%) lower if the same borrower had instead opted for non-relationship borrowing. Conversely, an average non-relationship borrower hypothetically would have had higher leverage (total investments) by 4.1% (5.3%) if relationship lending had been employed.

Another concern is that a change in financing and investment activity would have occurred regardless as to the existence of lending relationships. To alleviate this worry, I consider disruptions in relationships due to an adverse shock to the financial health of a lead relationship lender and conduct an event study. I rely on the occurrence of bank-specific events, such as announcements of bank write-downs or downgrades, to net out any unobservable demand effects. Finally, to isolate the magnitude of the lender's distress, I use an instrument that captures banks' exposure to toxic mortgage-backed securities (ABX exposure) during the recent financial crisis of 2007 as a source of exogenous variation in the availability of credit to borrowers.

Overall, the results of this study complement the existing banking literature by quantifying the real effects of lending relationships. The current research on banking relationships argues that establishing a close lending relationship with a bank can mitigate information asymmetries and create value for the borrower. This value creation could be in the form of lower financing costs, fewer collateral requirements, contract flexibility, re-negotiations of credit contracts, or the extension of additional loans when a corporation is in financial distress (Boot and Thakor, 1994; Petersen and Rajan, 1994).

While relationship banking has benefits for borrowers, offsetting costs exist that prevent firms from borrowing exclusively from relationship lenders. For example, Sharpe (1990) and Rajan (1992) argue that while a relationship lender can reduce agency problems, the firm-specific information about borrowers that banks obtain as a part of their relationships may create a hold-up problem. In other words, the proprietary information produced and used by the relationship lender increases its ex post bargaining power. This may be exploited to the detriment of the firm (Greenbaum, Kanatas, and Venezia, 1989; Sharpe, 1990; Rajan, 1992). Thus, these firms may choose non-noptimal investment and financing policies, and potentially valuable investment opportunities may be lost. At the extreme, when a relationship bank is also a shareholder of the firm, the bank may influence corporate decisions in its favor, making other creditors less willing to provide additional credit due to potential conflicts of interest.

Similarly, relationship banking can also affect the firms' choice of debt and investment through its effect on the non-pecuniary benefits received by the manager. In general, bank borrowing is associated with strict monitoring, thereby mitigating agency problems. This monitoring behavior, however, can reduce the manager's non-pecuniary benefits created by discretion over resource allocation. This reduction of non-pecuniary benefits by bank borrowing is likely to be stronger in relationship banking than in an arm's length relationship. In an arm's length relationship, monitoring by a bank is normally limited to ex ante and ex post monitoring, while interim monitoring, which is often associated with dispatching bank members to client firms, plays an important role in the relationship banking. Thus, when the costs of relationship banking exceed the benefits perceived by the manager, the firm's financing and investment policies can be distorted.

In the context of corporate policy, the net effect of lending relationships is ambiguous. This study adds to the literature by building on a panel database of loans to analyze the dynamic effects of relationship lending on the borrowers' investment and financing policies.[2] Unlike cross-sectional data (sampled at the loan level), a firm-year panel dataset can be used to analyze the economic effects of lending relationships as they evolve over time. This formation allows me to control for any unobservable borrower and time-series characteristics that are outside the purview of an empirical framework that may potentially lead to biased estimates. The time-series dimension of the panel data also solves the problem of multiple loan observations in a given year which, in cross-sectional studies, are treated as independent observations. However, these observations are obviously not independent, as the accounting information is only updated on an annual basis.

The remainder of the paper is organized as follows. Section I describes the data. In Section II, I specify the empirical test design. I discuss the results in Sections III and IV, and provide my conclusions in Section V.

I. Data and Empirical Specification

A. Sources of Data

I obtain details of loan transactions and the nature of the relationship between firms and their banks from the Dealscan database distributed by the Loan Pricing Corporation.[3] The sources of firm characteristics are Standard and Poor's Compustat database and Center for Research in Security Prices (CRSP) tapes. CRSP and Compustat data are merged using the historical header file from CRSP, and the link file from Chava and Roberts (2008) is used to merge Dealscan to Compustat/CRSP data. I narrow the sample by removing firms with total assets less than

[2] Ongena and Smith (2001) and Houston and James (1996) use a panel of firms to address issues associated with relationship banks' information monopolies, but do not tackle the capital structure issue. Berger and Udell (1995) and Petersen and Rajan (1994) use data from the National Survey of Small Business Finance, so neither of these papers have a panel of firms (inferences are made comparing firms at different points of their lending relationship). Degryse and Cayseele (2000) use of a panel of firm-loan data on Belgium firms, but do not exploit the panel structure in their empirical work. The data sample in Bharath et al. (2011) consists of a cross-sectional set of loans, where the deal-based lending relationships are calculated based on the date of the loans.

[3] Dealscan has information on 50% to 75% of all US commercial loan volume into the early 1990s, with coverage increasing to 80% to 90% later in the 2000s (Carey and Nini, 2007). It reports detailed information about the structure of loan contracts including the identity of the borrowers and lenders, origination and maturity dates, the purpose of the loan, the pricing, and the size of the deal.

$1 million, firms with an equity price of less than $1, and firms with missing values and negative values of total long-term debt. I follow the standard practice of excluding firms in the financial sector and regulated utilities to avoid capital structures governed by regulation. To mitigate the impact of data errors and outliers on my analysis, I winsorize all of the variables at the 1st and 99th percentiles. My results are unaffected by winsorizing at the 0.5th percentile at each tail.[4]

B. Investment and Financing Definitions

I examine multiple corporate policies, including leverage, net debt issuance, net equity issuance, and total investments. A firm may set its target debt level based on book value or the market value of assets. To eliminate concerns over spurious relationships between debt ratios and other explanatory variables, I run all tests for the book leverage and market leverage ratios. I mainly report the results for book leverage in the paper, but the results for market leverage are essentially identical for the parameters of interest. I consider the net amount of debt and equity financing, measured over a one-year period as a percentage of total assets at the beginning of the observation period. Net equity issue is the change in book equity minus the change in retained earnings scaled by the beginning period total assets. Net debt issue is the change in total assets minus the change in net equity minus the change in retained earnings scaled by the beginning period total assets. I consider the choice between debt versus equity issuance decisions where a financing decision is qualified as an issuance decision if the net amount issued is at least 1% or greater than the beginning period total assets. Firms with changes smaller than 1% in magnitude in a given year are classified as having no change. Using these qualifying debt and equity issuances, I construct the debt versus equity issuance as net debt issued minus net equity issued. I define investment as capital expenditures + acquisitions − sale property, and equipment (PPE) + research and development (R&D) expenditures normalized by the start-of-period total assets.

C. Measures of Relationship Lending

I extract the borrower name, members of the initial lending syndicate, loan size, bank loan covenants, loan spread, and other loan characteristics from Dealscan. For each borrower on a given date, I look back as far as 1985 for any outstanding syndicated loan facilities undertaken by this borrower, as well as its affiliated and predecessor companies. As Dealscan does not provide detailed bank-by-bank breakdowns for a loan facility, it is not possible to derive a precise loan size-weighted measure of banking relationships that would incorporate actual exposure data (without making some ad hoc assumptions, such as assigning the entire amount of the loan facility to each lead bank).

I define a bank-borrower relationship as a pairing between a lead arranger and a borrower as past literature and anecdotal evidence suggests that it is the lead arranger, and not the participant lenders, that generally possess soft information about the borrower.[5] Relationship measures are

[4] Merger activity in the banking and corporate sector can potentially disrupt a preexisting lending relationship. Since the information that a bank has regarding its client is likely to be inherited by the merged entity, I include loans that a firm took from a bank that subsequently merged as prior loans from the merged entity. I follow the same reasoning for mergers taking place in the corporate sector. I obtain data on bank merger and acquisition activity from the Securities Data Commission (SDC) Platinum, Capital IQ, and the Federal Reserve's National Information Center (NIC) database. I collect the data on corporate merger and acquisition activity from SDC Platinum and Capital IQ.

[5] In particular, a bank is defined as playing a lead role in a given loan facility if any one of the following conditions are met: 1) the bank is given a lead arranger credit for the given loan facility or 2) the bank was retained in any of the following roles including agent, arranger, administrative agent, lead manager, or sole lender. The rationale for this selection is that banks retained in these roles typically retained a large fraction of syndicated loans (over 25%), on average, and, for the

constructed as of the beginning of the year. I use three different metrics of relationship lending for each firm-year, using only those lenders retained in a lead role as defined above. More specifically, for each firm-year, I identify relationship lenders by searching all previous loans (over a five-year window excluding the current year) of that borrower as recorded in the Dealscan database. If at least one loan in a given year comes from a bank that has extended loans to the firm in the past five years, the given year is classified as one where a relationship lender made a loan. If none of the loans in the current year were made by any relationship lender, the given year is classified as one where relationship banks did not lend to the given firm. Based on the above classification, the first relationship measure is meant to capture the existence of former lending by the same bank:

- REL^{D}_{it}: This is a dummy variable that takes a value of one if borrower *i* has retained any bank over a five-year window excluding the current year (from year $t-1$ to $t-5$).

I define the other two metrics of relationship strength as follows:

- $REL^{\$}_{it}$: This is the ratio of the sum of loan facility amounts of all relationship loans taken by borrower *i* from year $t-1$ to $t-5$ to the sum of facility amounts of all loans taken by the same borrower during the same time span.
- $REL^{\#}_{it}$: This is the ratio of the total number of relationship loans taken by borrower *i* from year $t-1$ to $t-5$ to the total number of loans taken by the same borrower over the same five-year window.

I treat the loans granted by either a parent bank or a subsidiary as loans originating from the same lead lender since it is likely that different sections of the same bank holding company share information about common clients. I use the most recent data on subsidiaries of bank holding companies obtained from the Federal Reserve Board website. More detailed explanations and examples of the construction of relationship measures for the firm year sample can be found in the Appendix.

D. Other Control Variables

As control variables, I use the log of total assets (Titman and Wessels, 1988; Easley and O'Hara, 2004), as well as other control variables including access to public debt markets (rated dummy), profitability of the firm, Tobin's *Q*, the ratio of cash flow to total assets, sales growth, past stock returns, and earnings volatility.[6] When I consider the financing choice of the firm (debt vs. equity), I use Z-scores, capital investment ratios, deviation from target leverage, proxies for financing deficit, and debt capacity (Lemmon and Zender, 2010) of the firm as additional controls. As an empirical proxy for debt capacity, I use the firm-level tangibility measure in Almeida and Campello (2007), which is the expected asset liquidation value of a firm constructed based on the findings of Berger, Ofek, and Swary (1996).

last role, the given loan is not syndicated at all. Consequently, it is reasonable to assume that banks retained in these roles are truly one of the lead lenders in the given loan facility.

[6] Faulkender and Petersen (2006) find that firms with effective access to public debt markets have substantially more debt in their capital structures and argue that the existence of an S&P debt rating is almost always associated with public debt outstanding. I create a dummy variable "Rated," which equals one if the firm has an S&P senior secured debt rating and zero otherwise.

I incorporate gross domestic product (GDP) growth rate to control for any macroeconomic conditions that may affect investment and capital structure. I include industry fixed-effects in the investment regressions, but do not to include industry fixed-effects in my financing policy regressions as Lemmon, Roberts, and Zender (2008) find that industry median leverage reduces the power of the industry fixed-effects to explain leverage ratios. If I include industry fixed-effects, the results remain the same. Finally, I include firm and year fixed-effects.

Table I presents some salient summary statistics for the full sample. Overall, 22% of the firms in my sample obtain a public debt rating from Moody's, S&P, or both. The average bond rating is 13.5, which corresponds to a rating between BB and BB−. The median rating is BB+, which is the highest noninvestment grade rating. The median bank loan spread (AISD) is 259.4 bps. The average (median) loan is almost $176 million ($50 million) and the average maturity for loan facilities is 36 months (median 31 months). In terms of firm characteristics, the average (median) borrower in the sample has $2.13 billion ($188 million) in assets. The average book debt to assets ratio is 0.27, and average earnings before interest, taxes, depreciation, and amortization (EBITDA) scaled by assets is about 6.8%. The leverage also exhibits substantial cross-sectional variation with standard deviations of 0.15.

II. Empirical Test Design

My tests are designed to examine the effects of lending relationships on the level of leverage, debt equity choice, and the investment decisions of sample firms following 1) panel data estimations with firm and year fixed-effects, 2) the endogenous borrower-lender matching model, and 3) an event study approach.

A. Baseline Model (Panel Estimation)

I begin my empirical examination with a multivariate panel regression analysis with dependent variables measured at time t. In order to limit potential endogeneity issues, I lag the explanatory variables by one period (while this is only a partial solution, I later examine the issue more thoroughly). In all of the regressions, I report robust t-statistics that adjust for clustering at the firm level to allow the error term to be heteroskedastic and correlated within firms. The panel structure of my relationship observations allows me to use appropriate data techniques, namely firm and year fixed-effects, to control for potential time invariant firm-specific omitted variables.

$$y_{it} = \alpha_0 + \alpha_1 REL_{it-1} + x'_{it-1}\beta + 1'\Lambda_{f.e.} + \xi_{it}, \qquad (1)$$

for $i = 1, 2, \ldots, N$ and $t = 1, 2, 3, \ldots, T$. Here, y is the investment or financing choice of sample borrowers, REL is the measure of lending relationships, x is the vector of firm-specific and macro-level variables described above (Section I), 1 is the vector of ones, $\Lambda_{f.e.}$ is the vector of firm, industry, and time fixed-effects (i.e., $\Lambda_{f.e.} = [\mu_i \varphi_{ind} \phi_t]$), while ξ is the error term of the system.

B. Endogenous (Switching) Matching Model

Both firms and banks have strong economic incentives to choose their partners including geographical proximity, prior investment banking and underwriting services, degree of exposure to liquidity shocks, opaqueness, and creditworthiness of the borrower (discussed in Section

Table I. Summary Statistics for Borrower and Loan Characteristics

This table provides summary statistics of data for all firm years used in the analysis from 1990 to 2011. *Book Leverage* is book leverage defined as total debt (long-term debt plus debt in current liabilities) divided by the book value of assets. *Tobin's Q* is defined as the market value of assets divided by the book value of assets. The market value of assets equals the book value of assets plus the market value of common equity (calendar year close × shares outstanding) less the sum of the book value of common equity and balance sheet deferred taxes. Firm *Profitability* is defined as earnings before interest and taxes, divided by the book value of assets. *Firm Size* is total assets in millions. *Volatility* is measured as the standard deviation of operating earnings scaled by book assets over the trailing 12 quarters. *CashFlow* is defined as the sum of earnings before extraordinary items and depreciation divided by lagged net property, plant, and equipment divided by total assets. *Bond Rating* is the S&P credit rating of the firm, where the value one corresponds to an S&P rating of AAA+, two corresponds to AAA, three corresponds to AAA−, and so on. *Rated* is a dummy variable that is equal to one if the firm has a Standard and Poor's senior secured debt rating and zero otherwise. *Loan Spread* is the all-in-drawn spread above the benchmark. *Facility Size* is the dollar amount of the loan facility in millions. *Syndicate* is the percent of facilities that have the stated attribute. *Maturity* is length in months between the facility activation date and the maturity date. *Tangibles* is the ratio of the expected asset liquidation value of a firm constructed based on the findings of Berger et al. (1996) to total assets. *Financing Deficit* (funds flow deficit) is the sum of dividends paid, capital expenditures, and the current portion of long-term debt at the beginning of the period less operating cash flows after interest and taxes. *Net Equity Issuance* is the change in book equity minus the change in retained earnings scaled by the beginning period total assets. *Net Debt Issuance* is the change in total assets minus the change in net equity minus the change in retained earnings scaled by the beginning period total assets. *Investments* is the total investment expenditure. It is calculated as research and development expenditures, *R&D*, plus capital expenditures, *Capex*, plus Acquisition expenditures, *Acquisitions*, less cash receipts from the sale of property, plant, and equipment, *Sale PPE*.

	Mean	**Median**	***SD***	**25th pctl**	**75th pctl**
Loan characteristics					
Loan Spread	259.430	241.150	150.100	115.000	382.000
Facility Size ($ millions)	176.520	50.000	432.000	11.000	176.000
Maturity (months)	36.127	31.000	28.420	14.000	56.000
Syndicate	0.783	1.000	0.389	1.000	1.000
Firm characteristics					
Firm Size ($ millions)	2,133.000	188.000	12,637.000	84.860	1,429.000
Profitability	0.068	0.080	0.273	0.042	0.125
Tangibles	0.305	0.232	0.210	0.130	0.434
Tobin's Q	1.702	1.227	0.970	0.842	1.886
Financing deficit	0.042	0.000	0.449	−0.001	0.134
Volatility	0.061	0.037	0.101	0.010	0.125
CashFlow	0.335	0.278	0.663	0.130	0.509
Sales Growth	0.066	0.049	0.428	−0.021	0.250
Investment policies					
Investments	0.129	0.094	0.138	0.042	0.192
Capex	0.070	0.046	0.080	0.023	0.086
Acquisitions	0.023	0.000	0.068	0.000	0.007
Sale PPE	0.006	0.000	0.035	0.000	0.002
R&D	0.042	0.000	0.088	0.000	0.048
Financial details					
Rated	0.220	0.000	0.338	0.000	1.000
Bond Rating (AAA = 1, AA = 2, ..)	13.500	12.000	6.872	2.000	23.000
Book Leverage	0.268	0.190	0.151	0.090	0.395
Net Debt Issuance	0.045	0.000	0.226	−0.007	0.071
Net Equity Issuance	0.066	0.000	0.284	−0.011	0.093

III.B). Suppose that the model should include a material variable that is not measurable (perhaps a private information problem) and that this variable is correlated with the investment and financing decisions of borrowers. In particular, if a borrower and a lender use this private information problem as a factor to determine whether to form lending relationships, then the observed relationship measure becomes an endogenous variable in my regressions. Thus, the estimates on the relationship lending would be inconsistent.

The endogenous switching regression model also allows me to pose a "*what-if*" question. For a relationship borrower, what would the alternative investment and financing outcome be, had there been no such commitment? I answer this question using an endogenous switching regression model (Maddala, 1986). This is a departure from most of the existing literature on lending relationships, which does not address the issue of endogenous matching between a relationship lender and a borrower. A key advantage of the switching regression framework is that I obtain more useful estimates of (unobserved) counterfactual outcomes, which I explain in more detail below.

1. Model Setup

In this subsection, I model the propensity to form a banking relationship $REL \equiv REL^D$ as the result of an unobserved latent variable REL^* and two outcome (regime) equations on the financial variables of interest (i.e., leverage ratio net debt (equity) issuance or investment).

$$REL^*_{it} = z'_{it-1}\gamma + u_{it}, \tag{2}$$

$$y_{1it} = w'_{1it-1}\beta_1 + \varepsilon_{1it}, \tag{3}$$

$$y_{2it} = w'_{2it-1}\beta_2 + \varepsilon_{2it}, \tag{4}$$

where the vector w includes a constant term and other control variables (Equation 1). Here, the binary decision to form a relationship is modeled as $REL_{it} = 1$ if $z'_{it-1}\gamma + u_{it} > 0$ and $REL_{it} = 0$ if $z'_{it-1}\gamma + u_{it} \leq 0$.[7] u_{it} is an error or residual term with mean zero conditional on the variables in z. y_{1it} is the outcome equation for relationship lending, and y_{2it} is the outcome equation for non-relationship lending, but for the same borrower. Of course, one can only observe y_{1it} if $REL_{it} = 1$ or y_{2it} if $REL_{it} = 0$ and never both. Differential financing and investment behavior across firms in Regime 1 and Regime 2 will be captured by differences between β_1 and β_2.

In the empirical specification, the vector z contains variables that are likely to affect the tendency to form lending relationships. I model the endogeneity by allowing the residual in outcome Equations (3) and (4) to correlate with the residual in the relationship decision Equation (2), so that unobserved or missing variables (e.g., private information) in the decision equation are also allowed to affect the outcome.[8]

[7] Note that this model setup also holds for my other two measures of lending relationships, $REL^{\$}_{it}$ and $REL^{\#}_{it}$. The difference is that these relationship measures are formulated as a Tobit model instead of a binary choice model. The estimation results for these models are available from the author.

[8] This model is a generalization of the classic Heckman (1979) two-stage procedure. Instead of using two outcome equations for the two groups (i.e., relationship and nonrelationship groups) under the Heckman (1979) model, there is one second-stage equation that restricts the beta coefficients in Equations (3) and (4) to remain the same across borrower types. In addition, the model with one outcome equation seems more suitable for truncated data where the alternative is not observed. A classic example of this is the effect of labor participation on wage rates, where wages are unobservable

One advantage of this approach is that it allows the use of multiple variables to predict whether firms are prone to have lending relationships in the selection equation (Equation 2). In contrast, the traditional method of splitting the sample according to a priori characteristics is typically implemented using one characteristic at a time. In particular, the estimation of the selection equation allows me to assess the statistical significance of a given factor assumed to proxy for lending relationships, while controlling for the information contained in other factors. Which variables should be used in the section vector z? I discuss the set of variables included in z in Section III.B.

2. Estimation and Inference

Estimation strategies involve sequential estimation procedures or maximum likelihood. The sequential procedure involves first estimating Equation (2) by a probit regression, yielding consistent estimates of γ. The outcome regressions of Equations (3) and (4) are augmented with time-varying inverse Mills ratios (Greene, 2003) as additional regressors. These terms are adjusted for the conditional mean of the error terms and allow consistent estimations using ordinary least square (OLS). However, it is generally easier (and results in a more efficient estimator) to estimate the model using maximum likelihood. I follow the latter approach.

I am also interested in the following "*what-if*" question. For a relationship borrower with particular characteristics, what would have been the outcome (investment and financing decision) if the firm was, instead, a non-relationship borrower? To infer whether relationship borrowers make different investment and financing decisions than non-relationship borrowers, I compute the following difference:

$$\Lambda_{it} = y_{1it} - E[y_{2it} | REL^*_{it-1} > 0]. \tag{5}$$

The first term in Equation (5) is the observed outcome for relationship lending. The second term represents the counterfactual outcome (at time t) had the borrowing been nonrelationship (at time $t - 1$) for the same borrower. Econometrically, the hypothetical outcome is the predicted value from evaluating relationship borrowing attributes in the outcome equation for non-relationship lending:

$$E[y_{2it} | REL^*_{it-1} > 0] = w'_{2it-1}\beta_2 + \operatorname{cov}(\varepsilon_{2it}, u_{it-1}) \frac{\phi(z'_{it-2}\gamma)}{\Phi(z'_{it-2}\gamma)}. \tag{6}$$

Here, $\phi(.)$ and $\Phi(.)$ are the density and cumulative distribution functions of the normal distribution, respectively, and $\phi(.)/\Phi(.)$ is the time-varying inverse Mills ratio.

III. Empirical Results

A. Baseline Results

I examine the determinants of leverage ratios in panel regressions.[9] Columns (1) to (3) of Table II present the (book) leverage regression results where the key variable of interest is relationship lending. I scale the (non-dummy) coefficient estimates by the corresponding variable's

for those individuals who are not in the labor force. Since investment and financing decisions are always observed, but for different types of lending activity, the two-equation model is more appropriate.

[9] Following Lemmon, Roberts, and Zender (2008), I winsorize ratio variables at the one percent level in an attempt to lessen the effects of outliers and data errors, and I restrict leverage ratios to the closed unit interval.

Table II. The Effect of Relationship Lending on Leverage and Investments

This table presents the estimates from panel regressions of lending relationships on leverage and total investments. The dependent variables are measured at the end of fiscal year t, and the independent variables are measured as of time $t-1$. The dependent variable in Columns (1) to (3) is the book debt to assets ratio at time t, and the dependent variable in Columns (4) to (6) is the ratio of total investment (calculated as research and development expenditures, R&D plus capital expenditures, Capex, plus acquisition expenditures, Acquisitions, less cash receipts from the sale of property, plant, and equipment, Sale PPE) to total assets. All specifications contain an intercept. *Tobin's Q* is defined as the market value of assets divided by the book value of assets. The market value of assets equals the book value of assets plus the market value of common equity (calendar year close × shares outstanding) less the sum of the book value of common equity and balance sheet deferred taxes. *CashFlow* is defined as the sum of earnings before extraordinary items and depreciation divided by lagged net property, plant, and equipment divided by total assets. *Profitability* is defined as earnings before interest and taxes, divided by the book value of assets. *LnAssets* is the natural logarithm of total assets. *Rated* is a dummy variable equal to one if the firm has a Standard and Poor's rating. *Investment Grade* is a dummy variable equal to one if the firm has an investment grade rating. *Volatility* is measured as the standard deviation of operating earnings scaled by book assets over the trailing 12 quarters. *GDPgrowth* is the four-quarter growth rate of real GDP. All regressions include firm fixed effects (f.e.) and year fixed effects (f.e.). Financing policy regressions include *Industry Median* ratio and investment regressions include industry fixed-effects based on three-digit SIC codes. All test statistics are computed using standard errors that are robust to within firm correlation and heteroskedasticity and clustered at the firm level. *Wald* test statistics for the joint significance of the coefficients are also provided.

	Leverage$_t$						Investments$_t$					
	(1)		(2)		(3)		(4)		(5)		(6)	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
$REL^{\$}_{t-1}$	0.031***	(2.770)					0.025**	(2.455)				
$REL^{\#}_{t-1}$			0.029***	(2.566)					0.022**	(2.144)		
REL^{D}_{t-1}					0.040***	(3.110)					0.021**	(2.095)
Ln(Assets$_{t-1}$)	0.028**	(2.232)	0.032***	(2.602)	0.035***	(2.681)	0.647**	(2.110)	0.725**	(2.432)	0.537**	(2.026)
Profitability$_{t-1}$	−0.024**	(−2.371)	−0.020**	(−2.261)	−0.023**	(−2.332)	0.506***	(2.587)	0.630***	(2.741)	0.424*	(1.984)
Ind. Median Leverage$_{t-1}$	0.098***	(3.065)	0.109***	(3.255)	0.113***	(3.381)						
Past Stock Return$_{t-1}$	−0.080*	(−1.733)	−0.067	(−1.604)	−0.099*	(−1.860)	0.035**	(2.022)	0.036**	(2.380)	0.042**	(2.466)
Tobin's Q$_{t-1}$	−0.036	(−1.590)	−0.040	(−1.630)	−0.033	(−1.500)	0.059**	(2.051)	0.076**	(2.266)	0.060**	(2.070)
Sales Growth$_{t-1}$	0.030**	(2.441)	0.026**	(2.182)	0.022**	(2.022)	0.064***	(2.590)	0.084***	(2.852)	0.075***	(2.631)
Volatility$_{t-1}$	−0.117***	(−2.652)	−0.139***	(−2.964)	−0.124***	(−2.800)	−0.094**	(−2.155)	−0.124***	(−2.593)	−0.114**	(−2.421)

(Continued)

Table II. The Effect of Relationship Lending on Leverage and Investments *(Continued)*

	Leverage$_t$						Investments$_t$					
	(1)		(2)		(3)		(4)		(5)		(6)	
	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat
Rated$_{t-1}$	0.014***	(3.011)	0.026***	(3.655)	0.020***	(3.361)	0.068***	(3.114)	0.082***	(3.488)	0.062***	(2.880)
Investment Grade$_{t-1}$	−0.039*	(−1.674)	−0.032	(−1.490)	−0.038	(−1.563)	0.020**	(2.122)	0.018*	(2.099)	0.034***	(2.694)
CashFlow$_{t-1}$	−0.007	(−1.200)	−0.010	(−1.331)	−0.008	(−1.256)	0.039***	(3.053)	0.035***	(2.730)	0.028**	(2.152)
GDPgrowth$_{t-1}$	0.011**	(2.220)	0.008**	(2.140)	0.006**	(2.064)	0.021***	(2.601)	0.030***	(2.741)	0.031***	(2.780)
CashFlow$_{t-1}$ × REL_{t-1}							−0.304***	(−3.030)	−0.289***	(−2.771)	−0.276***	(−2.657)
Adj. R^2	0.583		0.601		0.592		0.574		0.625		0.619	
Wald-test (p-value)	0.033		0.038		0.028		0.015		0.016		0.019	
Observations	22,772		22,772		22,772		21,506		21,506		21,506	
Industry f.e.	No		No		No		Yes		Yes		Yes	
Firm f.e. and year f.e.	Yes		Yes		Yes		Yes		Yes		Yes	

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

standard deviation to ease the interpretation and comparison of the estimates, a practice I follow throughout the paper. The results indicate that the parameter estimates of relationship lending are positive and strongly significant at respective levels.[10] My estimates suggest that the magnitude of these effects is not economically trivial. In economic terms, the regression estimates in Column (1) suggest that an increase in $REL^{\$}$ by one standard deviation is associated with a 3.1% increase in the leverage ratio, on average, in the following year. To put this increase into perspective, 3.1% represents approximately 11.5% of the average leverage ratio (26.8%) during my sample period. For $REL^{\#}$, this change is associated with an average increase in book leverage of 10.8% of the mean leverage ratio (2.9% of 26.8). For the REL^{D}, the results paint a similar picture as the other two metrics of relationship lending. The importance of relationship lending on leverage is largely undiminished after including additional covariates, such as earnings volatility, sales growth, and the rated dummy. I find that larger firms and firms with higher growth opportunities have higher leverage ratios, while firms with greater earnings volatility, higher past returns, and greater profitability tend to have lower leverage. As an alternative to combined firm and year fixed-effects, I repeat my tests by excluding firm fixed-effects in some cases. While the effect of lending relationships on leverage increases somewhat, my results are qualitatively similar to those reported in Table II.

In Columns (4) to (6) of Table II, the coefficients on the relationship proxies are positive as expected and significantly different from zero. I find, on average, great relationship sensitivity of investment in my sample firms. This finding is in line with studies by Hoshi et al. (1991) on modern Japan and Ramirez (1995) on J.P. Morgan at the turn of the last century. Bank-attached firms enjoyed substantially lower liquidity sensitivity than their unattached counterparts. Economically, relationship lending, on average, increases total investments by 16.2% of the assets relative to non-relationship borrowers. In a similar vein, a one-standard deviation increase in $REL^{\$}$ leads to a 19.3% increase in investments. The interaction of REL^{D} and cash flow has a negative coefficient that is statistically significant at the 1% level. The results are robust to variations in the *REL* variables including using fractions or counts instead of dummies. Thus, the presence of lending relationships is associated with significantly lower investment cash flow sensitivity. In sum, my results thus far suggest that relationship lending has a significant effect on the financing and investment behavior of corresponding firms.

Relationship lending can reduce debt issuance by forcing firms to substitute loans for debt issuance. Alternatively, if relationship lending raises the optimal level of debt overall, then it will have a positive impact on both loans and debt issuance. To explore this, I examine the decision to raise or retire capital. This will help me to determine whether lending relationships are influencing specific financing decisions or whether leverage is changing due to passive changes in the market value of equity or an accumulation of retained earnings. The latter scenario is unlikely as my results are unaffected by the inclusion of a firm's stock returns and measures of profitability. However, I want to provide more direct evidence regarding the precise financing channels that are driving the leverage results. Studying incremental financing decisions using discrete choice analysis allows me to identify the effect at the point when firms decide to refinance or change their capital structure (Strebulaev, 2007). This setup allows me to use explanatory variables from a year prior to the firm's refinancing decisions. Assuming that a firm's characteristics do not change rapidly over time, I can safely presume that the characteristics of the subsample are characteristics of firms at their refinancing point.

[10] Note that the Tables II and III are baseline specifications and address conditional correlations only. I thank the referee for pointing out that the effects of relationship lending is not known yet, just that companies that have lending relationships are happen to be associated with the characteristics of interest.

A natural way to model the endogenous decision of the firm to access the capital markets is to employ a probit model. I follow the two-stage procedure advocated by Heckman (1979) and Maddala (1986) to control for selection bias. The first stage models the probability that a firm will decide to raise capital. The second stage models the probability that given the firm's decision to raise capital, what financial instrument will it use? In the first stage, the control variables include firm size, market-to-book, tangibility, profitability, credit ratings, net working capital (all lagged by one period), and year fixed effects. As the disturbances of the two regressions are correlated, a simple estimation of the outcome models (i.e., investment and leverage models in the second stage) produces inconsistent coefficients. To consistently estimate the parameter of this system, I also include the inverse Mills ratio in the outcome models to account for self-selection (Maddala, 1986).[11] Panel A of Table III presents the results from the second stage probit regression, modeling the probability of issuing debt when raising capital. These results depict the effects of the relationships concerning the decision to issue debt vs. equity conditional on firm needs to raise external capital, with a positive (negative) coefficient indicating the likelihood of issuing debt increasing (decreasing) in the covariate. I also present the odds ratios for the estimated coefficients in parentheses. For instance, a ratio of 1.5 for a continuous covariate indicates that a one-standard deviation increase in the covariate raises the likelihood by 50%.

I find that even after controlling for variables that the previous literature finds to be relevant in the decision to issue debt or equity, whether a firm is a relationship borrower remains an important determinant of these decisions. The probit results are consistent with the view that lending relationships increase the likelihood of debt financing ceteris paribus. Regardless as to which measure is used, the relationship effect is both economically and statistically significant highlighting the importance of lending relationships. The probit coefficient of 0.269 in Column (1) implies that a one-standard-deviation increase in $REL^{\$}$ is associated with a 30% increase in the odds that a firm will issue debt in the following year. The other firm-specific factors demonstrate similar relations to debt issuance decisions as found in previous studies (Hovakimian, Opler, and Titman, 2001; Leary and Roberts, 2005). Larger and rated firms, firms making larger capital expenditures, and firms with higher Z-scores are more likely to issue debt when raising capital. Firms are more likely to issue equity when raising capital if they have had higher stock returns in the past and high Q ratios. Firms with leverage above their estimated target leverage are also more likely to issue equity. In addition to the decision to issue debt, the relative amount of debt issued is also closely tied to relationship lending.

Next, I examine the effect of lending relationships on the size of equity and net debt issuances. There is no column dedicated to repurchases as the dependent variables in this panel are simply net changes and, as such, can be positive or negative. Panel B compliments my findings in Table II, as I find that lending relationships are related not only to the probability of net debt issuance, but also to the size of net debt issuances as a percentage of total assets. The coefficients in Panel A allow me to determine whether or not firms change their leverage in response to the existence and strength of lending relationships, while my tests in Panel B allow me to determine how firms change their leverage. I find that when firms increase their leverage in response

[11] Technically, the system should be identified by the nonlinearity of the inverse Mills ratio (that arises naturally from the assumption of joint normality). The underlying reason for the poor performance evident in some applications is that the inverse Mills ratio is nearly linear over much of its range, introducing potentially severe multicollinearity issues between covariates and the inverse Mills ratio during the second-stage regression. The best remedy for this problem is to introduce an instrument in the first-stage probit estimations that provides some source of variation in the inverse Mills ratio. For that reason, I treat growth options (proxied by market-to-book) and the size of net working capital as instruments in the first stage. An alternative approach is to estimate the outcome models with two stage least square (2SLS) using the fitted probabilities from the first-stage model as the instrumental variable (Maddala, 1986).

Table III. The Effect of Relationship Lending on Choice of Equity or Debt When Raising Capital

Panel A reports the results from a probit model. The dependent variable is equal to one (zero) if the firm is a net issuer of debt (equity) while raising capital. Panel B presents the coefficient estimates from a linear model where the dependent variable is the size of Net Stock (Debt) Issued as a percentage of total assets. Firm specific factors denote variables corresponding to firm *i*'s value in year $t-1$. Target market leverage is estimated from the results of the panel regression in Table II using Specifications (1) to (3). *Capital Investment* is the ratio of capital expenditures to total assets. *Z-score* is the Altman's Z-score. *Tangibles* is the ratio of expected asset liquidation value of a firm constructed based on the findings of Berger et al.'s (1996) total assets. Specifications also include the inverse Mills ratio (unreported) obtained through the first stage estimations. All regressions include firm fixed-effects (f.e.) and year fixed-effects (f.e.). Other observable controls are defined as in Table II. All test statistics are computed using standard errors that are robust to within firm correlation and heteroskedasticity and clustered at the firm level. *Wald* test statistics for the joint significance of the coefficients are also provided.

	Pr (Net Debt Issuance$_t$ = 1)					
	(1)		(2)		(3)	
	Estimate	Odds Ratio	Estimate	Odds Ratio	Estimate	Odds Ratio
Panel A. Probit Models of the Debt-Equity Choice Conditional on Raising Capital						
$REL^{\$}_{t-1}$	0.269**	(1.309)				
$REL^{\#}_{t-1}$			0.226**	(1.254)		
REL^{D}_{t-1}					0.291**	(1.338)
Ln(Assets$_{t-1}$)	0.117	(1.017)	0.134	(1.035)	0.148	(1.049)
Profitability$_{t-1}$	0.262***	(1.290)	0.285***	(1.329)	0.266***	(1.304)
Ind. Median Leverage$_{t-1}$	0.119**	(1.127)	0.117**	(1.124)	0.115**	(1.121)
Past Stock Return$_{t-1}$	−0.219***	(0.803)	0.200***	(0.819)	−0.239**	(0.787)
Tobin's Q$_{t-1}$	−0.804	(0.448)	−0.922	(0.398)	−0.782	(0.457)
Sales Growth$_{t-1}$	0.576**	(1.779)	0.225**	(1.252)	0.331**	(1.392)
Volatility$_{t-1}$	−0.129**	(0.879)	−0.243**	(0.784)	−0.280**	(0.756)
Rated$_{t-1}$	0.011**	(1.011)	0.010**	(1.010)	0.016***	(1.016)
Investment Grade$_{t-1}$	0.114	(1.121)	0.154	(1.166)	0.125	(1.133)
CashFlow$_{t-1}$	0.147	(1.158)	0.128	(1.137)	0.118	(1.125)
GDPgrowth$_{t-1}$	0.230	(1.259)	0.214	(1.239)	0.235	(1.265)
Z-score$_{t-1}$	0.475**	(1.608)	0.290**	(1.336)	0.381*	(1.463)
Capital Investment$_{t-1}$	0.073**	(1.076)	0.036**	(1.037)	0.028**	(1.028)
Tangibles$_{t-1}$	0.260**	(1.297)	0.281***	(1.324)	0.299***	(1.349)
Deviation from Target$_{t-1}$	−0.322**	(0.725)	−0.290**	(0.748)	−0.116**	(0.890)
Pseudo R^2	0.047		0.036		0.039	
Wald-test (*P*-value)	0.033		0.035		0.040	
Observations	15,847		15,847		15,847	
Firm f.e. and year f.e.	Yes		Yes		Yes	

(Continued)

Table III. The Effect of Relationship Lending on Choice of Equity or Debt When Raising Capital *(Continued)*

	Net Debt Issuance$_t$						Net Equity Issuance$_t$					
	(1)		(2)		(3)		(4)		(5)		(6)	
	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat	Estimate	*t*-stat
Panel B. Size of Net Debt–Equity Issuances												
$REL^{\$}_{t-1}$	0.009**	(2.335)					−0.007**	(−2.410)				
$REL^{\#}_{t-1}$			0.013***	(2.822)					−0.006**	(−2.360)		
REL^{D}_{t-1}					0.011**	(2.400)					−0.008***	(−2.572)
Ln(Assets$_{t-1}$)	0.072**	(2.212)	0.087**	(2.491)	0.105***	(2.662)	0.087*	(1.833)	0.072*	(1.765)	0.103*	(1.921)
Profitability$_{t-1}$	−0.080***	(−2.760)	−0.060**	(−2.254)	−0.046*	(−1.988)	−0.012**	(−2.071)	−0.011**	(−2.032)	−0.014**	(−2.140)
Ind. Median Leverage$_{t-1}$	0.010**	(2.024)	0.012**	(2.146)	0.011**	(2.074)	0.052**	(2.484)	0.060**	(2.201)	0.047**	(2.126)
Past Stock Return$_{t-1}$	−0.027**	(−2.392)	−0.020**	(−2.165)	−0.029**	(−2.423)	0.073***	(2.636)	0.066**	(2.348)	0.048**	(2.154)
Tobin's Q$_{t-1}$	−0.064*	(−1.723)	−0.066*	(−1.777)	−0.053	(−1.542)	0.020*	(1.786)	0.032*	(1.935)	0.026*	(1.800)
Sales Growth$_{t-1}$	0.702**	(2.301)	0.710**	(2.362)	0.698**	(2.270)	0.495***	(3.337)	0.506***	(3.493)	0.677***	(3.662)
Volatility$_{t-1}$	−0.206**	(−2.266)	−0.254***	(−2.653)	−0.229**	(−2.331)	−0.082**	(−2.290)	−0.093***	(−2.540)	−0.076**	(−2.116)
Rated$_{t-1}$	0.111***	(2.935)	0.133***	(3.160)	0.106***	(2.822)	0.024***	(2.651)	0.027***	(2.852)	0.025***	(2.781)
Investment Grade$_{t-1}$	0.062*	(1.696)	0.081*	(1.931)	0.065*	(1.760)	0.066***	(2.797)	0.058***	(2.520)	0.049**	(2.305)
CashFlow$_{t-1}$	0.010	(1.058)	0.011	(1.122)	0.014	(1.270)	0.020	(1.280)	0.019	(1.211)	0.030	(1.440)
GDPgrowth$_{t-1}$	0.062**	(2.034)	0.065**	(2.274)	0.057*	(1.933)	0.015**	(2.092)	0.027**	(2.458)	0.032***	(2.772)
Z-score$_{t-1}$	−0.014**	(−2.111)	−0.015**	(−2.146)	−0.016**	(−2.182)	−0.010**	(−2.015)	−0.008*	(−1.780)	−0.014**	(−2.240)
Capital Investment$_{t-1}$	0.032***	(3.200)	0.047***	(3.365)	0.063***	(3.881)	0.063***	(3.100)	0.055***	(2.720)	0.061***	(3.060)
Tangibles$_{t-1}$	0.034*	(1.933)	0.049**	(2.090)	0.055**	(2.134)	0.098***	(3.492)	0.079***	(3.253)	0.101***	(3.582)
Deviation from Target$_{t-1}$	−0.100*	(−1.962)	−0.092*	(−1.712)	−0.088	(−1.627)	0.077	(1.261)	0.095	(1.392)	0.092	(1.300)
Adj. R^2	0.603		0.614		0.590		0.638		0.606		0.554	
Wald-test (p-value)	0.010		0.012		0.029		0.006		0.008		0.012	
Observations	15,847		15,847		15,847		15,847		15,847		15,847	
Firm f.e. and year f.e.	Yes		Yes		Yes		Yes		Yes		Yes	

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

to lending relationships, they generally do so by increasing debt rather than by issuing equity. Economically speaking, according to Specification (1), a one-standard deviation increase in $REL^{\$}$ implies a 0.9% change in net debt issuance, which is about 20% of the mean net debt issuance. This compares to a 0.7% decrease in net equity issuance by a one-standard deviation shift in $REL^{\$}$ implying 11% of the average.[12]

B. Endogenous (Switching) Matching Results

I present the results of the two-stage switching regression tests (described in Section II.B) in Table IV. Panel A of this table presents estimation results for the first-stage decision to form banking relationships (Equation 2). I note that in order to fully identify the switching regression model, I need to determine which borrowers have lending relationships and those that do not.

Which variables should be used in the selection vector z? I use all exogenous variables specified in the continuous outcome equations and additional covariates including a lender's reputation based on the lead lender's market share, the market-to-book ratio, geographic distance (Coval and Moskowitz, 2001), liquidity exposure (based on Pastor and Stambaugh, 2003), market return, and credit spreads, average loan terms plus an instrumental variable.[13] Very often, identification is an issue in a simultaneous equations model. However, due to the nonlinear form of the selection bias control terms, the endogenous switching model be identified even if the exogenous variables in Equations (2) to (4) are identical. However, it does not hurt to include an instrumental variable that can determine the propensity to form lending relationships, but does not directly affect firms' financing and investment decisions. Following Berger et al. (2005) and Hellmann, Lindsey, and Puri (2008), I include *Capital Availability* as an instrument. This is defined as the dollar value of loans from all potential relations lenders in the firm's headquarters area normalized by the dollar value of loans to the same geographic area, both excluding the firm itself.[14] This instrument provides me with a certain degree of exogenous variation in the likelihood of forming lending relationships, which affect the selection equation (i.e., the matching outcome), but do not directly affect the impact on financing and investment decisions.[15]

The results in Table IV indicate that relationship lending is significantly more likely to take place in smaller, financially constrained (measured by the lack of credit ratings), high growth firms, while it is significantly less likely to occur when greater liquidity is available through a buoyant stock market. In addition, relationship lending is significantly more likely to transpire when there is greater informational asymmetry (as measured by earnings volatility). It is interesting to note

[12] However, in over 32% of the firm-year observations, there is neither a net debt nor net equity issuance. Therefore, in Table III, my sample is restricted to just those firm-years in which a financing decision occurs. The results reflect debt vs. equity choices. When I include those firm-years in which borrowers take no action and re-estimate the debt issuance decision model using a multinomial logit model, I find there is little effect on the economic and statistical significance of my findings (untabulated).

[13] For the sake of brevity, I report only those coefficients that are most significant statistically.

[14] I thank the referee for suggesting this variable as an instrument. As suggested by the referee, for the cases in which this ratio is undefined (i.e., if the firm is not in an area with other corporate headquarters such that there are no other loans), I input zero for my instrument.

[15] Previous research suggests that I need to incorporate the existence of prior advisory and underwriting relationships between borrowers and lenders into my first-stage model as these factors are likely to affect the firm's decision to match with a lender. As to previous advisory and underwriting relationships between a lead lender and a borrower, I concentrate on two specific investment banking products: 1) underwriting of public debt issues, and 2) the advisory role in mergers and tender offers. I identify prior debt underwriting and advisory relationships between each borrower and lead lender from the SDC and Capital IQ databases. This task results in 6,695 distinct issues of debt by 1,056 firms and advisory roles in mergers and tender offers in 2,054 firms.

Table IV. The Effects of Lending Relationships on Corporate Financial and Investment Choice: Endogenous Switching Regressions

This table presents maximum likelihood estimate of Equations (2) to (4) in the text. Panel A presents the results for the propensity to form lending relationships (selection equation), where the dependent variable is a binary variable that is equal to one if a lending relationship exists in a given year, and zero otherwise. Panel B reports estimation results for the two second-stage outcome equations, one for the relationship group and the other for the non-relationship group. Outcome variables are the book leverage, the ratio of total investment to total assets, and net debt and equity issuance measured at the end of fiscal year t. The selection equation is estimated based on all exogenous variables specified in the outcome equations and additional covariates such as lender's reputation, market-to-book, geographic distance, liquidity exposure, market return, average loan term, credit spread and an instrumental variable based on the availability of capital. *Reputation* is based on the lead lender's market share. *Capital Availability* is the dollar value of loans from all potential relationship banks in the company's headquarters area normalized by the dollar value of loans to the same geographic area, both excluding the firm. *Distance* is the spherical distance between each borrower and the lead lender. *Liquidity Exposure* is the liquidity risk exposure of borrowers measured as beta measure of Pastor and Stambaugh (2003). *Average Loan Term* is the average term of loans in the prior five years. *Credit Spread* equals the difference between the yields of BB- vs. AAA-rated corporate bonds obtained from Bloomberg. *Mkt* is the monthly return on the value-weighted CRSP. The independent variables are measured as of time $t-1$. Other observable controls are defined as in Table II. The independent variables are measured as of time $t-1$. The last row reports p-values for the test of the null hypothesis that a single outcome equation for each investment and financing variable of interest, as opposed to two outcome equations (relationship vs. nonrelationship borrowers), is sufficient to describe the data. This test is based on a likelihood ratio statistic in which the chi-squared distribution can be used for statistical inferences (Goldfeld and Quandt, 1976).

	Marginal Effect	Pr>ChiSq
Panel A. First-stage results of endogenous switching model		
Capital Availability	−0.106**	(0.050)
Ln(Assets$_{t-1}$)	−0.234*	(0.061)
Volatility$_{t-1}$	0.055**	(0.050)
Market-to-book$_{t-1}$	0.019**	(0.041)
Z-score$_{t-1}$	0.114*	(0.091)
Rated$_{t-1}$	−0.008**	(0.024)
Reputation$_{t-1}$	0.202*	(0.065)
Ln(1+Distance$_{t-1}$)	−0.175**	(0.043)
Liquidity Exposure$_{t-1}$	0.190***	(0.000)
Average Loan Term$_{t-1}$	−0.011*	(0.080)
Credit Spread$_{t-1}$	0.026**	(0.034)
Mkt$_{t-1}$	−0.017*	(0.060)
Model p-value (likelihood ratio test)	0.000	

(Continued)

Table IV. The Effects of Lending Relationships on Corporate Financial and Investment Choice: Endogenous Switching Regressions *(Continued)*

	Relationship Dummy = 1				Relationship Dummy = 0				p-values for Coefficient Differences	
	(1)		(2)		(3)		(4)			
	$Leverage_t$		$Investments_t$		$Leverage_t$		$Investments_t$			
	Est.	*t*-stat	Est.	*t*-stat	Est.	*t*-stat	Est.	*t*-stat	(1)−(3)	(2)-(4)
Panel B. Second-stage results of endogenous switching model (for leverage and total investments)										
$Ln(Assets_{t-1})$	0.010*	(1.803)	0.006**	(2.030)	0.022***	(2.520)	0.025***	(3.203)	0.015	0.011
$Profitability_{t-1}$	−0.067***	(−2.514)	0.039***	(3.200)	−0.044**	(−2.355)	0.012***	(2.622)	0.000	0.000
Ind. Median $Leverage_{t-1}$	0.115**	(2.141)			0.110**	(2.241)			0.172	0.198
Past Stock $Return_{t-1}$	−0.024**	(−2.381)	0.021**	(2.124)	−0.011**	(−2.063)	0.079***	(2.955)	0.011	0.000
Tobin's Q_{t-1}	−0.010*	(−1.770)	0.010**	(2.151)	−0.019*	(−1.982)	0.035***	(3.446)	0.009	0.009
Sales $Growth_{t-1}$	0.198***	(3.052)	0.037***	(2.766)	0.134**	(2.366)	0.140***	(3.673)	0.000	0.000
$Volatility_{t-1}$	−0.039*	(−1.886)	−0.156***	(−3.143)	−0.087***	(−2.857)	−0.923***	(−5.482)	0.006	0.000
$Rated_{t-1}$	0.008	(1.212)	0.047	(1.638)	0.166***	(3.995)	0.089*	(1.971)	0.000	0.020
Investment $Grade_{t-1}$	−0.010	(−1.298)	0.072*	(1.882)	−0.045**	(−2.480)	0.150***	(2.820)	0.000	0.017
$CashFlow_{t-1}$	0.004	(1.041)	0.010	(1.563)	0.031**	(2.020)	0.055***	(4.006)	0.009	0.008
$GDPgrowth_{t-1}$	−0.007	(−1.590)	−0.008	(−1.411)	−0.008*	(−1.674)	−0.011*	(−1.675)	0.210	0.208
Model *p*-value (likelihood ratio test)	0.000		0.000		0.000		0.000			
Observations	14,574		13,763		8,198		7,743			
Industry f.e.	No		No		Yes		Yes			
Firm f.e. and year f.e.	Yes		Yes		Yes		Yes			

(Continued)

Table IV. The Effects of Lending Relationships on Corporate Financial and Investment Choice: Endogenous Switching Regressions *(Continued)*

	Relationship Dummy = 1				Relationship Dummy = 0				p-values for Coefficient Differences	
	(5)		(6)		(7)		(8)			
	Net Debt Issuance$_t$		Net Equity Issuance$_t$		Net Debt Issuance$_t$		Net Equity Issuance$_t$			
	Est.	t-stat	Est.	t-stat	Est.	t-stat	Est.	t-stat	(5)–(7)	(6)-(8)
Panel C. Second-stage results of endogenous switching model (for debt and equity issuances)										
Ln(Assets$_{t-1}$)	0.049***	(3.504)	0.026***	(2.555)	0.018**	(2.224)	0.009**	(2.040)	0.005	0.009
Profitability$_{t-1}$	−0.045***	(−3.722)	−0.015**	(−2.104)	−0.019**	(−2.280)	−0.006*	(−1.762)	0.007	0.013
Industry Median$_{t-1}$	0.025	(1.623)	0.024*	(1.942)	−0.028*	(−1.751)	0.032**	(2.023)	0.176	0.165
Past Stock Return$_{t-1}$	−0.029**	(−2.070)	0.076***	(4.287)	−0.060***	(−3.030)	0.014**	(2.366)	0.007	0.010
Tobin's Q$_{t-1}$	−0.016**	(−2.381)	0.034***	(3.306)	−0.006*	(−1.824)	0.014**	(2.341)	0.007	0.008
Sales Growth$_{t-1}$	0.052***	(3.090)	0.049***	(3.775)	0.030**	(2.109)	0.085***	(4.468)	0.010	0.006
Volatility$_{t-1}$	−0.014	(−1.335)	−0.004	(−1.066)	−0.070***	(−3.394)	−0.066***	(−3.655)	0.000	0.000
Rated$_{t-1}$	0.013**	(2.206)	0.015**	(2.272)	0.049***	(2.838)	0.040***	(3.524)	0.000	0.000
Investment Grade$_{t-1}$	0.006*	(1.982)	0.006*	(1.693)	0.009**	(2.281)	0.010**	(2.012)	0.187	0.180
CashFlow$_{t-1}$	0.005	(1.574)	0.014*	(1.970)	0.022**	(2.166)	0.062***	(4.117)	0.018	0.000
GDPgrowth$_{t-1}$	−0.032**	(−2.492)	0.008*	(1.851)	−0.010	(−1.605)	0.038***	(3.160)	0.006	0.000
Z-score$_{t-1}$	−0.029**	(−2.455)	−0.012	(−1.020)	−0.009*	(−1.733)	−0.021*	(−1.808)	0.000	0.000
Capital Investment$_{t-1}$	0.015***	(2.986)	0.012*	(1.733)	0.073***	(3.495)	0.057***	(3.292)	0.000	0.000
Tangibles$_{t-1}$	0.068***	(2.951)	0.008	(1.556)	0.002**	(2.157)	0.005*	(1.731)	0.005	0.022
Deviation from Target$_{t-1}$	−0.003	(−1.300)	−0.010	(−1.622)	−0.005	(−1.413)	−0.002	(−1.010)	0.156	0.266
Model p-value (likelihood ratio test)	0.000		0.000		0.000		0.000			
Observations	14,574		13,763		8,198		7,743			
Firm f.e. and year f.e.	Yes		Yes		Yes		Yes			

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

that the size of the coefficient on liquidity exposure is significantly positive, implying that the insurance motive plays an important role in forming lending relationships.

In Panel B, I present the estimation results for the second-stage outcome equations (Equations 3 and 4) for the observed (relationship lending) and the "counterfactual" (non-relationship lending) situations.[16] While most of the variables have the same sign in both equations, in some cases, their effects are notably different in terms of statistical and economic significance across the two lending groups. Note that size, rated dummy, and volatility are less important, both economically and statistically, in relationship loans suggesting that relationships serve as a tool for reducing asymmetric information problems to some extent.[17] In addition, debt financing for relationship borrowers is significantly higher during economic downturns (with lower GDP growth), which is consistent with the view that these relationships are especially economically meaningful during these downturns. Table IV also reports that investment is less sensitive to innovations in cash flow when a firm has lending relationships. This suggests that firms with lending relationships are less reliant on internal cash flow. Moreover, the last row of Panel B reports *p*-values for the test of the null hypothesis that a single financing and investment regime, as opposed to two regimes, is sufficient to describe the data. This test is based on a likelihood ratio statistic for which the χ^2 distribution can be used for statistical inferences (Goldfeld and Quandt, 1976).

As previously noted, my two-stage switching regression model allows me to answer "*what-if*" type of questions through the estimation of the measure Λ_{it} (Equation 5). In other words, I can address the question, "For relationship lending, what would the alternative investment and financing decision be, had no relationship been formed?" Table V presents the results, both actual and hypothetical outcomes, from this analysis. I find that, on average, for any given relationship lending, non-relationship lending would have delivered significantly lower leverage, investment, and debt issuance. For instance, the difference in net debt issuance for relationship borrowers (over non-relationship borrowers) is 3.7%. Conversely, nonrelationship borrowers would have had higher net debt issuance by 4.6%, on average, if relationship lending had been employed. The final set of columns reports the statistics and *p*-values of a two-sample Kolmogorov-Smirnov (KS) test for the equality of the actual distribution and the hypothetical distribution for each corporate policy variable. The differences are highly significant. I find similar patterns for leverage and the total investment ratios.

C. Heterogeneity in Relationship Lending

Next, I examine the heterogeneity in the coefficient on relationship measures using the change in the outcome variables of interest. Specifically, I classify firms into financially constrained and unconstrained groups and estimate the following specification:

$$y_{it} = \alpha_0 + \alpha_1 REL_{it} + \alpha_2 REL_{it} * Constrained_{it} + \alpha_3 Constrained_{it} + x'_{it-1}\beta + 1'\Lambda_{f.e.} + \nu_{it} \quad (7)$$

where *Constrained* is an indicator for the treatment group (financially constrained firms). In this model, α_2 measures the difference in the mean of the outcome variable due to lending relationships for the financially constrained firms, relative to firms with financial slack. Taking lending relationships into account, this specification allows me to deepen the understanding of corporate financial policy and to net out any demand effects that are common to both the control

[16] Note that the fixed effects are not constrained to be the same across switching regressions. One needs to be cautious in interpreting these results.

[17] The *p*-values for coefficient differences across relationship and nonrelationship borrowers are significant at respective levels.

Table V. Actual Versus Hypothetical and Simulated Outcomes for Relationship and Nonrelationship Borrowers

This table presents actual and hypothetical mean outcomes (leverage, investments net debt and equity issuance) for relationship and non-relationship lending. The computation of the hypothetical values is discussed in the text. The final set of columns performs two-sample Kolmogorov-Smirnov (KS) tests for the equality of the actual and the hypothetical distributions, and *p*-values.

	(1) Actual	(2) Hypothetical	(3) KS Test (Actual-Hypothetical)	(4) *p*-value
Panel A. Comparisons for relationship borrowers (relationship dummy = 1)				
$Leverage_t$	0.298	0.247	0.957***	0.000
$Investments_t$	0.066	0.038	0.486***	0.001
Net Debt $Issuance_t$	0.053	0.015	0.905***	0.000
Net Equity $Issuance_t$	0.006	0.030	0.236***	0.007
Panel B. Comparisons for non-relationship borrowers (relationship dummy = 0)				
$Leverage_t$	0.143	0.190	0.795***	0.000
$Investments_t$	0.052	0.098	0.896***	0.002
Net Debt $Issuance_t$	0.020	0.066	0.579***	0.000
Net Equity $Issuance_t$	0.052	0.012	0.688***	0.000

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

and the treatment groups. In the same spirit of Gertler and Gilchrist (1994), each year, I rank firms into terciles based on the book value of total assets in $t - 1$ and classify the bottom (top) tercile of the sample firms as financially constrained (unconstrained). Similarly, following Fazzari, Hubbard, and Petersen (1988), I classify firms into constrained and unconstrained groups according to their dividend payout ratio in $t - 1$. Non-dividend paying (dividend paying) firms are classified as financially constrained (unconstrained) as dividends and investment are competing uses of funds. Firms facing severe financing constraints tend to choose not to pay any (or to pay lower) dividends.

Whited (1992) and Faulkender and Petersen (2006), among others, use the presence of bond ratings as a proxy for access to public debt markets and financial constraints. Similarly, Calomiris, Himmelberg, and Wachtel (1995), among others, use the presence of commercial paper ratings as a proxy for access to public debt markets and financial constraints. In each year during the sample period, I classify those firms with positive debt, but without S&P's commercial paper or bond ratings in $t - 1$ as financially constrained. Financially unconstrained firms are those with positive debt and S&P commercial paper or bond ratings in a given year.

Column (1) of Table VI present the estimates for relationship lending interacted with indicator variables identifying the top (financially unconstrained) and bottom (financially constrained) third of the within-year distribution of firm size. For binary interaction variables (having a credit rating or dividend payout), the interaction is directly with the binary variable. My inferences come from any differences in the estimated coefficients across these areas of the distribution. Consistent with firms forming banking relationships to overcome borrowing constraints, I find that after controlling for firm, industry, and year fixed effects, the effects of lending relationships are more pronounced among smaller firms, non-dividend payers, and firms without a credit rating

Table VI. Interactions with Firm Characteristics

This table presents the impact of lending relationships on leverage, total investments, net debt and equity issuance interacted with indicator variables identifying the lower and upper third of the within industry-year distribution of lagged values of firm size (Column 1), whether the firm is a dividend payer (Column 2), whether the firm has a credit rating (Column 3). Top (bottom) tercile dummies refer to the financially unconstrained (constrained) firms. For binary interaction variables (dividend payer, bond or CP rating), the interaction is directly with the binary variable. The dependent variables are measured at the end of fiscal year t, and the independent variables are measured as of time $t-1$. Additional control variables and fixed-effects are defined in Tables II and III. All test statistics are computed using standard errors that are robust to within firm correlation and heteroskedasticity and clustered at the firm level. Standard errors are clustered at the firm level.

	(1) Firm Size	*t*-stat	(2) Dividend Payer	*t*-stat	(3) Bond or CP Rating	*t*-stat
			Panel A. Leverage$_t$			
$REL^D{}_{t-1}$ × Top Tercile	0.018**	(2.223)	0.008	(1.542)	0.028**	(2.498)
$REL^D{}_{t-1}$ × Bottom Tercile	0.050***	(3.191)	0.049***	(2.901)	0.073***	(4.460)
Difference (Bottom-Top)	0.032***	(2.560)	0.041***	(2.750)	0.045***	(2.805)
			Panel B. Investments$_t$			
$REL^D{}_{t-1}$ × Top Tercile	0.011**	(2.111)	0.008	(1.477)	0.006	(1.285)
$REL^D{}_{t-1}$ × Bottom Tercile	0.029**	(2.482)	0.024**	(2.362)	0.032***	(2.543)
Difference (Bottom-Top)	0.018**	(2.214)	0.016**	(2.155)	0.026**	(2.298)
			Panel C. Net Debt Issuance$_t$			
$REL^D{}_{t-1}$ × Top Tercile	0.002	(1.166)	0.006	(1.240)	0.014**	(2.272)
$REL^D{}_{t-1}$ × Bottom Tercile	0.025**	(2.370)	0.041***	(2.612)	0.052***	(3.440)
Difference (Bottom-Top)	0.023**	(2.291)	0.035***	(2.631)	0.038***	(2.684)
			Panel D. Net Equity Issuance$_t$			
$REL^D{}_{t-1}$ × Top Tercile	0.009	(1.607)	0.005	(1.207)	0.012**	(2.075)
$REL^D{}_{t-1}$ × Bottom Tercile	−0.024**	(−2.270)	−0.019**	(−2.196)	−0.044***	(−2.794)
Difference (bottom − top)	−0.033***	(−2.531)	−0.024**	(−2.342)	−0.056***	(−3.868)
Other controls	As in Tables II & III; top (bottom) indicator		As in Tables II & III; top (bottom) indicator		As in Tables II & III; top (bottom) indicator	

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

(bond or CP). In addition, by allowing the connection between investment or financing choice variables and lending relationships to vary by firm size, the availability of credit ratings, and dividend payouts, I can explain a larger portion of the variation in financing decisions, capital structure, and investment ratios, increasing my adjusted R^2 (unreported) from 60% (Tables II and III) to 68%.

D. Event Study: Severing Relationships

My primary concern is that a change in net debt issuing activity, investments, and debt ratios could have occurred regardless as to the existence of lending relationships. An alternative way to deal with the potential endogeneity problem is to isolate a subset of changes in investment and capital structure or financing decisions that are plausibly unrelated to the demand effects. Specifically, I consider disruptions in relationships due to an adverse shock to the financial health of a lead relationship lender and conduct an event study. I rely on the occurrence of bank-specific events, such as announcements of bank write-downs or downgrades in relationship banks' long-term credit ratings, with respect to a parent bank or the material subsidiary of a lender to identify lender-specific shocks, which typically indicate a significant threat to lending relationships. In a similar fashion, Fernando, May, and Megginson (2012), who also conduct an event study analysis, use the collapse of Lehman Brothers in 2008 as an instrument for lending relationships. I obtain year-end long-term credit ratings from S&P's RatingsXpress database (Blume et al., 1998; Amato and Furfine, 2004) as coverage of long-term ratings from Moody's is much more incomplete in comparison. Since there is a very tight correspondence between ratings from the two agencies, there is no reason to expect that relying strictly on the S&P's long-term ratings will induce a systematic bias in the control sample. I rely on the WDCI (Write Down vs. Capital Infusion) function in Bloomberg and the material impairment section of 8-K forms filed with the Securities Exchange Commission (SEC) for public announcements of asset write-downs, large loan loss provisions, retained interest write-downs, and asset backed security write-downs by individual banks. WDCI includes inter alia, losses related to subprime mortgages, structured finance products, and credit default swaps. I augment the WDCI data with Factiva and Lexis-Nexis news sources for information pertaining to the write-downs. My list does not include rumor, speculation, or negotiations, but actual events in the financial services sector after they have occurred. This yields approximately 703 events. I refine this to include only those relationship lenders identified in my sample data. This reduces the sample to 558 events. I then discard all events (write-downs and rating downgrades) with contaminating information, such as takeover announcements. I am left with 534 clean events taking place during my sample period for a list of 196 banks, of which 387 of these announcements are due to write-downs, and 147 are due to rating downgrades.

Using this sample, I carry out a difference-in-difference regression test, as well as a difference-in-difference paired t-test. One potential concern with my tests here is that the occurrence of shocks to the financial health of relationship lenders may impact not only relationship borrowers, but also non-relationship borrowers that borrow from identified distressed relationship lenders in terms of leverage, investments, and the choice of financing. I mark the event year as t_0. To be eligible for the control group, I require that a firm has either never had a loan from a distressed relationship lender during the five years preceding the event year from $t_0 - 1$ to $t_0 - 5$ or that it has had at least one non-relationship loan from a distressed relationship lender from $t_0 - 1$ to $t_0 - 5$ prior to the event year. For this reason, I create three new dummy variables, one indicating whether the firm had at least one relationship loan from a distressed relationship lender between $t_0 - 1$ to $t_0 - 5$, and zero otherwise, and label it $I^{Rel-loan}_{t_0-1,t_0-5}$. Similarly, the other dummy variable, $I^{Nonrel-loan}_{t_0-1,t_0-5}$, indicates whether the firm had at least one non-relationship loan from a troubled relationship lender between $t_0 - 1$ to $t_0 - 5$, and zero otherwise. Finally, $I^{No-loan}_{t_0-1,t_0-5}$, is an indicator for those firms that had no loans from a distressed relationship lender over the five years preceding the event year. If lending relationships matter for firms' investment and financing decisions, I expect the effect of banking distress to be stronger for relationship firms than for those firms with no loans or with non-relationship loans from distressed relationship lenders. My main identification strategy is to compute the differences in investment and financing changes prior to and after these adverse events. The difference-in-difference approach corrects for other (unobserved) factors that could be associated with both adverse shocks and changes in debt issuing activity, investments, and leverage ratios.

For my regression analysis, I create two more dummy variables, one indicating whether a relationship lender experiences an adverse shock to its financial health in $t - 1$ (*Shock* = 1 in this case), and the other indicating whether the time period is prior to or after the shock (*After* = 1 after-shock). In Table VII, I only report the results for the difference-in-difference estimator of interest, which is the triple interaction term, *Shock* × *After* × $I^{j}_{t_0-1,t_0-5}$ where $j = \{$*Rel-loan, Nonrel-loan, No-loan*$\}$. In order to isolate the effect of relationship lender distress, I restrict my sample to the period one year prior to the distress event to one year after the event. To avoid perfect multicollinearity, the specifications do not contain intercept terms. In the regression, I control for the determinants of each dependent variable used in Tables II and III, as well as individual representations and the interaction of the *Shock* and *After* dummies, *Shock* × $I^{j}_{t_0-1,t_0-5}$ and *After* × $I^{j}_{t_0-1,t_0-5}$ interaction terms where $j = \{$*Rel-loan, Nonrel-loan, No-loan*$\}$. I find the effects of lender distress are most pronounced for the relationship borrowers, while firms with no loan history with a distressed lender are not affected by the lender-specific shocks. To be more specific, for relationship borrowers, the effect of distress on leverage, net debt issuance, and investment ratios is negative and significant. For firms with non-relationship loans, the effect of distress on leverage (net debt issue) is negative (positive), but insignificant, negative, but marginally significant on the investment ratio, and positive and insignificant on net equity issue. For firms with no loan history with distressed lenders, all coefficient estimates, but net equity issuance, which is positive at the 5% level, are insignificant.

Next, I employ a propensity score matching technique (Rosenbaum and Rubin, 1983, 1985) where I match each treatment firm to a control firm in the same industry at the same time (based on 17 Fama-French industry groups) on size, industry, past performance, lagged debt ratios, sales growth, EBITDA, and market-to-book ratios. It is not feasible to perform the match on all possible controls, but I use the bias correction approach suggested by Abadie and Imbens (2011) to correct for bias due to remaining differences between the treated and the control samples. My treatment sample includes firms that had relationship loans from a distressed relationship lender in the last five years prior to the event. I construct two different control samples, one involving firms that had no loans and another including firms that had at least one non-relationship loan from a distressed relationship lender.

Panel A of Table VIII presents the results of a difference-in-difference paired *t*-test, with relationship borrowers being the treatment group. I compare the mean difference in leverage, net debt (equity) issuance, and investment ratio between the treatment and control groups in the year prior to the lender-specific shock to the mean difference one year after the shock. I find that the mean difference between leverage (investment) for the treatment and the control groups shrinks by a statistically significant 0.052 (0.047), from 0.058 (0.039) before the shock to 0.006 (−0.008) after the shock. The mean difference produces a *t*-statistic of −2.15 (−3.99) indicating a change in leverage (investment) stemming from a

Table VII. Event Study: Severing Lender-Borrower Relationship(s): Multivariate Results

This table reports leverage, net debt issuance, net equity issuance, and the ratio of total investment to total assets difference-in-difference tests using panel regression results surrounding lender-specific adverse shocks to lending relationships. To avoid perfect multicollinearity, the specifications do not contain intercept terms. Lender distress is identified as announcements of bank asset write-downs or downgrades in relationship banks' long-term credit ratings. *Shock* is a dummy that takes a value of one when a relationship bank is hit by either of these shocks in year $t-1$. *After* is a post shock dummy variable that is equal to one if after a shock, and zero otherwise. t_0 is the event year. $I^{Rel-loan}_{t_0-1,t_0-5}$ is a dummy variable indicating whether a firm had at least one relationship loan from a distressed relationship lender, and zero otherwise. $I^{Nonrel-loan}_{t_0-1,t_0-5}$ is a dummy variable indicating whether a firm had at least one non-relationship loan from a distressed relationship lender during the five years preceding the event year from t_0-1 to t_0-5, and zero otherwise. $I^{No-loan}_{t_0-1,t_0-5}$ is the indicator for those firms that had no loan from a distressed relationship lender from t_0-1 to t_0-5, and zero otherwise. Other controls include those defined in Tables II and III, as well as individual representations and interaction of *Shock*, *After* dummies and their interactions, and $Shock \times I^{j}_{t_0-1,t_0-5}$ and $After \times I^{j}_{t_0-1,t_0-5}$ interaction dummies, where $j = \{Rel\text{-}loan,\ Nonrel\text{-}loan,\ No\text{-}loan\}$. The dependent variables are measured at the end of fiscal year *t*, and the independent variables are measured as of time $t-1$. To isolate the effect of the shock in lending relationships stemming from lender distress, I restrict my sample to three years per firm: one year prior to the event to one year after the event. All regressions use year fixed-effects (f.e.). All test statistics are computed using standard errors that are robust to within firm correlation and heteroskedasticity and clustered at the firm level. *Wald* test statistics for the joint significance of the coefficients are also provided.

	(1) Leverage$_t$	(2) Investments$_t$	(3) Net Debt Issuance$_t$	(4) Net Eq. Issuance$_t$
$Shock \times I^{No-loan}_{t_0-1,t_0-5} \times After$	−0.002	−0.024	−0.003	0.008**
	(−1.383)	(−1.434)	(−1.403)	(2.457)
$Shock \times I^{Rel-loan}_{t_0-1,t_0-5} \times After$	−0.055***	−0.035***	−0.043***	0.026**
	(−3.105)	(2.681)	(−2.775)	(2.052)
$Shock \times I^{Nonrel-loan}_{t_0-1,t_0-5} \times After$	−0.018	−0.009*	0.015	0.010
	(−1.522)	(−1.660)	(1.601)	(1.533)
Other controls	As in Tables II-III and several additional covariates as explained in the text.			
Adj. R^2	0.590	0.663	0.637	0.601
Wald-test (p-value)	0.002	0.021	0.009	0.013
Observations	3,237	3,025	2,769	2,769
Year f.e.	Yes	Yes	Yes	Yes

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

Table VIII. Event Study: Severing Lender-Borrower Relationship(s): Matched-Sample Results

This table reports difference-in-difference paired-test results comparing the mean difference in leverage, net debt issuance, net equity issuance, in the year prior to the event to the mean difference in the year after the lender-specific adverse shocks. Lender distress is identified as announcements of bank write-downs or downgrades in relationship banks' long-term credit ratings. t_0 is the event year. I use propensity score matching to compose control groups that are similar in several aspects to the treatment group. The treatment group includes those relationship borrowers that had loan(s) from a distressed relationship lender during the five years preceding the event year from $t_0 - 1$ to $t - 5$. The control group in Panel A is comprised of those firms who had no loan(s) from a distressed relationship lender from $t_0 - 1$ to $t - 5$. The control group in Panel B consists of non-relationship borrowers who had at least one non-relationship loan from a distressed relationship lender from $t_0 - 1$ to $t - 5$. All test statistics are computed using standard errors that are robust to within firm correlation and heteroskedasticity and clustered at the firm level.

	Panel A.			*Panel B.*		
	***Treatment*: Borrowers with relationship loan from event lender**			***Treatment*: Borrowers with relationship loan from event lender**		
	***Control*: Borrowers with no loan from event lender**			***Control*: Borrowers with non-relationship loan from event lender**		
	(1) $t_0 - 1$	**(2)** $t_0 + 1$	**(2)−(1)** $(t_0 + 1 - t_0 - 1)$	**(3)** $t_0 - 1$	**(4)** $t_0 + 1$	**(4)−(3)** $(t_0 + 1 - t_0 - 1)$
$Leverage^{treat} - Leverage^{control}$	0.058	0.006	−0.052**	0.024	−0.004	−0.028**
			(−2.150)			(−2.020)
$Investments^{treat} - Investments^{control}$	0.039	−0.008	−0.047***	0.014	−0.003	−0.017**
			(−3.991)			(−2.224)
Net Debt $Issuance^{treat}$ − Net Debt $Issuance^{control}$	0.021	−0.008	−0.029***	0.016	−0.004	−0.020**
			(−2.674)			(−2.403)
Net Eq. $Issuance^{treat}$ − Net Eq. $Issuance^{control}$	−0.007	0.009	0.016**	−0.002	0.008	0.010*
			(2.100)			(1.857)

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

decrease in relationships that results from lender-specific shocks. I find that the results for net debt and equity issuance qualitatively paint a very similar picture to that of leverage.

I repeat the difference-in-difference paired *t*-test in Panel B, but this time my control group includes those firms with non-relationship loans from a distressed relationship lender during the five years preceding the event year. Finally, I repeat my event study and re-estimate Tables VII and VIII using quarterly data rather than annual data. In this case, my event window covers four quarters prior to the event and four quarters after the event. I find my results to be quite robust using data at the quarterly frequency. Taken together, these tests support the same conclusion that lending relationships have a causal positive effect on investment and debt financing choices.

IV. Additional Tests

A. Bank Fixed Effects

To alleviate concerns that my results may be driven by an unobserved characteristic at the lender level, I have also replicated my analysis with lender fixed effects. I use lender fixed effects to analyze how a particular bank, given a certain funding shock, changes how it lends to various firms differently (within-bank comparison). Since these fixed effects capture (un)observed characteristics of banks, concerns about omitted variable bias should be fairly limited. The lender fixed effects coefficient estimates (untabulated) are very similar to those reported in Tables II and III.

B. Instrumenting for Bank's Financial Health

To the extent that much of a bank's business comes from relationship borrowers, the health of the bank is likely to be a function of the financial health of those borrowers (Dahiya et al., 2003). In other words, if relationship borrowers are significantly riskier than nonrelationship borrowers, my results maybe outcome product of the poor credit quality of these firms and may not necessarily be linked to the health of their relationship lenders. In order to alleviate concerns that the shock to a bank's health is correlated with the financial health of its relationship borrowers, I undertake two additional tests to isolate borrower's distress.

In my first attempt to isolate lender distress, I use an instrument that captures a bank's exposure to toxic mortgage-backed securities (ABX exposure). I infer a bank's exposure from the correlation of their daily stock returns with the return on the ABX AAA 2006-H1 index. This index follows the price of residential mortgage-backed securities issued during the second half of 2005 with a AAA rating at issuance. The loading of a bank's stock returns on the ABX index provides a measure of the bank's exposure to underlying components or similar securities. The AAA index includes securities that banks would have viewed as completely safe upon acquisition. Indeed, the index remained roughly at par until the fall of 2007, but then fell by 10% in October and November of that year. By 2009, the index had fallen by another third. However, I only compute the loadings from October 2007 to December 2007 to avoid reverse causality as movements in the ABX sometimes reflect the fire sale of securities by distressed banks around the period of the Bear Stearns and Lehman Brothers collapses. The results provided in Panel A of Table IX indicate a strong correlation for relationship borrowers with the loading of the bank's stock returns on the ABX AAA index.

In addition, I employ geographic-year fixed effects. More specifically, I use a metropolitan statistical area (MSA) as a geographical region. The local economic conditions faced by a bank and its relationship borrowers are likely to be highly correlated. For example, adverse regional

Table IX. Additional Tests

This table reports the results of several robustness tests. I report results only for the REL^D relationship measure. Panel A replicates Table VIII and uses dispersion in lender health during a recent financial crisis as a source of exogenous variation in the availability of credit to borrowers. The instrument exploits the fact that the financial crisis originated outside of the non-financial corporate sector and captures exposure to mortgage backed securities through the loading of each sample bank's stock return on the ABX AAA 2006-H1 Index from October 2007 to December 2007. Panels B and C report the results of regressions similar to those provided in Table II and Panel B of Table III using metropolitan statistical area (MSA)-year fixed-effects and an unconsolidated sample, respectively. Panel D reports the results post-crisis of 2007 where *Crisis* takes a value of one after July 2007 and the dependent variables are the changes in corporate outcomes. Additional control variables and fixed-effects are defined in Tables II, III, and VIII. All test statistics are computed using standard errors that are robust to within firm correlation and heteroskedasticity and clustered at the firm level.

	(1) $Leverage_t$	(2) $Investments_t$	(3) $Net\ Debt\ Issuance_t$	(4) $Net\ Equity\ Issuance_t$
	Panel A. Instrumenting for Bank's Financial Health			
$ABX\ Exposure \times I^{No-loan}_{t_0-1,t_0-5} \times After$	−0.012	−0.009	−0.001	−0.008*
$ABX\ Exposure \times I^{Rel-loan}_{t_0-1,t_0-5} \times After$	−0.038***	−0.041***	−0.029**	0.018**
$ABX\ Exposure \times I^{NonRel-loan}_{t_0-1,t_0-5} \times After$	−0.005	−0.006	0.011***	0.007
Panel B. MSA-Year effects	0.029***	0.017***	0.010*	−0.001
Panel C. Unconsolidated sample	0.020***	0.030***	0.011**	−0.009***
Panel D. Subprime crisis				
REL^D × Crisis	−0.033***	−0.025***	−0.022**	0.010*

***Significant at the 0.10 level.
**Significant at the 0.05 level.
*Significant at the 0.01 level.

conditions may cause a temporary increase in uncertainty, leading firms to delay investment and borrowing decisions. Moreover, adverse shocks can hurt borrower balance sheets and exacerbate the effects of asymmetric information and limited contractibility, prompting banks to curtail lending to riskier borrowers or raising lending spreads. To isolate the variation arising solely from differences within a certain region, I replace the year-effects with MSA-year effects based on MSA where the firm's headquarters are located. The results provided in Panel B of Table IX indicate that my earlier findings hold almost identically (Tables II and III).

C. Unconsolidated Sample

Over the sample period, there was extensive merger and acquisitions activity in the US banking and corporate sector. The consolidation of the banking system increases the average size of banks, thus modifying the organizational model of the lending process and often centralizing decision-making powers. Alternatively, the increasing number of bank branches in local markets leads to large banks being geographically closer to their customers. However, there is fairly widespread concern that the banking consolidation process, with growth in bank size, could have a negative impact on bank-firm credit relations. I investigate whether my main findings are robust to including only relationships from the unconsolidated sample. More specifically, I use a subsample that is free of any transfer relationships and find similar effects on these relationships regarding the financing and investment decisions of the sample firms (Panel C of Table IX).

D. Impact of Subprime Crisis

The subprime crisis of 2007 has brought about a serious credit crunch for both individuals and financial institutions, and a major decline in the liquidity of debt securities in virtually every market. As a final test, I determine whether and how the existence of relationship lending may have affected corporate outcomes during the crisis that began in July 2007. As such, I create a dummy variable *Crisis* that takes a value of one after July 2007 and use changes in corporate outcomes as my dependent variables. The results indicate that (Panel D of Table IX) firms with existing lending relationships decrease their leverage, debt use, and investment expenses more than those without such relationships. For example, the coefficient estimate in Column (3) indicates that relationship firms experience a decrease in the use of debt in the magnitude of 0.022 relative to firms without relationships. In unreported tests, in order to isolate the effect of the crisis, I restrict my sample to July 2010 and I find stronger results.[18] Overall, my findings are in line with those presented in Tables VII and VIII as the subprime crisis raised serious concerns about the health of the banking sector. Bank-dependent firms have been the most affected by this crisis.

V. Conclusion

Existing studies almost exclusively provide only a very rough test of the value of relationship banking on investment and financing decisions of firms. This study provides a broad-based analysis of the effect of lending relationships on corporate investment and financing policies. Using a panel dataset, I demonstrate that lending relationships are important determinants of

[18] This is because by mid-2010, the markets began to recover in the sense that the stock market was rebounding from its lowest level and credit spreads were declining from their peak. The panic had subsided and stock prices in the financial sector were increasing.

corporate investment and financial policies. Interdependencies between relationships and debt-equity issuances drive interdependencies between relationships and leverage ratios.

However, identification of the net effects of lending relationships on investment and financing policies is challenging due to endogeneity issues. The decision to form lending relationships is endogenous and may depend on non-observable factors that are also correlated with investment and financing decisions. I control for the endogeneity of relationship formation using a two-stage endogenous switching regression model. To establish causality, I use firm and year fixed effects and difference-in-difference techniques. I conduct a detailed analysis as to whether leverage, investment, and net debt-equity issuance activity change significantly in the aftermath of events that represent exogenous shocks to bank-borrower lending relationships. While the techniques are different, the results consistently suggest that lending relationships significantly affect firms' investment and financing choices.

Appendix

Construction of Relationship Measures

I construct relationship measures as of the beginning of each year using three different alternatives for each firm. In a given year, a firm may have received: (1) a relationship loan from a bank, (2) a nonrelationship loan from a bank, or (3) no loan from any bank. The construction of $REL^{\$}$ and $REL^{\#}$ are straightforward. However, I adopt three different coding techniques for the relationship dummy REL^D. The difference comes from the treatment of the no loan sample. In the first technique, where the no loan sample is coded as the base category, I require two dummy variables to account for all of the between-group variability. REL^D takes a value of one for relationship loans and zero otherwise and $NONREL^D$ takes a value of one for non-relationship loans and zero otherwise. In the second technique, I adopt an "effect coding" approach, where REL^D takes a value of one for relationship loans, zero for non-relationship loans, and -1 for no loan (base category) observations. Finally, in the third technique, I require one dummy variable, where REL^D takes a value of one for relationship loans, zero for non-relationship loans, and missing for no-loan observations.

In tables, for ease of interpretation, I report detailed results for only the third technique. However, the first technique produces quantitatively stronger results and second technique produces qualitatively the same results. I illustrate the methodology for the third technique by an example. In 2004, International Paper Co. borrowed \$1.25 billion from a syndicate led by J.P. Morgan Chase. To calculate International Paper Co.'s lending relationships, I review the loan history for International Paper Co. from January 1, 1999 to December 31, 2003. During this five-year period,

Table A1. Deals can Loan History for International Paper Co. from 1999 to 2003

Five-Year Loan History (January 1999 to December 2003)					
1999	**2000**	**2001**	**2002**	**2003**	**2004**
Two loans by J.P. Morgan	One loan by CITI	One loan by J.P. Morgan	One loan by CITI	One loan by J.P. Morgan	Total loan amount of \$1.25B by a lead lender JP Morgan Chase
	Two loans by Credit Suisse	One loan by Credit Suisse			

International Paper Co. acquired four loans from J.P. Morgan Chase (one loan each in 2003 and 2001 and two loans in 1999 for a total of $5.1 billion), two loans from Citibank (in 2002 and 2000 for a total of $2.5 billion), and three loans from Credit Suisse (two loans in 2000 and one loan in 2001 for a total of $7 billion).

International Paper Co. began 2004 with a banking history with J.P. Morgan Chase, Citibank, and Credit Suisse. If, during 2004, any of these three banks extended at least one loan to International Paper Co., then International Paper Co. is defined as having a relationship loan in year 2004, and the REL^{D}_{2004} dummy is equal to one. If International Paper Co. took no loans or took loans but none of them is from J.P. Morgan Chase, Citibank, or Credit Suisse in 2004, then the REL^{D}_{2004} dummy is equal to zero. In my example, since the firm received a syndicated loan from J.P. Morgan Chase in 2004, for the International Paper Co., I assign $REL^{D}_{2004} = 1$. The other two measures are ratios, expressing the fraction of loans and the average loan size received from relationship banks relative to the total loan size. Then, $REL^{\$}_{2004}$, which is the ratio of the total amount of all relationship loans taken by International Paper Co. from January 1, 1999 to December 31, 2003 to the total facility amount of all (relationship and non-relationship) loans taken by the same borrower during the same time span, is $5.1/14.6 = 0.35$. In a similar vein, $REL^{\#}_{2004}$, which is the ratio of the number of relationship loans taken by International Paper Co. from January 1, 1999 to December 31, 2003 to the total number of loans taken by the same borrower for the same period, is $4/9 = 0.44$.

References

Abadie, A. and G.W. Imbens, 2011, "Bias-Corrected Matching Estimators for Average Treatment Effects," *Journal of Business & Economic Statistics* 29, 1–11.

Almeida, H. and M. Campello, 2007, "Financial Constraints, Asset Tangibility, and Corporate Investment," *Review of Financial Studies* 20, 1429–1460.

Amato, J. and C. Furfine, 2004, "Are Credit Ratings Procyclical?" *Journal of Banking and Finance* 28, 2641–2677.

Berger, A., N.H. Miller, M.A. Petersen, R.G. Rajan, and J.C. Stein, 2005, "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks," *Journal of Financial Economics* 76, 237–269.

Berger, A. and G. Udell, 1995, "Relationship Lending and Lines of Credit in Small Firm Finance," *Journal of Business* 68, 351–381.

Berger, P., E. Ofek, and I. Swary, 1996, "Investor Valuation of the Abandonment Option," *Journal of Financial Economics* 42, 257–287.

Bharath, S., S. Dahiya, A. Saunders, and A. Srinivasan, 2011, "Lending Relationships and Loan Contract Terms," *Review of Financial Studies* 24, 1141–1203.

Blume, M., F. Lim, E. Marshall, and A. MacKinlay, 1998, "The Declining Credit Quality of US Corporate Debt: Myth or Reality?" *Journal of Finance* 53, 1389–1413.

Boot, A. and A. Thakor, 1994, "Moral Hazard and Secured Lending in an Infinitely Repeated Credit Market Game," *International Economic Review* 35, 899–920.

Calomiris, C.W., C.P. Himmelberg, and P. Wachtel, 1995, "Commercial Paper, Corporate Finance, and the Business Cycle: A Microeconomic Perspective," *Carnegie-Rochester Conference Series on Public Policy* 42, 203–250.

Carey, M. and G. Nini, 2007, "Is the Corporate Loan Market Globally Integrated? A Pricing Puzzle," *Journal of Finance* 62, 2969–3007.

Chava, S. and M. Roberts, 2008, "How Does Financing Impact Investment? The Role of Debt Covenant Violations," *Journal of Finance* 63, 2085–2121.

Coval, J.D. and T.J. Moskowitz, 2001, "The Geography of Investment: Informed Trading and Asset Prices," *Journal of Political Economy* 109, 811–841.

Dahiya, S., A. Saunders, and A. Srinivasan, 2003, "Financial Distress and Bank Lending Relationships," *Journal of Finance*, 58, 375–399.

Degryse, H. and P.V. Cayseele, 2000, "Relationship Lending within a Bank Based System: Evidence from European Small Business Data," *Journal of Financial Intermediation* 9, 90–109.

Easley, D. and M. O'Hara, 2004, "Information and the Cost of Capital," *Journal of Finance* 59, 1553–1583.

Faulkender, M. and M.A. Petersen, 2006, "Does the Source of Capital Affect Capital Structure?" *Review of Financial Studies* 19, 45–79.

Fazzari, S., R.G. Hubbard, and B. Petersen, 1988, "Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity* 1, 141–95.

Fernando, C., A. May, and W. Megginson, 2012, "The Value of Investment Banking Relationships: Evidence from the Collapse of Lehman Brothers," *Journal of Finance* 67, 235–270.

Gertler, M. and S. Gilchrist, 1994, "Monetary Policy, Business Cycles and the Behavior of Small Manufacturing Firms," *Quarterly Journal of Economics* 109, 309–340.

Goldfeld, S.M. and R.F. Quandt, 1976, "Techniques for Estimating Switching Regressions," in S. Goldfeld and R. Quandt, Eds., *Studies in Non-Linear Estimation*, Cambridge, FL, Ballinger Publishing Company, 3–36.

Greenbaum, S.I., G. Kanatas, and I. Venezia, 1989, "Equilibrium Loan Pricing Under the Bank-Client Relationship," *Journal of Banking and Finance* 13, 221–235.

Greene, W., 2003, *Econometric Analysis*, New York, NY, Pearson Publishing.

Heckman, J., 1979, "Sample Selection Bias as a Specification Error," *Econometrica* 47, 153–161.

Hellmann, T., L. Lindsey, and M. Puri, 2008, "Building Relationships Early: Banks in Venture Capital," *review of Financial Studies* 21, 513–541.

Hoshi, T., A. Kashyap, and D. Scharfstein, 1991, "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups," *Quarterly Journal of Economics* 106, 33–60.

Houston, J. and C. James, 1996, "Bank Information Monopolies and the Mix of Private and Public Debt Claims," *Journal of Finance* 51, 1863–1889.

Hovakimian, A., T. Opler, and S. Titman, 2001, "The Debt-Equity Choice," *Journal of Financial and Quantitative Analysis* 36, 1–24.

James, C., 1987, "Some Evidence on the Uniqueness of Bank Loans," *Journal of Financial Economics* 19, 217–235.

Leary, M.T. and M. Roberts, 2005, "Do Firms Rebalance Their Capital Structures?" *Journal of Finance* 60, 2575–2619.

Lemmon, M.L., M. Roberts, and J.F. Zender, 2008, "Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure," *Journal of Finance* 63, 1575–1608.

Lemmon, M. and J. Zender, 2010, "Debt Capacity and Tests of Capital Structure Theories," *Journal of Finance and Quantitative Analysis* 45, 1161–1187.

Lummer, S.L. and J.J. McConnell, 1989, "Further Evidence on the Bank Lending Process and the Capital Market Response to Bank Loan Agreements," *Journal of Financial Economics* 25, 99–122.

Maddala, G.S., 1986, *Limited Dependent and Qualitative Variables in Econometrics*, Cambridge, UK, University Press.

Ongena, S. and D.C. Smith, 2001, "The Duration of Bank Relationships," *Journal of Financial Economics* 61, 449–475.

Pastor, L. and R.F. Stambaugh, 2003, "Liquidity Risk and Expected Stock Returns," *Journal of Political Economy* 111, 642–685.

Petersen, M. and R. Rajan, 1994, "The Benefits of Lending Relationships: Evidence from Small Business Data," *Journal of Finance*, 49, 3–37.

Rajan, R., 1992, "Insiders and Outsiders: The Choice Between Informed and Arm's-Length Debt," *Journal of Finance* 47, 1367–1400.

Ramirez, C., 1995, "Did J.P. Morgan's Men Add Liquidity? Corporate Investment, Cash Flow, and Financial Structure at the Turn of the Twentieth Century," *Journal of Finance* 50, 661–678.

Rosenbaum, P. and D. Rubin, 1983, "The Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika* 70, 41–55.

Rosenbaum, P. and D. Rubin, 1985, "Constructing a Control Group Using Multivariate Matched Sampling Methods That Incorporate the Propensity Score," *American Statistician* 39, 33–38.

Sharpe, S., 1990, "Asymmetric Information, Bank Lending and Implicit Contracts: A Stylized Model of Customer Relationships," *Journal of Finance* 45, 1069–1087.

Strebulaev, I., 2007, "Do Tests of Capital Structure Theory Mean What They Say?" *Journal of Finance* 62, 1747–1787.

Titman, S. and R. Wessels, 1988, "The Determinants of Capital Structure Choice," *Journal of Finance* 43, 1–19.

Whited, T.M., 1992, "Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data," *Journal of Finance* 47, 1425–1460.