<u>Online Appendix for</u>

Networking Behind the Scenes: Institutional Cross-industry Holdings and Corporate Loan Markets

Jie (Jack) He, Lantian Liang, Hui (Grace) Wang, and Han Xia

Appendix I: Variable definition

Dependent variable:
LoanSpread: "all-in-spread-drawn" (AISD), which equals the coupon spread over LIBOR on the drawn amount plus the annual fee (in basis points).
Total cost-of-borrowing (*TCB*): An alternative measure of the cost of loans that accounts for both fees and loan spreads. The *TCB* measure is obtained from Berg, Saunders, and Steffen (2016).

Key Independent variables:
HoldBank ($HoldBank^{HIGH}$): An indicator variable that equals one if the borrower shares high-stake blockholders with outside banks (that have not served as the lead lenders of the borrower's loans in the past five years) during the quarter immediately prior to the loan origination (i.e., the pre-loan quarter); it equals zero if the borrower does not share any blockholders with outside banks. A high-stake blockholder is one whose blocks in the borrower and the outside banks are both among the top 20 blockholdings of the institution.
$HoldBank^{LOW}$: An indicator variable that equals one if the borrower shares low-stake blockholders with outside banks (that have not served as the lead lenders of the borrower's loans in the past five years) during the quarter immediately prior to the loan origination (i.e., the pre-loan quarter); it equals zero if the borrower does not share any blockholders with outside banks. A low-stake blockholder is one whose blocks in the borrower or the outside banks are below the top 20 blockholdings of the institution.

Firm Characteristics
LnAsset: The natural logarithm of total assets (in millions) of the borrower at the nearest fiscal year end prior to the loan origination.
Leverage: The sum of the borrower's long-term debt and current liabilities at the nearest fiscal year end prior to the loan origination divided by its beginning-of-year total assets.
Tangibility: The borrower's property, plant, and equipment (PP&E) at the nearest fiscal year end prior to the loan origination divided by its beginning-of-year total assets.
ProfitMargin: The borrower's earnings before interest, taxes, and depreciation (EBITDA) divided by its sales over the nearest fiscal year prior to the loan origination.
MarketBook: The borrower's market value of equity divided by book value of equity at the nearest fiscal year end prior to the loan origination.
IntCoverage: The natural logarithm of one plus the borrower's earnings before interest, taxes, and depreciation (EBITDA) divided by its total interest expense over the nearest fiscal year prior to the loan origination.

CurrentRatio: The borrower's current assets divided by current liabilities at the nearest fiscal year end prior to the loan origination.
Block: The natural logarithm of one plus the number of institutional blockholders of the borrower during the pre-loan quarter.
InstOwn: The total percentage ownership by all institutional investors of the borrower during the pre-loan quarter.

Loan Characteristics
Maturity: The natural logarithm of the loan maturity in years.
Secured: An indicator variable that equals one if a loan is secured by collateral, and zero otherwise.
DivRestriction: An indicator variable that equals one if the borrower is restricted from paying dividends to its shareholders, and zero otherwise.
LnNumLead: The natural logarithm of the number of lead lenders in a loan syndication.
LoanSize/Assets: The total amount of loans that a firm borrows from either the treatment bank or the control "bank" in a given year, scaled by the total assets of the borrower at the nearest fiscal year end prior to the loan origination.
LnCovenant: The natural logarithm of one plus the total number of financial covenants in the loan contract.
CovStrictness: Expected likelihood of covenant violation. The *CovStrictness* measure is obtained from Demerjian and Owens (2016).

Relationship Characteristics
CommonOwn: An indicator variable that equals one if the borrower and the current lender(s) of the loan share the same institutional blockholder during the pre-loan quarter, and zero otherwise.
Relationship: An indicator variable that equals one if any of the current lead lender(s) of the loan served as a lead lender to the borrower over the past five years prior to the loan origination, and zero otherwise.
LnNumRelBank: The natural logarithm of one plus the number of banks that a firm borrowed from over the past five years prior to the loan origination.

Institution Characteristics
LnInstSize: The natural logarithm of an average institutional investor's size in terms of its total market value of equity holdings in $billions.
LnNumIndExpert: The natural logarithm of one plus the number of industry-expert institutional investors, identified as the top 10 institutions in terms of their total dollar equity holdings in a given industry.
LnNumCrossPeer: The natural logarithm of one plus the number of a borrower's same four-digit SIC industry peers that it shares cross-blockholders with during the pre-loan quarter.

Appendix II: Additional Tables

Table A1: Excluding loans originated prior to 1996

This table reports robustness test of Table 2, excluding loans originated prior to 1996 as reported in DealScan. Definitions of all variables are in Online Appendix I. Each regression has a separate intercept. Standard errors are double clustered by borrower industry and year. *T*-statistics are reported in parentheses. Within R-squared is reported for each regression. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dep. Var.	*LoanSpread*			
	(1)	(2)	(3)	(4)
HoldBank (d)	-20.695***	-12.266**	-20.062***	-12.390**
	(-3.727)	(-2.292)	(-3.346)	(-2.209)
Relationship Controls	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES
Loan Controls	NO	YES	NO	YES
Institution Controls	NO	YES	NO	YES
Industry FE	YES	YES	NO	NO
Deal Year FE	YES	YES	NO	NO
Lead lender FE	YES	YES	YES	YES
Loan Purpose FE	NO	YES	NO	YES
Industry*Year FE	NO	NO	YES	YES
Observations	4,590	4,590	4,424	4,424
R-Squared	0.438	0.517	0.379	0.466

Table A2. Baseline regression based on low-stake blockholders

This table reports the OLS regression results of the alternative sample that includes loans from borrowers that either share low-stake blockholders with outside banks (*HoldBank*^{LOW}=1) or do not share any blockholders with outside banks (the benchmark) during 1990-2012. Definitions of all variables are in Online Appendix I. Each regression has a separate intercept. Standard errors are double clustered by borrower industry and year. *T*-statistics are reported in parentheses. Within R-squared is reported for each regression. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dep. Var.	*LoanSpread*			
	(1)	(2)	(3)	(4)
HoldBank^{LOW} *(d)*	-10.773***	-9.377**	-10.579***	-9.493**
	(-2.946)	(-2.382)	(-2.737)	(-2.255)
Relationship Controls	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES
Loan Controls	NO	YES	NO	YES
Institution Controls	NO	YES	NO	YES
Industry FE	YES	YES	NO	NO
Deal Year FE	YES	YES	NO	NO
Lead lender FE	YES	YES	YES	YES
Loan Purpose FE	NO	YES	NO	YES
Industry*Year FE	NO	NO	YES	YES
Observations	11,171	11,171	10,996	10,996
R-Squared	0.415	0.485	0.348	0.425

Table A3. Diagnostic tests of propensity score matching for difference-in-differences analysis

Panels A and B report the means of the matching variables for the treatment and control firms, along with the *t*-statistics testing their differences, before and after the propensity score matching respectively. The treatment and control firms are identified in the same way as in Table 4. The propensity score matching method is described in Section 4.2.2. *T*-statistics and *p* values testing the differences of each variable between the treatment and control firms are reported in the last two columns.

Panel A: Mean differences before matching

Var.	Treatment	Control	Difference	*T*-statistics of differences in means	*P* value of differences in means
TotalInstHolding	0.552	0.759	-0.207	-9.317	<0.001
Block	1.000	1.000	0	<0.001	1.000
Asset	2.221	3.048	-0.827	-1.351	0.177
Leverage	0.469	0.383	0.086	3.170	0.002
Tangibility	0.329	0.302	0.028	1.270	0.204
ProfitMargin	0.010	0.104	-0.094	-1.683	0.093
MarketBook	1.846	1.608	0.238	2.335	0.020
IntCoverage	3.922	4.861	-0.939	-6.106	<0.001
CurrentRatio	2.188	2.103	0.085	0.618	0.537

Panel B: Mean differences after matching

Var.	Treatment	Control	Difference	*T*-statistics of differences in means	*P* value of differences in means
TotalInstHolding	0.572	0.582	-0.010	-0.337	0.736
Block	1.000	1.000	0	<0.001	1.000
Asset	2.117	3.027	-0.911	-1.374	0.171
Leverage	0.464	0.414	0.051	1.366	0.173
Tangibility	0.345	0.364	-0.019	-0.698	0.486
ProfitMargin	0.140	0.149	-0.009	-0.633	0.528
MarketBook	1.675	1.671	0.005	0.041	0.967
IntCoverage	3.923	4.537	-0.614	-2.642	0.009
CurrentRatio	2.011	1.915	0.095	0.630	0.529

Table A4. Additional difference-in-differences tests

This table reports additional DiD analyses. The DiD setting is described in detail in Section 4.2.1. Panel A verifies the premise of the quasi-natural experiment that, following institution mergers, the treatment firms experience a larger expansion in the network with outside banks than the control firms do. The dependent variable is *HoldBank*, denoting whether a borrower shares high-stake institutional blockholders with outside banks. Panel B excludes mergers that took place between 2008 and 2009. Definitions of all other variables are in Online Appendix I. Each regression has a separate intercept. Standard errors are double clustered by borrower industry and year. *T*-statistics are reported in parentheses. Within R-squared is reported for each regression. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: The effect of institution mergers on cross-holding networks

Dep. Var.	*HoldBank (d)*				
	(1)	(2)	(3)	(4)	(5)
Treat × *Post*	0.691***	0.662***	0.488***	0.725***	0.675***
	(9.770)	(8.797)	(5.476)	(9.519)	(9.800)
Treat	-0.725***	-0.703***	-0.526***	-0.725***	-
	(-10.096)	(-9.973)	(-5.680)	(-9.552)	-
Post	-0.008	-0.007	0.001	0.002	-0.012
	(-0.608)	(-0.524)	(0.064)	(1.167)	(-0.670)
Full Set of Controls	NO	YES	YES	YES	YES
Merger*Industry*Year FE	NO	NO	NO	YES	NO
Merger*Industry FE	YES	YES	YES	NO	NO
Merger*Institution FE	NO	NO	YES	NO	NO
Merger*Borrower FE	NO	NO	NO	NO	YES
Year FE	YES	YES	YES	NO	YES
Observations	5,925	5,186	5,186	4,389	4,898
R-squared	0.661	0.646	0.798	0.728	0.632

Panel B: DiD analysis excluding mergers between 2008 and 2009

Dep. Var.	*LoanSpread*				
	(1)	(2)	(3)	(4)	(5)
Treat × *Post*	-41.481***	-32.245***	-26.103***	-25.173*	-28.255**
	(-3.842)	(-3.498)	(-2.580)	(-1.870)	(-2.173)
Treat	17.437	15.262	45.962**	-7.422	-
	(1.261)	(1.166)	(2.092)	(-0.355)	-
Post	25.382**	19.374*	19.049*	31.004**	14.575
	(2.282)	(1.784)	(1.765)	(2.538)	(1.565)
Full Set of Controls	NO	YES	YES	YES	YES
Merger*Industry*Year FE	NO	NO	NO	YES	NO
Merger*Institution FE	NO	NO	YES	NO	NO
Merger*Industry FE	YES	YES	YES	NO	NO
Merger*Borrower FE	NO	NO	NO	NO	YES
Lead lender FE	YES	YES	YES	YES	YES
Deal Year FE	YES	YES	YES	NO	YES
Loan Purpose FE	NO	YES	YES	YES	YES
Observations	1,094	876	876	490	716
R-squared	0.141	0.504	0.512	0.575	0.348

Table A5. Instrumental variable analysis

This table presents the two-stage least squares (2SLS) results of the instrumental variable analysis. Panel A reports the first-stage regression and Panel B reports the second-stage regression corresponding to each column in Panel A. In the first stage, the dependent variable is *HoldBank*, denoting whether the borrower shares high-stake institutional blockholders with outside banks. *HoldBank - Instrumented* is the fitted value of *HoldBank* from the first-stage regression. *Treat* is a dummy that equals one if a firm is a treatment firm, and zero if it is a control firm. *Post* is a dummy to indicate the post-merger period. *Treat* and *Post* are included but not reported in Panel B. Definitions of all other variables are in Online Appendix I. Each regression has a separate intercept. R-squared is suppressed due to a lack of statistical meaning in the context of 2SLS. Standard errors are double clustered by borrower industry and year. *T*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: First-stage regression

Dep. Var.	*Holdbank (d)*				
	(1)	(2)	(3)	(4)	(5)
*Treat*Post*	0.335***	0.329***	0.327***	0.372*	0.285***
	(2.597)	(2.594)	(2.917)	(1.696)	(3.236)
Treat	-0.940***	-0.944***	0.075	-1.017***	-
	(-11.297)	(-12.625)	(0.251)	(-13.796)	-
Post	-0.312**	-0.318**	-0.343*	-0.416	-0.308***
	(-2.199)	(-2.253)	(-1.911)	(-1.480)	(-2.972)
Full Set of Controls	NO	YES	YES	YES	YES
Merger*Industry*Deal year FE	NO	NO	NO	YES	NO
Merger*Institution FE	NO	NO	YES	NO	NO
Merger*Industry FE	YES	YES	YES	NO	NO
Merger*Borrower FE	NO	NO	NO	NO	YES
Lead lender FE	YES	YES	YES	YES	YES
Deal year FE	YES	YES	YES	NO	YES
Loan Purpose FE	NO	YES	YES	YES	YES
Cragg-Donald Wald F Stat	50.561	48.088	45.946	50.114	30.772
Observations	1,833	1,833	1,818	1,353	1,404

Panel B: Second-stage regression

Dep. Var.	*LoanSpread*				
	(1)	(2)	(3)	(4)	(5)
HoldBank (d) - Instrumented	-189.306***	-146.536***	-105.688**	-103.025*	-101.666**
	(-2.958)	(-2.756)	(-2.300)	(-1.854)	(-1.996)
Full Set of Controls	NO	YES	YES	YES	YES
Merger*Industry*Deal year FE	NO	NO	NO	YES	NO
Merger*Industry FE	YES	YES	YES	NO	NO
Merger*Institution FE	NO	NO	YES	NO	NO
Merger*Borrower FE	NO	NO	NO	NO	YES
Lead lender FE	YES	YES	YES	YES	YES
Deal year FE	YES	YES	YES	NO	YES
Loan Purpose FE	NO	YES	YES	YES	YES
Observations	1,833	1,833	1,818	1,353	1,404

Table A6. Cross-holding institutions as banks

This table reports results for cases in which all high-stake cross-holding institutions that a borrower shares with outside banks are also banks (i.e., institutions *I* belong to bank holding companies). Such cases are compared with the case when a borrower does not share any cross-holding institutions with outside banks (*HoldBank*=0). The detailed setting is described in Section 6. Each regression includes a separate intercept. Standard errors are double clustered by borrower industry and year. T-statistics are reported in parentheses. Within R-squared is reported for each regression. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dep. Var.	*LoanSpread*			
	(1)	(2)	(3)	(4)
HoldBank (d)	-16.265**	-11.285	-22.156**	-16.810*
	(-2.024)	(-1.553)	(-2.144)	(-1.743)
Relationship Controls	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES
Loan Controls	NO	YES	NO	YES
Institution Controls	NO	YES	NO	YES
Industry FE	YES	YES	NO	NO
Deal Year FE	YES	YES	NO	NO
Lead lender FE	YES	YES	YES	YES
Loan Purpose FE	NO	YES	NO	YES
Industry*Year FE	NO	NO	YES	YES
Observations	3,076	3,076	2,827	2,827
R-Squared	0.421	0.496	0.368	0.455

Table A7. Relative importance of holdings in the borrower versus in the outside banks

This table reports the effect of cross-holding networks on loan spreads using modified definitions for *HoldBank*. In columns (1) and (2), *HoldBank* equals one if the cross-holding institutions hold high stakes in a borrower (whose equity block is among the top 20 blockholdings of the institution), and any stakes (any blocks) in outside banks; it equals zero if a borrower does not share cross-holding institutions with outside banks. In columns (3) and (4), *HoldBank* equals one if the cross-holding institutions hold high stakes in outside banks (whose equity block is among the top 20 blockholdings of the institution), and any stakes (any blocks) in a borrower; it equals zero if a borrower does not share cross-holding institutions with outside banks. Each regression includes a separate intercept. Standard errors are double clustered by borrower industry and year. *T*-statistics are reported in parentheses. Within R-squared is reported for each regression. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dep. Var.	*LoanSpread*			
	High stakes in borrower		High stakes in outside banks	
	(1)	(2)	(3)	(4)
HoldBank (d)	-13.492***	-11.836**	-8.591*	-8.625*
	(-2.593)	(-2.006)	(-1.921)	(-1.808)
Relationship Controls	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES
Loan Controls	YES	YES	YES	YES
Institution Controls	YES	YES	YES	YES
Industry FE	YES	NO	YES	NO
Deal Year FE	YES	NO	YES	NO
Lead lender FE	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES
Industry*Year FE	NO	YES	NO	YES
Observations	4,083	3,818	8,047	7,842
R-squared	0.515	0.463	0.489	0.422

Table A8: Other loan terms and cross-holding networks

This table reports the OLS regression results of loan contract strictness and maturity on cross-holding networks. Columns (1) and (2) report the regression results for loan contract strictness. The dependent variable, *CovStrictness*, is obtained from Demerjian and Owens (2016) and calculated based on the methodology of Murfin (2012). Columns (3) and (4) report the regression results for loan maturity. *Maturity* is defined as the natural logarithm of loan maturity in years. Definitions of all other variables are in Online Appendix I. Each regression includes a separate intercept. Standard errors are double clustered by borrower industry and year. *T*-statistics are reported in parentheses. Within R-squared is reported for each regression. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dep. Var.	*CovStrictness*		*Maturity*	
	(1)	(2)	(3)	(4)
HoldBank (d)	-0.040***	-0.052***	0.006	0.015
	(-2.662)	(-2.896)	(0.268)	(0.622)
Relationship Controls	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES
Loan Controls	YES	YES	YES	YES
Institution Controls	YES	YES	YES	YES
Industry FE	YES	NO	YES	NO
Deal Year FE	YES	NO	YES	NO
Lead lender FE	YES	YES	YES	YES
Loan Purpose FE	YES	YES	YES	YES
Industry*Year FE	NO	YES	NO	YES
Observations	2,847	2,633	5,869	5,642
R-squared	0.301	0.285	0.289	0.176

Appendix III. Example of the Signature Page of a Credit Agreement

The title of the banker is highlighted with the red circle. The names of the banker, firm, and the firm executive, are removed to protect privacy.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed by their respective authorized officers as of the day and year first above written.

BORROWERS:

[redacted] LLC

By: /S/P[redacted]P J. L[redacted]

Name: P[redacted]p J. L[redacted]

Title: Vice President & Treasurer

LENDERS:

BANK OF AMERICA, N.A.,

as a Lender and Swing Line Lender

By: /S/M[redacted] M[redacted]

Name: M[redacted] M[redacted]

Title: Director

Appendix IV. Description of the Credit Committee of a Bank

The name of the bank is removed to protect privacy.

Purpose

The primary purpose and responsibilities of the Credit Committee (the "Committee") of the Board of Directors (the "Board") of [redacted] Bank (the "Company") are to:

(1) oversee the credit and lending strategies and objectives of the Company;

(2) oversee the credit risk management of the Company as it relates to the lending, loan review, and credit administration functions and the organizational effectiveness thereof, including internal credit policies, portfolio limits, portfolio data, analytics and trends, and stress testing, including but not limited to past due and non-performing loans, TDRs, policy exceptions, sensitivity analysis, concentrations, risk rating analysis, and portfolio reporting;

(3) review the quality and performance of all segments of the Company's credit portfolio; and

(4) review and approve credits as specified in the applicable loan approval policies.

Composition

The Committee shall consist of at least three directors. To the extent possible, the Board shall ensure that a majority of the members of the Committee shall meet the independence requirements as set forth in the Listing Rules of The NASDAQ Stock Market ("NASDAQ"), as they may be amended from time to time.

At the discretion of the Committee, the Chairman, the Chief Executive Officer, and/or other directors may attend meetings in an advisory, non-voting capacity. The Credit Committee may invite other members of management to its meetings as it deems appropriate. The participation of the Executive Chairman, the CEO, and other management personnel in Credit Committee meetings shall be limited to providing information to the Credit Committee.

The Board of Directors, based on the recommendation of the Nominating and Corporate Governance Committee, shall appoint the members of the Committee, and shall appoint the chairperson and any vice chairperson of the Committee. The members of the Committee shall serve for a term of three years or until their successors shall be appointed and qualified. No member of the Committee shall be removed except by majority vote of the full Board. The Board shall have the authority to fill vacancies or add additional members to the Committee.

The chairperson shall be responsible for the leadership of the Committee, including overseeing the agenda, presiding over meetings, and reporting to the Board. The Committee shall have the authority to create, and delegate any of its responsibilities to, subcommittees, as the Committee may deem appropriate.

Responsibilities and Duties of the Committee

The Committee shall:

(1) Monitor the performance and quality of the Company's credit portfolio through the review of selected measures of credit quality, stress testing, portfolio concentrations and trends and such other information

as it deems appropriate, including criticized/classified and non-performing assets, loan delinquencies and net charge-offs.

(2) Oversee the administration and effectiveness of, and compliance with, the Company's credit policies through the review of such policies, processes, reports and other information as it deems appropriate, including legal and in-house lending limits, loan approvals, loan quality risk ratings and examination processes, internal and external audits and examinations of the Company's credit processes, and the frequency and reasons for credit policy exceptions.

(3) Review changes to the credit policies proposed by management or initiated by the Committee from time to time, taking into account changes in applicable laws or regulations, or as warranted by changing economic and/or banking conditions, and shall recommend the approval of any such changes to the Board.

(4) Review the Company's credit review process, which shall address, without limitation, asset quality, early recognition of any deteriorating credit situation, quantifying the level of risk in the portfolio, adequacy of documentation, and compliance with applicable regulations and credit policies.

(5) Review and assess the adequacy of the allowance for loan and lease losses with management on at least a quarterly basis, and periodically review the methodology and governance that support management's establishment of the allowance for loan and lease losses.

(6) Review the strategies to develop and achieve the credit and lending goals of the Company, and make appropriate recommendations to the Board.

(7) Review and approve loans required to be submitted to the Board for approval under the Company's loan approval policies, other than Regulation O loans, which are required to be approved by the full Board. Loans to officers, directors, principal shareholders, and their related interests are subject to the Company's loan approval policies, Regulation O Policy, and Related Person Transactions Policy.

(8) Communicate, as appropriate, with the Risk Management Committee to ensure appropriate oversight of credit-related issues.

(9) Review and assess the adequacy of this charter annually. The Committee may recommend amendments to this Charter at any time and submit amendments for approval to the Board.

(10) Review its own performance annually.

(11) Perform such other duties and responsibilities as may be directed by the Board.