

# The Externalities of Information: Lending to Peer Firms

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  - repeated interactions mitigate information frictions
  - lower lending costs: reduce screening and monitoring efforts
  - bank relationships provide beneficial loan terms

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- A unique feature of banks is their superior ability to extract information
  - repeated interactions mitigate information frictions
  - lower lending costs: reduce screening and monitoring efforts
  - bank relationships provide beneficial loan terms
- Meanwhile, banks also accumulate relevant information:
  - the growth potential of firms' industries
  - the conditions about local economy

helps to evaluate similar firms coming from the same industry and area – local peers.

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- Why matter/interesting?
  - better understand how information affects bank lending behavior,
    - Do banks reuse information?
    - Does peer information matter for firms' credit costs?
  - it may have an impact on local financing conditions and economic growth,

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  - diversified loan portfolios can lower bank risk (Diamond, 1984; Boyd and Prescott, 1986).
  
- specification v.s. diversification (Winton, 1999; Acharya et al., 2006)

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- Hard to identify the mechanism is due to previously collected information, instead of
  - local bias (Coval and Moskowitz, 1999)
  - better ability to collect information in some areas, e.g. more bank branches.

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  - better ability to collect information in some areas, e.g. more bank branches.
  
- endogenous matching in lending (Ackerberg and Botticini, 2002)

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- using a firm-bank matched loan data, containing rich information  $\Rightarrow$  to control deposit ratio, concentration risk, etc.
- the banks' various lending patterns allow me to add bank  $\times$  year fixed effect  $\Rightarrow$  help to address the endogeneity in lending,
- I use the financial misconduct records of firm local peers as exogenous shocks to bank information  $\Rightarrow$  identify the role of information .

# Identify the Role of Information

**Identification:** local peers' fraud/misconduct behavior

- it should be exogenous to firms.
- it affects banks' previously collected information,
  - banks feel harder to judge the credibility,
  - become less confident to reuse,
  - hence behave more prudently and put more effort in screening and monitoring.

⇒ This increases the lending costs, hence any beneficial loan terms offered to local peers due to information should be diminished!



## Related Literature

- Information asymmetries in lending
  - Sharpe (1990); Rajan (1992); Petersen (2004)
  - Relationship Lending: Boot and Thakor (1994); Petersen and Rajan (1994); Ongena and Smith (1998); Berlin and Mester (1999); Elyasiani and Goldberg (2004); Bharath et al., (2011).

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- Information/credit quality on costs of credit:
  - Francis et al. (2004, 2005); Bharath et al.(2008); Nini et al (2009); Murfin (2012); Parsons et al. (2014)

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  - ◇ not only firm own, but their local peers' fraud behavior have a negative effect on costs of credit.
- Previous studies shed light on information externalities/spillover in lending:
  - Murfin (2012) find that banks write tighter contracts after suffering other firms' payment defaults.
  - Garmaise and Natividad (2016) shows that the neighbors can obtain more funding because of the increasing supply of firm information.

# Empirical Strategy

# Empirical Specification

Baseline: I estimate the following regression:

$$r_{l,t} = \beta_1 Info_{l,t} + \mathbf{X}'\gamma + \delta_{b,t} + \epsilon_{l,t}, \quad (1)$$

where

- $r_{l,t}$  is the loan rate for loan  $l$  at quarter  $t$ ,

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- $\delta_{b,t}$  is the bank-year fixed effect.
- standard errors are clustered at bank level.

# Endogeneity in Lending

Bank  $\times$  Year Fixed Effect

To illustrate, consider a loan spread equation that writes (omit time index  $t$ )

$$r_l = \beta_1 X_b + \beta_2 Y_f + \beta_3 Z_{l,(b,f)} + \theta L_l + \varepsilon_l, \quad (2)$$

$$X_b = \tilde{X}_b + \mu_b; Y_f = \tilde{Y}_f + \nu_f; Z_{l,(b,f)} = \text{Info}_l + \omega_{l,(b,f)}. \quad (3)$$

where

- $X_b$  and  $Y_f$  are bank and firm characteristics which we can only observe partially by  $\tilde{X}_b$  and  $\tilde{Y}_f$ , such as size, credit rating, etc.
- $Z_{l,(b,f)}$  is bank  $b$ 's information of firm  $f$ , which is proxied by  $\text{Info}_l$

# Endogeneity in Lending

Bank  $\times$  Year Fixed Effect

Substituting these equations into Equation (2), we can obtain

$$r_l = \beta_1(\tilde{X}_b + \mu_b) + \beta_2(\tilde{Y}_f + \nu_f) + \beta_3(\text{Info}_l + \omega_{l,(b,f)}) + \theta L_l + \varepsilon_l. \quad (4)$$

- As banks and firms choose each other based on certain characteristics,  $\text{Cov}(\tilde{Y}_f, \mu_b)$  or  $\text{Cov}(\nu_f, \mu_b)$  is unlikely to be 0  $\Rightarrow$  Endogeneity!

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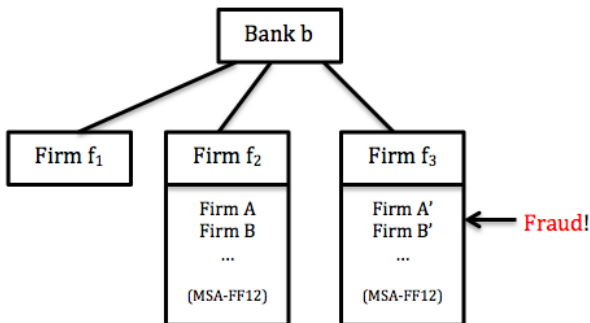
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- As banks and firms choose each other based on certain characteristics,  $\text{Cov}(\tilde{Y}_f, \mu_b)$  or  $\text{Cov}(\nu_f, \mu_b)$  is unlikely to be 0  $\Rightarrow$  Endogeneity!
- One way to solve the problem is to add bank  $\times$  year fixed effect to wash out  $\mu_b$ .
  - on average, a bank lend to 79 (median 65) MSA and 234 (median 183) local peer groups.

# Empirical Strategy

Assume bank  $b$  lend to identical firm  $f_1$ ,  $f_2$ , and  $f_3$ , comparing the loans rates offered to

- $f_1$  and  $f_2$ : does local peer loans cheaper?
- $f_1$  and  $f_3$ : does information play a role?
  - $f_3$  local peers committed fraud in last period,
  - making banks' information deteriorate.



# Data and Sample



# Data source

- Loan Pricing Corporations (LPC) DealScan
- Firm fraud/misconduct: Securities Class Action Clearinghouse (SCAC)
  - It covers all securities class actions filed in Federal Court, after the Private Securities Litigation Reform Act of 1995 came into effect.
  - in total, more than 4000 securities filled.
- Other firm information
  - CRSP-Compustat merged
  - Text-based Network Industry Classifications (TNIC) (Hoberg and Phillips (2016)): firm-pair similarities.
- Federal Deposit Insurance Corporation (FDIC): bank branch-level information

# Sample Construction

- for each loan, I add borrower and bank information
  - borrower: DealScan-Compustat Link (Chava and Roberts (2008))
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- Criteria:
  - exclude the loans to financial companies
  - restrict to the dollar-denominated loans syndicated in the US
  - both the borrowers and lenders are located in the US
  - focus on lead arranger(s) rather than participants

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  - both the borrowers and lenders are located in the US
  - focus on lead arranger(s) rather than participants
- from 1996-2012.

## Variable Construction

- $LocalPeer_{l,t}$ : =1 if at least a lead bank lent to firm  $f$ 's local peers in previous 3 years,
  - the same MSA and Fama-French 12 industries

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- $LocalPeer_{l,t}$ : =1 if at least a lead bank lent to firm  $f$ 's local peers in previous 3 years,
  - the same MSA and Fama-French 12 industries
- Information proxies:
  - $Info^1$ : total number of loans bank  $b$  lent to firm  $f$ ' local peers (group  $s$ ) in past 3 years;

$$Info_{b,s,t}^1 = \log \left( 1 + \sum_{k=1}^3 n_{b,s,t-k} \right), \quad (5)$$

- $Info^2$ : taking firm similarities (TNIC-2) into considerations,

$$Info_{b,f,t}^2 = \sum_{k=1}^3 \left( \sum_{f_2=1}^N score_{f,f_2,t} \times m_{b,f_2,t-k} \right) \quad (6)$$

- transform them into loan level using the average value for loans with multiple lead banks.

# Variable Construction

- Fraud variables
  - $OwnFraud_{f,t}$ : =1 if firm  $f$  filed in SCAC in  $t$ .
  - $PeerFraud_{l,t}$ : =1 if the local peers of firm  $f$ , in the bank's current loan portfolio, filed in SCAC in  $t$ .
- Control variables:
  - $Relloan_{l,t}$ : =1 if at least a lead bank lent to firm  $f$  in previous 3 years;
  - Deposit ratio: ratio of bank branch deposit in each MSA;
  - Concentration Risk: ratio of bank loan portfolio composition for each group of firms;
  - other firm and loan controls  
borrowers' credit rating dummies, log assets, profitability, tangibility, Tobin's Q, current ratio;  
log(maturity), log(amount), collateral and dummies for loan type and purpose

# Summary statistics

- The final sample contains 19,263 facilities and 24,674 firm-bank-loan observations from 1996 to 2012.
- The median loan in the sample is 150 million dollars with a 4-year maturity and 175 bps credit spread.
- There are 660 out of 4,001 (16.5%) firms in the sample ever filed SCAC during 1996 to 2012; most of them only filed once (558).



# Empirical Results:

## I: Lending to Borrowers' Local Peers

# Lending to Borrowers' Local Peers

$$AISD_{l,t} = \beta_1 LocalPeer_{l,t} + \mathbf{X}'\gamma + \delta + \epsilon_{l,t},$$

	Bank-loan Level			Loan Level
	(1)	(2)	(3)	(4)
<i>LocalPeer</i>	-12.607*** (2.098)	-10.552*** (2.117)	-10.783*** (2.063)	-11.241*** (2.480)
Control variables	✓	✓	✓	✓
Year Fixed effect	✓	✓		
Borrower Fixed effect	✓	✓	✓	✓
Bank Fixed effect		✓		
Bank - Year Fixed effect			✓	✓
MSA - Year Fixed effect				✓
Observations	19,654	19,653	19,596	19,199
R-squared	0.755	0.758	0.768	0.812

# Lending to Borrowers' Local Peers

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<i>LocalPeer</i>	-12.607*** (2.098)	-10.552*** (2.117)	-10.783*** (2.063)	-11.241*** (2.480)	-9.340*** (2.653)
Control variables	✓	✓	✓	✓	✓
Year Fixed effect	✓	✓		✓	
Borrower Fixed effect	✓	✓	✓	✓	✓
Bank Fixed effect		✓			
Bank - Year Fixed effect			✓	✓	✓
MSA - Year Fixed effect				✓	✓
Observations	19,654	19,653	19,596	19,199	14,369
R-squared	0.755	0.758	0.768	0.812	0.801

# Lending to Borrowers' Local Peers

$$AISD_{l,t} = \beta_1 LocalPeer_{l,t} + \mathbf{X}'\gamma + \delta + \epsilon_{l,t},$$

	Bank-loan Level			Loan Level	Drop <i>Relloan</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>LocalPeer</i>	-12.607*** (2.098)	-10.552*** (2.117)	-10.783*** (2.063)	-11.241*** (2.480)	-9.340*** (2.653)	-18.013*** (6.412)
Control variables	✓	✓	✓	✓	✓	✓
Year Fixed effect	✓	✓		✓	✓	✓
Borrower Fixed effect	✓	✓	✓	✓	✓	✓
Bank Fixed effect		✓				
Bank - Year Fixed effect			✓	✓	✓	✓
MSA - Year Fixed effect				✓	✓	✓
Observations	19,654	19,653	19,596	19,199	14,369	5,768
R-squared	0.755	0.758	0.768	0.812	0.801	0.867

## Lending to Borrowers' Local Peers

- *LocalPeers* loans have lower loan spreads, after controlling for borrower, bank-year and MSA-year fixed effects.
- On average, a *LocalPeer* loan obtain 10 bps lower loan rate ( $\approx$  \$150,000).
- The results are robust
  - at loan-level.
  - drop relationship; first time to borrow

## Banks' Information and Loan Rates

	Bank-loan Level			
	(1)	(2)	(3)	(4)
<i>Info</i> <sup>1</sup>	-4.668*** (0.987)		-2.924*** (1.037)	
<i>Info</i> <sup>2</sup>		-7.378** (3.236)		-6.184* (3.397)
<i>LocalPeer</i>			-7.985*** (2.819)	-11.091*** (2.536)
Control variables	✓	✓	✓	✓
Borrower Fixed effect	✓	✓	✓	✓
Bank - Year Fixed effect	✓	✓	✓	✓
MSA - Year Fixed effect	✓	✓	✓	✓
Observations	19,199	19,199	19,199	19,199
R-squared	0.811	0.811	0.812	0.812

## Banks' Information and Loan Rates

- A current borrower would get a even lower loan rate if it were more similar to its local peers that its lender once lent to.
- On average, one standard-deviation increase in  $info^1$  ( $info^2$ ) is associated with 6.1 (2.2) bps drop in AISD.
- The results are robust
  - at loan-level.
  - drop relationship; first time to borrow

## Robustness check: IV results

- Banks and firms are not randomly matched,
  - bank  $\times$  year fixed effect should help to eliminate the endogeneity concern to some extent.
  - still a problem if any bank-firm-time variables that is related to firm-features are omitted ( $Cov(\nu_f, \omega_{I(b,f)}) \neq 0$ ).
- IV: nearest distance between a firm and any branch of its bank
  - i should be exogenous to loan rates
  - ii relevant with bank information; banks have better ability to collect reliable information.
- Should be better than using the distance between bank HQ and firms.
  - some regard the distance as a priced factor,
  - firms do not borrow syndicated loans from bank branches.



## Robustness check: IV results

Panel A: Second stage	Bank-loan Level			Loan Level		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>LocalPeer</i>	-81.461** (32.106)			-92.228*** (31.850)		
<i>Info</i> <sup>1</sup>		-33.523** (13.890)			-35.715*** (12.190)	
<i>Info</i> <sup>2</sup>			-328.756* (186.320)			-377.901* (192.612)
Control variables	✓	✓	✓	✓	✓	✓
Borrower Fixed effect	✓	✓	✓	✓	✓	✓
Bank - Year Fixed effect	✓	✓	✓	✓	✓	✓
MSA - Year Fixed effect	✓	✓	✓	✓	✓	✓
Observations	18,774	18,774	18,774	14,076	14,076	14,076
R-squared	0.802	0.804	0.755	0.787	0.792	0.727
F	21.26	27.65	6.567	24.97	54.09	8.216
Panel B: First stage						
	<i>LocalPeer</i>	<i>Info</i> <sup>1</sup>	<i>Info</i> <sup>2</sup>	<i>LocalPeer</i>	<i>Info</i> <sup>1</sup>	<i>Info</i> <sup>2</sup>
log(1 + distance)	-0.021*** (0.004)	-0.050*** (0.009)	-0.005** (0.002)	-0.030*** (0.006)	-0.076*** (0.010)	-0.007*** (0.003)
Observations	18,774	18,774	18,774	14,076	14,076	14,076
R-squared	0.833	0.898	0.816	0.829	0.901	0.823

## Robustness check: IV results

- The first stage is strongly negative in each specification: closer distance  $\Rightarrow$  more information.
- The second results suggest an even larger reduction in loan spreads for *LocalPeer* loans.

# Identify the Role of Information:

## II: Information Deterioration and Costs of Credit

## Information Deterioration and Costs of Credit

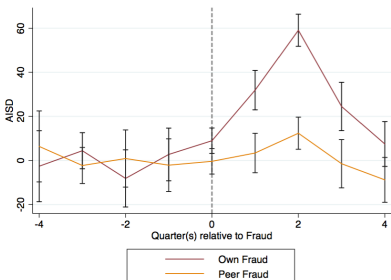
- Fraud or misconduct behavior deteriorates bank information towards the group of firms,
- Therefore, any beneficial loan terms offered to local peers due to information should be diminished.
- First, I explore the time pattern of credit spreads before and after the fraud behavior of firms or their local peers.
  - fraud or misconduct behavior can raise the costs of credit,

# Time Pattern of Fraud

	Own Fraud	Peer Fraud
	(1)	(2)
T-4	-2.607 (19.678)	6.054 (8.240)
T-3	4.421 (8.995)	-3.453 (4.218)
T-2	-8.140* (4.047)	-1.284 (5.995)
T-1	2.724 (8.316)	-3.878 (6.651)
T	8.952 (9.686)	-0.942 (3.410)
T+1	31.902** (12.447)	9.357** (4.261)
T+2	59.064*** (13.690)	18.582*** (4.711)
T+3	24.493 (16.698)	4.206 (6.328)
T+4	7.466 (17.133)	-2.801 (4.251)
Control variables	✓	✓
Borrower Fixed effect	✓	✓
Bank - Year Fixed effect	✓	✓
MSA - Year Fixed effect	✓	✓
Observations	12,523	12,469
R-squared	0.806	0.804

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## Time Pattern of Fraud

- Firms would need to pay 30-60 bps more because of their own fraud behavior.
- Firms would need to pay 10-20 bps more because of their local peers fraud behavior, after controlling for any regional spikes of misconduct (MSA-year FE).
- This suggests a negative spillover of bad information on credit costs.

# Information Deterioration and Costs of Credit

$$AISD_{l,t} = \beta_1 LocalPeer_{l,t} + \beta_2 LocalPeer_{l,t} \times PeerFraud_{l,t-1} + \mathbf{X}'\gamma + \delta + \epsilon_{l,t},$$

	Bank-loan level		Loan level	
	(1)	(2)	(3)	(4)
<i>LocalPeer</i> × <i>PeerFraud</i>	10.232*** (3.148)	11.818*** (2.619)	10.844*** (2.980)	12.211*** (3.731)
<i>LocalPeer</i>	-11.614*** (2.057)	-12.152*** (2.376)	-10.049*** (2.557)	-10.168*** (2.543)
$\beta_1 + \beta_2$	-1.381 (3.647)	-0.334 (4.106)	0.794 (3.376)	2.042 (5.139)
Own Fraud	48.676*** (9.741)	45.163*** (11.303)	41.388*** (10.042)	41.754*** (13.892)
Control variable	✓	✓	✓	✓
Borrower Fixed effect	✓	✓	✓	✓
Bank - Year Fixed effect	✓	✓	✓	✓
MSA - Year Fixed effect		✓		✓
Observations	19,596	19,199	14,908	14,369
R-squared	0.769	0.812	0.761	0.802



# Information Deterioration and Costs of Credit

- The benefit of *LocalPeer* loans **vanishes** if local peers, in banks' current loan portfolio, committed fraud.
- One concern: banks raise loan rates to all borrowers after information deterioration (Murfin, 2012).  
However, this bank-specific variable should be washed out by bank-year fixed effect.

## Negative Spillover in Lending: quantities

- Previously: information deterioration negatively affects the costs of credit.
- Next: explore how it affects the loan quantities.

$$\mathbf{1}(\Delta\text{Aggloan} < 0)_{b,s,t} = \beta_1 \text{PeerFraud}_{b,s,t-1} + \delta + \varepsilon_{b,s,t}, \quad (7)$$

# Negative Spillover in Lending: quantities

	$1(\Delta N < 0)$			$1(\Delta Amount < 0)$
	(1)	(2)	(3)	(4)
<i>PeerFraud</i>	0.041*** (0.006)	0.039*** (0.006)	0.039*** (0.006)	0.036*** (0.008)
Year Fixed effect	✓			
Bank Fixed effect	✓			
MSA - FF12 Fixed effect	✓	✓	✓	✓
Bank - Year Fixed effect		✓	✓	✓
MSA - Year Fixed effect			✓	✓
Industry - Year Fixed effect			✓	✓
Observations	114,913	114,901	114,800	114,800
R-squared	0.047	0.055	0.091	0.096

## Negative Spillover in Lending: quantities

- Banks reduce lending to the group of firms after their local peers had financial misconduct,
- suggesting that financial misconduct can pose negative externalities on local firms in terms of credit availability.

# Conclusion

- This paper presents the evidence that banks would offer lower loans if they lent to similar firms before.
    - Local peers matter for firms' costs of credit.
  - Previously collected information plays a role in the benefit.
  - Local peers' misconduct can pose negative externalities on credit costs as well as loan availability.
    - shows a bias of banks in reusing information.
- ⇒ Information has externalities in lending decision.

# Summary statistics

	<i>LocalPeer</i> Loans				non- <i>LocalPeer</i> Loans			
	N	Mean	Std.dev	Median	N	Mean	Std.dev	median
<b>Panel A: Loan characteristics (Loan-quarter level)</b>								
AISD	10,642	181.4	128.8	162.5	8,673	191.4	133.7	175
Loan facility amount	10,642	445.4	950.5	200	8,673	302.4	672.1	125
Loan maturity (months)	10,273	45.56	22.92	50	8,455	44.93	23.91	48
Collateral	10,642	0.514	0.500	1	8,673	0.553	0.497	1
Revolving Facility	10,642	0.744	0.436	1	8,673	0.716	0.451	1
Term Loan	10,642	0.225	0.418	0	8,673	0.254	0.435	0
Corporate Purpose	10,642	0.344	0.475	0	8,673	0.305	0.460	0
Working Capital	10,642	0.185	0.388	0	8,673	0.178	0.383	0
Debt Repayment	10,642	0.166	0.372	0	8,673	0.192	0.394	0
Takeover	10,642	0.111	0.315	0	8,673	0.132	0.339	0
Lead Arranger Count	10,642	1.377	0.695	1	8,673	1.183	0.477	1
<b>Panel B: Firm characteristics (Firm-quarter level)</b>								
Book Assets (million)	7,486	4,494	8,127	1,161	6,060	3,465	7,237	781.7
ROA	7,106	0.0310	0.0359	0.0322	5,655	0.0307	0.0337	0.0314
Tobin's Q	7,265	1.488	1.139	1.167	5,855	1.451	1.150	1.103
Book leverage	7,272	0.289	0.194	0.274	5,868	0.310	0.197	0.303
Current Ratio	7,296	1.930	1.416	1.626	5,836	1.962	1.435	1.638
Tangibility	7,513	0.303	0.239	0.234	6,071	0.327	0.230	0.274
S&P Long-term rating	7,615	0.541	0.498	1	6,112	0.481	0.500	0
<b>Panel C: other variables (Loan-quarter level)</b>								
<i>Relloan</i>	10,642	0.589	0.492	1	8,673	0.462	0.499	0
<i>Info</i> <sup>1</sup>	10,643	2.160	1.285	1.946	8,673	0	0	0
<i>Info</i> <sup>2</sup>	10,643	0.106	0.296	0	8,673	0	0	0
Concentration Risk	10,642	0.0242	0.0410	0.0136	8,673	0.0228	0.0671	0.00660
Deposit Ratio	10,642	0.113	0.204	0.0306	8,673	0.0265	0.0937	0
<i>lpfraudb</i>	10,642	0.0382	0.192	0	8,673	0.00888	0.0938	0

## Annual SCAC filings

There are 660 out of 4,001 (16.5%) firms in the sample ever filed SCAC during 1996 to 2012; most of them only filed once (558).

Year	Total N of Loans	Fraud	LP Fraud
1996	1,407	2	15
1997	1,828	15	26
1998	1,567	42	103
1999	1,469	38	99
2000	1,436	43	86
2001	1,371	38	96
2002	1,321	80	133
2003	1,164	60	130
2004	1,294	45	105
2005	1,240	32	109
2006	1,040	27	91
2007	1,010	18	57
2008	588	21	64
2009	406	7	30
2010	657	34	76
2011	1,034	27	130
2012	431	9	57
Total	19,263	539	1,407

# Does more information helps in the case of Fraud?

	Bank-loan level			
	(1)	(2)	(3)	(4)
<i>Info</i> <sup>1</sup> × <i>PeerFraud</i>	-2.691 (2.661)		-3.710 (2.334)	
<i>Info</i> <sup>2</sup> × <i>PeerFraud</i>		-8.328 (9.912)		-9.227 (8.896)
<i>Info</i> <sup>1</sup>	-4.753*** (1.136)		-2.621** (1.216)	
<i>Info</i> <sup>2</sup>		-5.663 (4.789)		-4.164 (4.679)
Control <i>LocalPeer</i>			✓	✓
Control variables	✓	✓	✓	✓
Borrower Fixed effect	✓	✓	✓	✓
Bank - Year Fixed effect	✓	✓	✓	✓
MSA - Year Fixed effect		✓		✓
Observations	19,199	19,199	19,199	19,199
R-squared	0.812	0.812	0.812	0.812