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Bank dividends and signaling to information-sensitive depositors ☆

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ABSTRACT

This study investigates whether banks use dividends to signal asset quality and liquidity to their debtholders. We exploit an exogenous shock to the asset opaqueness and perception of risks of Brazilian banks caused by the global financial turmoil of 2008. Our empirical identification takes advantage of the cross-sectional heterogeneity of types of depositors in Brazilian banks and the existence of several owner-managed banks (for which shareholder-targeted signaling is implausible) to identify that information-sensitive depositors (institutional investors) are targets of dividend signaling by banks. These costly signaling efforts are particularly strong during financial crises when asset opaqueness, informational asymmetry and depositors' concerns regarding bank liquidity are exacerbated. From a policy perspective, our results favor the imposition of limits on bank dividends during financial crises, because the banks' need to signal their financial health through dividends during crises intensifies the pro-cyclical effects of bank capital on lending.

1. Introduction

The banking sector is among the industries with the largest payout ratios. Dickens et al. (2002) show that 92% of US banks paid dividends in 2000, compared with only 49% of nonfinancial firms. Nevertheless, banks receive little attention in studies on dividends and are generally excluded from the samples of studies on firm payouts.

Miller and Modigliani (1961) suggest that managers can use dividends to convey information about future earnings. Bhattacharya (1979), Miller and Rock (1985) and others formally model this idea of dividend signaling. Most empirical research on the signaling effect of dividends uses stock price responses to dividend changes, initiations and omissions to gauge the informational content of dividends. Some of these studies focus specifically on banks (e.g., Bessler and Nohel, 2000) and show that stock prices react to dividend information.

This study investigates whether dividends are used by managers to convey information to debtholders. More specifically, we use the exogenous shock to the opaqueness of assets and perception of risk of Brazilian banks arising from the financial turmoil that followed Lehman Brother's demise to investigate whether banks use dividends as a signal to information-sensitive depositors.

Kauko's (2012) model relates bank dividends to funding stability. In this model, dividends are an important source of information for depositors because they signal both profitability and liquidity (i.e., liquid and profitable banks can pay larger dividends than illiquid and unprofitable banks). Depositors are particularly sensitive to bank liquidity during financial crises because of the potential negative effects of bank runs and fire sales. Therefore, banks may decide to increase their dividends to keep depositors calm and to prevent bank runs during periods of financial turmoil. Although Kauko's (2012) model assumes uniform depositors (i.e., all depositors are equally sensitive to information), recent theoretical models and empirical evidence (Huang and Ratnovski, 2011; Oliveira et al., 2015) suggest that wholesale financiers, such as institutional depositors, are both more prone to engaging in runs during periods with high informational asymmetry (asset opaqueness) and more sensitive to information (such as dividend payments) than retail depositors. Ben-David et al. (2012) argue that institutional investors are more reactive to information than other investors because they have internal risk management systems and funding

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requirements that force them to periodically revise their asset allocations. Additionally, institutional investors differ from other depositors in that they are customers of banks on the liabilities side only, affording them a higher degree of freedom to move their resources across banks.

We begin with the observation that, during the acute period of the financial crisis, many Brazilian banks increased their dividends. We find that these banks increased their dividends to signal liquidity and asset quality to information-sensitive depositors (institutional investors) in an attempt to prevent bank runs.

One alternative explanation for such a dividend increase during a financial crisis is that dividends are used as a tool to expropriate debtholders (Easterbrook, 1984). In banks, the incentives for debtholder expropriation are particularly strong if a bank is in impending distress and if its charter value is low – conditions that are more likely to occur during financial crises, as Acharya et al. (2013) note. Because bank deposits are generally demandable, information-sensitive depositors may withdraw their deposits at any sign of expropriation.

Two features of the Brazilian banking system allow for the use of an empirical identification strategy to disentangle the signaling and expropriation hypotheses. First, we explore the heterogeneity of bank funding sources. Brazilian banks may obtain funding from both wholesale and retail financiers. We specifically focus on institutional investors,[1] an important funding source for some Brazilian banks. As of December 2007, the deposits by institutional investors exceeded the value of liquid assets for more than one-third of the banks in Brazil. Preventing a run by these depositors (or stop an ongoing one) is crucial for these banks during periods of tight liquidity.

We find that bank dividends are positively related to the reliance on deposits of institutional investors during normal times, and that this relationship becomes more pronounced during the crisis. More specifically, banks with a high pre-crisis level of funding by institutional depositors increase their payout during the crisis, while other banks decrease their payout.

Because institutional investors are more reactive to new information than other depositors, expropriation of debtholders and violation of the preference of debt over equity in such banks are implausible. Any attempts by banks to expropriate debtholders would be detected by institutional depositors, who could quickly withdraw their funds. Therefore, our results indicate that the increase in dividends is unlikely an attempt to expropriate debtholders, but a costly signaling effort. If banks were engaging in debtholder expropriation, larger dividends would be observed in banks that rely more heavily on information-insensitive debtholders, such as retail depositors.

Second, we can determine whether depositors (and not shareholders) are the targets of dividend signaling by examining domestic banks that are owned and managed by small groups of shareholders (which we refer to as closely held banks). These banks do not have any need to signal information to their shareholders; thus, if signaling efforts are undertaken by these banks, they are likely directed toward debtholders.

To the best of our knowledge, this study is the first to obtain empirical evidence on debtholder-targeted signaling. A clear advantage of our study over previous research is that the dependence on wholesale funding (provided mainly by institutional investors) has not been previously used in bank dividend models. We also use the interest rate paid on freshly issued CDs, which allows us to control for the marginal cost of funding. Previous studies have used proxies for this variable that capture the average (not the marginal) cost of funding. We find a negative relationship between payments of dividends and the cost of funding (i.e., banks with higher cost of capital pay smaller dividends), a finding consistent with the notion that dividends are a costly signal.

Our results have implications for the shareholders and depositors of financial institutions as well as regulators. When informational asymmetry and risk aversion are more pronounced, as they were during the 2008 financial crisis, Brazilian banks maintain or even increase dividend payments, even if they suffer deposit losses (Oliveira et al., 2015). Paying dividends reduces bank equity, and doing so during a financial crisis exacerbates the well-known pro-cyclical characteristic of regulatory capital requirements (Kashyap and Stein, 2004). If banks decrease their target leverage during a crisis, dividend payments imply a further reduction in lending during an economic downturn. Our results support the view that regulators should be able to adopt policies that impose limits on bank dividends during economic downturns, a subject that has been extensively debated by regulators in drafting the third Basel accord.

More generally, our evidence is consistent with the notion that financial markets shape dividend policy, which has long been accepted in the financial literature. However, extant research has focused mainly on the influence of equity markets, whereas our evidence shows that depositors also have a role in shaping bank dividend policy.

Our study is related to the literature on the information content of dividends (Sant and Cowan, 1994; Michaely et al., 1995; Nissim and Ziv, 2001; Koch and Amy, 2004, among others) and the role of financial markets in influencing dividend policy (e.g., Brav et al., 2005; Leary and Michaely, 2011; Michaely and Roberts, 2012). It is also directly related to the literature on bank dividends (Boldin and Leggett, 1995; Bessler and Nohel, 1996; Casey and Dickens, 2000; Dickens et al., 2002). Additionally, this study indirectly concerns the literature on the role of institutional investors and wholesale markets in bank funding (Huang and Ratnovski, 2011; Oliveira et al., 2015) and creditor information demand (e.g., Peek et al., 2010).

The remainder of the paper is organized as follows: Section 2 provides the institutional background and describes our data. Section 3 explains our identification strategy and methodology, and Section 4 reports our results. A final section presents our conclusions.

2. Institutional background and data

2.1. Institutional background and bank ownership

All banks in Brazil are regulated at the federal level by the Central Bank and are required to be incorporated as *Sociedades Anonimas*. According to Brazilian law, *Sociedades Anonimas* are required to pay at least 25% of their adjusted after-tax earnings to shareholders. However, *Sociedades Anonimas* with only a few shareholders (which we call closely held firms) can easily circumvent minimum payout requirements, whereas publicly traded firms cannot.[2]

[1] Institutional investors are investment funds, investment companies, pension funds and insurance companies.

[2] Minimum dividend requirements are circumvented through the following simple maneuver: at a given meeting, shareholders decide to pay dividends and interest on equity and use these payments to increase capital (i.e., the money does not leave the boundaries of the firm, even though financial statements will report dividend payments). This maneuver is transparent to investors (including depositors). Regulators are also well aware of this common practice and do not consider it illegal. Implementing this maneuver is virtually impossible for publicly traded firms because it requires the unanimous approval of voting shareholders. Martins and Novaes (2012) find that some Brazilian publicly traded companies can also exploit loopholes to avoid payments of minimum dividends, but such loopholes are more complex for these firms than for closely held firms, and they can be used only under very special circumstances and only in 1 year. For our purposes, these loopholes are unimportant exceptions.

The Brazilian legal framework allows for a distinctive type of payout to shareholders, called *interest on equity*. Minimum payouts to shareholders may be made by using dividends, interest on equity, or a combination of the two. Dividends are not tax deductible at the firm level and are tax exempt for shareholders. Interest on equity is limited to a fraction of firm equity and, unlike dividends, is deductible from a firm's taxable income, but taxable at the shareholder level. Boulton et al. (2012) suggest that the total amount paid to shareholders in Brazilian firms is not affected by the composition of payouts. In other words, the total amount paid by firms to shareholders is a first-order decision, and the *payout mix* (between dividends and interest on equity) is a second-order decision.

Brazilian regulations require that banks report the controlling shareholder or block of controlling shareholders to the Central Bank. Banks operating in the country are classified by the Central Bank into three groups according to type of control: (1) domestic privately owned banks,[3] (2) governmental banks and (3) foreign banks. We further separate the group of domestic privately owned banks into two subgroups according to ownership structure: (a) closely held and (b) publicly traded.[4]

Closely held banks are controlled by domestic shareholders and are not traded on exchanges. Banks in this group have virtually no minority shareholders, and, whenever they exist, the Central Bank requires a control agreement between majority shareholders and minority shareholders who hold a substantial number of shares. Typically, closely held banks have highly concentrated ownership, with shares belonging to a single shareholder or to a small group of individuals (in many cases, a family) who are also in top management positions or on the board of directors. In most closely held banks, the controlling shareholders hold more than 90% of the voting shares, and the remaining shares are retained by insiders (managers and members of the board).[5] The Central Bank does not allow institutional investors (investment funds and pension funds) to be controlling shareholders (or to have a controlling interest) in banks, and a single institutional investor is generally limited to owning no more than 5% of the voting shares of a bank.

Deposits must be denominated in the local currency, with a few exceptions (deposits in foreign currencies account for less than 2% of total deposits in the financial system). Deposit insurance is mandatory for all banks in Brazil and is provided by the FGC (*Fundo Garantidor de Crédito*), a private non-profit organization. However, insured values are small: deposit insurance covered up to 60,000 BRL (approximately 30,000 USD) per depositor during the majority of our sample period,[6] a figure that did not change during the financial crisis. Therefore, typically only a very small fraction of the deposit of a wholesale financier is insured by the FGC.

2.2. Data and sample construction

We use two main data sources provided by the Central bank of Brazil. The first set of data is available to the public and consists of detailed balance sheets, income and earnings reports and selected regulatory indicators. The second database comprises balances of CDs that are held by institutional investors, non-financial firms and individual investors as well as the annual weighted average interest rates paid on the CDs issued by each bank. All information is annual and spans the period from 2001 to 2009. Following Michaely and Roberts (2012), we exclude subsidiaries of other banks from our sample; thus, we consider only the effective payouts of banks to shareholders and disconsider inter-company dividends. After missing data are excluded, the sample consists of an unbalanced panel of 168 banks covering 9 years and 1237 bank-years.

3. Identification strategy and econometric model

To investigate the extent to which bank funding by information-sensitive depositors affects payout policy, we estimate the following model:

$$\begin{aligned} Payout_{i,t} = {} & \alpha + \beta_1 \times Institutional\,Investors_{i,t} + \beta_2 \times Crisis_t + \beta_3 \\ & \times (Crisis_t \times Institutional\,Investors_{i,t}) + \beta_4 \\ & \times CD\,Interest\,Rates_{i,t} + \beta_5 \times ROA_{i,t} + \beta_6 \times Size_{i,t} + \beta_7 \\ & \times Capital_{i,t-1} + \beta_8 \times Leverage_{i,t-1} + \beta_9 \\ & \times Governmental_{i,t} + \beta_{10} \times Publicly\,Traded_{i,t} + \beta_{11} \\ & \times Foreign\,bank_{i,t} + \beta_{12} \times Loan\,Growth_{i,t} + \beta_{13} \\ & \times Loan\,Risk_{i,t} + \omega' d_t + \varepsilon_{i,t}, \end{aligned} \quad (1)$$

where i and t represent the bank and year, respectively, d_t and $\varepsilon_{i,t}$ represent year dummies and error terms, respectively, and α, βs and ω' are the coefficients to be estimated.

$Payout_{i,t}$ is the payout ratio and is calculated as the sum of dividends, repurchases and interest on equity paid relative to the fiscal year t divided by earnings in the same year.[7] We combine dividends and interest on equity, as Boulton et al. (2012) suggest that the combination of these types of payouts does not affect total cash flows to shareholders. As noted above, actual payouts may differ from the reported payouts because of the maneuver described in Section 2.1 that is commonly used to circumvent minimum dividend requirements. To address this issue, we search for increases in capital in the Statement of Changes in Equity for each period. When dividends are the source of a capital increase, the amount used to increase capital does not leave the boundaries of the firm to reach the pockets of shareholders, indicating the circumvention of the minimum dividend requirement. Therefore, the value of the increase in capital is subtracted from the *reported payout* to determine the *actual payout*. *Actual payout* is 18.9% smaller than *reported payout* on average (and 49.5% smaller if conditioned on the circumvention of the Law). We use the *actual payout* (and not the *reported payout*) in our regressions because the *reported payout* is only an accounting figure, shaped by a legal requirement that can be easily circumvented. The *reported payout* does not have the economic feature that characterizes a signal to investors (cash leaving the firm and reaching the pockets of shareholders). The *actual payout* does have this feature.

[3] We use the term "privately owned" to distinguish these banks from "state-owned" banks, not to imply that these banks are not publicly traded.

[4] There is another group of banks called *cooperative banks*, which account for less than 1.5% of total assets in the banking system. However, these banks are outside the scope of our study because of their particular ownership and operating structure.

[5] Data on minority shareholders are static and available only as of the last filing (December 2009). In addition, shareholders with less than 5% ownership cannot be identified unless they are managers or members of the board (for which ownership must be disclosed regardless of the number of shares owned). We are unable to identify the exact evolution of the ownership structure, except in cases of significant changes, such as an IPO or a transfer of controllership (i.e., a change in the controlling shareholder). We argue that this limitation does not affect our identification and classification of banks for two reasons: (i) we can identify when a bank changes its classification (i.e., changes from one group to another), and (ii) changes in stock ownership of closely held banks are very infrequent.

[6] At the beginning of the sample period, deposit insurance was 20,000 BRL. It was increased to 60,000 BRL in 2005, a period of calm for the financial system.

[7] No precise timing pattern exists for the disclosure and payment of dividends. This information is generally made publicly available in January of year $t+1$, when it is disclosed along with the pro-forma financial statements for the fiscal year t, as required by the Central Bank. Dividends that refer to year t are generally disclosed in January and are paid during the first quarter of year $t+1$. We follow most of the literature in this respect: for example, for the computation of $Payout_{i,2005}$, we use dividends and earnings of bank i relative to 2005 (disclosed and paid in early 2006).

In our robustness tests, we use two alternative measures of firm payout: (i) the percent change in *actual payout*, which captures increases and decreases in cash terms; and (ii) a dummy indicating a payout ratio larger than 40%.

An important characteristic of this variable that directly interferes with the applied estimation method is the fact that the value of dividends is zero in 34.5% of the observations. For this reason, we use a Tobit model.

Institutional investors$_{i,t}$ measures the reliance of bank *i* on funding provided by institutional investors at time *t* (measured by the ratio of the value of CDs issued to institutional investors to total assets).

Crisis$_t$ is a dummy variable that takes a value of 1 for the year 2008 and 0 otherwise (in essence, it is a time dummy to which we give special attention). We follow the definition of Aït-Sahalia et al. (2012), according to which the most acute period of the financial crisis was the period dating from the collapse of Lehman Brothers (September 2008) to mid-2009. Oliveira et al. (2015) also show that by June 2009, the deposits of most Brazilian banks had returned to pre-crisis levels. Therefore, dividends for fiscal year 2009 (paid in early 2010) were paid in a less stressful environment.[8]

The control variables are defined as follows: *CD interest rates*$_{i,t}$ is the weighted average interest rate paid on CDs by bank *i* in year *t*; *ROA*$_{i,t}$ is the return on assets of bank *i* in year *t*; *size* is defined as the natural logarithm of total assets; *capital*$_{i,t}$ is the regulatory capital adequacy ratio; *leverage*$_{i,t}$ is the ratio of liabilities to the book value of equity; *governmental*, *publicly traded* and *foreign* are dummies referring to the type of ownership (*closely held* is the omitted type of ownership); *loan growth*$_{i,t}$ is the percent change in loans of bank *i* from year $t-1$ to year *t*; and *loan risk* is the ratio of nonperforming loans to total loans.

These control variables are traditionally used in previous papers (Mayne, 1980; Rozeff, 1982; Barclay et al., 1995; Nissim and Ziv, 2001; Renneboog and Trojanowski, 2011; Fatemi and Bildik, 2012). The exception is the interest rate paid on freshly issued CDs (*CD interest rates*), which has not been previously used in dividend models. We argue that controlling for the marginal cost of funding is a clear advantage of our study over previous studies. The full list of dependent variables, the rationales for their inclusion and their precise operational definitions are presented in Table 1.

Our main coefficients of interest are β_1 and β_3. β_1 is a measure of the association between dividend payouts and reliance on institutional investors for funding. Since institutional investors are more prone to run in the absence of good news, banks that rely on these types of investors may decide to signal with dividends to keep these information-sensitive depositors calm. Therefore, a positive β_1 suggests that dividends have the purpose of signaling to institutional investors.

Endogeneity problems may arise owing to selection bias if institutional investors' choice of bank is made on the basis of prior information, such as dividend level or bank profitability, which would undermine a causal interpretation of β_1. To address this issue, we also run IV-Tobit models. In these regressions, we use instrumental variables for *institutional investors*, aiming to eliminate the potential endogenous relationship between the level of institutional investors and the payout of each bank. The instruments are past levels of *institutional investors* and the variable *big bank* (see Table 1). Big banks typically have large networks of branches and thus are more likely to use retail deposits than deposits of institutional investors, a characteristic that is arguably unrelated to dividend payouts. Tests of the validity of the instruments show that these variables are valid and that they are not weak instruments.

Table 1
This table describes the regression variables. The first column provides the names of the variables that are used in the econometric model and in the other tables, the second column indicates the expected signs of the coefficients, and the third column provides operational definitions of the variables.

Variable	Expected sign	Description	Operational definition
Size	(+)	Size of bank	Natural logarithm of the assets of the bank
ROA	(+)	Return on assets	Operating income divided by total assets
CD interest rate	(−)	Interest paid on CDs	Weighted average (by volume issued) interest rate paid on freshly issued CDs
Institutional investors	(+)	Percentage of CDs issued to institutional investors	CDs held by institutional investors divided by the total value of CDs issued
Leverage	(+/−)	Bank leverage	Liabilities divided by equity
Capital	(+/−)	Capital adequacy ratio	Equity divided by risk-weighted assets
Publicly traded	(−)	Control for public traded bank	Dummy variable with a value of 1 for publicly traded banks and 0 otherwise
Governmental ownership	(−)	Control for government owned bank	Dummy variable with a value of 1 for government-controlled banks and 0 otherwise
Closely held	(+)	Control for closely held bank	Dummy variable with a value of 1 for closely held banks and 0 otherwise
Subsidiaries of foreign banks	(−)	Control for subsidiaries of foreign banks	Dummy variable with value of 1 for subsidiaries of foreign banks and 0 otherwise
Loan risk	(−)	Risk of loan portfolio	Nonperforming loans divided by total loans
Credit growth	(−)	Growth rate of the loan portfolio	Current loan portfolio minus the portfolio of the previous year divided by the portfolio of the previous year
Crisis dummy	(−)	Dummy for 2008 turmoil	Dummy variable with a value of 1 for 2008 and 0 for other years
Big bank		Control for big banks	Dummy variable with a value of 1 for big banks and 0 otherwise, as defined by Oliveira et al. (2015)

Another potential concern is that other types of wholesale depositors, such as high net-worth individuals and large corporations may also be more sensitive to information than retail depositors.[9] Unfortunately, our data do not allow us to identify other types of wholesale depositors. Therefore, wholesale funding is measured with error. Nevertheless, we argue that this issue does not affect our empirical identification because we do not see any reason why the measurement error should be correlated to the other covariates (and thus bias our estimates of β_1 and β_3). In addition, our IV approach captures wholesale funding more broadly by design and addresses this issue. Finally, institutional investors are arguably the most reactive among wholesale financiers.

The second coefficient of interest, β_3, indicates whether the association between funding by institutional investors and payout changes significantly during the financial crisis (i.e., it captures the

[8] In unreported robustness tests, we also use an alternative definition of the crisis, with the crisis dummy taking a value of 1 for fiscal years 2008 and 2009 and 0 otherwise. We obtain qualitatively similar results.

[9] We thank an anonymous referee for making this point.

Table 2
This table presents descriptive statistics of the dependent variables. Panel A shows the average and standard deviations (in parentheses) of payout ratios by bank type over the years in the sample and the proportions of observations in which the payout ratio is equal to 0, between 0% and 40% or greater than 40% by bank type. Panel B shows the total amount of each form of payout (dividends, interest on equity and share repurchases) across the years.

	Governmental	Foreign	Publicly traded	Closely held	All banks
Panel A: Payout ratio					
2001	0.1081	0.2541	0.2820	0.2661	0.2472
	(0.1617)	(0.4115)	(0.2396)	(0.3543)	(0.3642)
2002	0.1528	0.3394	0.2011	0.3121	0.3061
	(0.1834)	(0.4683)	(0.2384)	(0.3534)	(0.3910)
2003	0.2633	0.2411	0.1733	0.2944	0.2687
	(0.1959)	(0.4316)	(0.1947)	(0.3699)	(0.3803)
2004	0.2472	0.1616	0.3530	0.2508	0.2200
	(0.1716)	(0.3161)	(0.0796)	(0.3248)	(0.3095)
2005	0.3855	0.2250	0.2826	0.2704	0.2645
	(0.3933)	(0.4102)	(0.1055)	(0.3280)	(0.3625)
2006	0.3145	0.1240	0.2445	0.2637	0.2184
	(0.3099)	(0.2065)	(0.2112)	(0.3032)	(0.2787)
2007	0.2438	0.1707	0.2256	0.2310	0.2113
	(0.1858)	(0.3016)	(0.1733)	(0.3313)	(0.3033)
2008	0.2982	0.2259	0.4395	0.3630	0.3182
	(0.1979)	(0.3761)	(0.4481)	(0.4935)	(0.4403)
2009	0.4495	0.2420	0.6308	0.3273	0.3292
	(0.4191)	(0.4794)	(0.5232)	(0.4044)	(0.4481)
All years	0.2863	0.2611	0.3663	0.2236	0.2646
	(0.3660)	(0.2638)	(0.3654)	(0.3911)	(0.3695)
Payout ratio = 0	19.7%	51.6%	10.3%	29.2%	34.5%
0 < payout ratio < 40%	53.5%	19.1%	46.6%	30.6%	32.2%
Payout ratio ⩾ 40%	26.8%	29.3%	43.1%	40.2%	33.3%
Number of observations	126	464	49	598	1237

	Dividends BRL (M)	Interest on equity BRL (M)	Repurchases BRL (M)	Total payout BRL (M)
Panel B: Amount disbursed				
2001	1841	3135	268	5244
2002	8019	3584	230	11,833
2003	5801	7843	358	14,002
2004	5549	7120	157	12,826
2005	8396	11,449	1332	21,177
2006	5487	11,083	68	16,638
2007	11,934	10,049	476	22,459
2008	12,745	12,918	1354	27,017
2009	11,355	13,733	309	25,397

differential effect of institutional investors during the crisis). The 2008 crisis is an exogenous shock to perceptions of risk and asset opaqueness of Brazilian banks. Therefore we argue that the additional partial effect of reliance on institutional investors on dividend payouts during the crisis (β_3) has a causal interpretation and is not subject to endogeneity or selection bias issues.[10] In other words, the informational content of dividends during the crisis is larger than in normal times because of an exogenous shock. This combination is stronger than any instrument. A comprehensive set of robustness checks also ensures the causal interpretation of our findings.

A positive β_3 implies that the differential positive impact of the financial crisis on dividends is larger for banks that rely more heavily on institutional, controlling for other features. Such a result would support the signaling hypothesis rather than the expropriation hypothesis. If banks were increasing their dividends to engage in debtholder expropriation, larger dividends would be observed in banks with depositors that would not react to this information by withdrawing (i.e., banks with relatively fewer institutional depositors).

A potential confounding effect may arise if equity markets shape the dividend policies of publicly traded banks and if such banks were to exhibit an increased propensity to rely on the deposits of institutional investors. In this case, a positive β_3 may reflect shareholder-targeted signaling during the crisis. To further investigate the debtholder-signaling hypothesis and avoid any confounding effects, we examine closely held banks, because such banks have no reason to engage into a costly signaling effort to shareholders. Therefore, if such banks are engaging in signaling, it is directed toward debtholders. Second, closely held Brazilian banks can easily circumvent the legal minimum dividend requirements, whereas publicly traded banks cannot. These combined features allow us to conclude that dividends that are paid by closely held banks are not due to legal requirements nor they are a signal to shareholders.[11]

4. Results

4.1. Descriptive statistics

Table 2, Panel A, shows payout ratios by type of bank and year. On average, all bank types increased their payout ratios for fiscal year 2008 (the crisis year) relative to the previous year. The total amount of cash distributed for fiscal year 2008 is also the largest

[10] We also test for possible selection bias exhibited by institutional investors in their choice of banks. See our robustness tests.

[11] Note that there is no reason to expect the results to be stronger for closely held banks. These banks are important for our identification because they are not subject to minimum dividend requirements and shareholder-targeted signaling is implausible in these banks. Therefore, our results for this group of banks are not influenced by these possible confounding effects.

Table 3
This table presents the mean and median (in brackets) values of the explanatory variables in the regressions. The column *institutional investors* indicates the total value of CDs issued to institutional investors as a percentage of total CDs issued, *ROA* is return on assets, *size* is total assets in BRL millions, *leverage* is liabilities divided by equity, *capital adequacy ratio* is regulatory capital divided by risk-weighted assets (as provided by the Central bank of Brazil), *credit risk* is nonperforming loans divided by total loans, and *credit growth* is the growth rate of the loan portfolio.

Type of bank	Institutional investors	ROA (%)	Size BRL (M)	Leverage	Capital adequacy ratio	Loans risk	Growth in loans
Closely held	27.10	4.04	6,318	5.22	0.33	0.05	0.43
	(7.27)	(3.24)	(552)	(3.29)	(0.23)	(0.03)	(0.16)
Governmental	9.49	2.56	44,000	9.77	0.21	0.08	0.15
	(1.59)	(2.45)	(4209)	(8.41)	(0.11)	(0.07)	(0.16)
Public traded	40.01	4.99	57,417	5.55	0.30	0.03	0.58
	(41.42)	(3.18)	(7091)	(5.30)	(0.16)	(0.03)	(0.22)
Foreign	23.00	2.78	7190	6.19	0.27	0.04	0.41
	(0.00)	(2.07)	(1486)	(4.97)	(0.17)	(0.02)	(0.12)

for any year in the sample, as shown in Panel B. The combined value of dividends and interest on equity distributed by the banks in our sample is nearly stable from fiscal year 2008 to 2009, which suggests that managers are reluctant to decrease payout during turbulent times, as a smaller payout could be interpreted as a sign of financial distress.

Foreign banks, followed by closely held banks, are characterized by the highest proportion of observations of payouts equal to 0%, indicating that banks with few shareholders can circumvent minimum dividend requirements (in fact, foreign banks typically have a single shareholder and can easily circumvent minimum dividend requirements). Further, governmental and publicly traded banks have the highest frequency of payouts between 0% and 40%. Finally, unlike in the US, repurchases represent a minimal fraction of payout.

Table 3 presents descriptive statistics for the independent variables by bank group. Closely held and publicly traded banks rely more heavily on institutional investors (27% and 40%, respectively) on average, although the distribution for closely held banks is quite asymmetric (the median is 7%, which indicates substantial cross-sectional heterogeneity). Some other facts (unreported) are worth noting: (i) the 75th percentile for *institutional investors* is 50.1%, meaning that, for one quarter of the banks in the sample, at least half of the deposits come from institutional investors; (ii) as of December 2007, funding by institutional investors exceeded the book value of equity for more than 40% of the banks in the sample; (iii) for 10% of the banks in the sample, the amount of deposits of institutional investors are more than double the amount of liquid assets, meaning that a run by institutional depositors would have a drastic negative effect to bank liquidity.

Table 3 also shows that governmental and foreign banks are substantially less profitable than their domestic privately owned counterparts: the ROAs of closely held and publicly traded banks are quite similar (4% and 5%, respectively), whereas the ROAs of governmental and foreign banks are only 2.5% and 2.8%, respectively. Governmental and publicly traded banks are larger than closely held and foreign banks. In addition, governmental banks have almost double the leverage of their counterparts and, consequently, lower capital adequacy ratios. The loan portfolios of governmental banks also grew more slowly on average than those of their peers during the sample period.

To describe the effect of institutional depositors on payout, we split the sample into two groups: (i) banks that issued CDs to institutional investors (banks that rely on institutional depositors) during the year immediately prior to the crisis (December 2007) and (ii) banks that did not issue CDs to institutional investors during the same period (banks that do not rely on institutional investors). Fig. 1 shows that banks in group (i) pay larger dividends on average than banks in the other group during the sample period. From 2001 to 2007, the payout ratios show similar trends. The average payout ratio for banks in group (i) increases dramatically in 2008 (relative to 2007), whereas the average payout ratio for banks in group (ii) increases only slightly in 2008. This evidence is consistent with the story that banks relying on institutional depositors have greater signaling needs than banks that do not rely on these depositors, and that this difference increases during the financial turmoil.

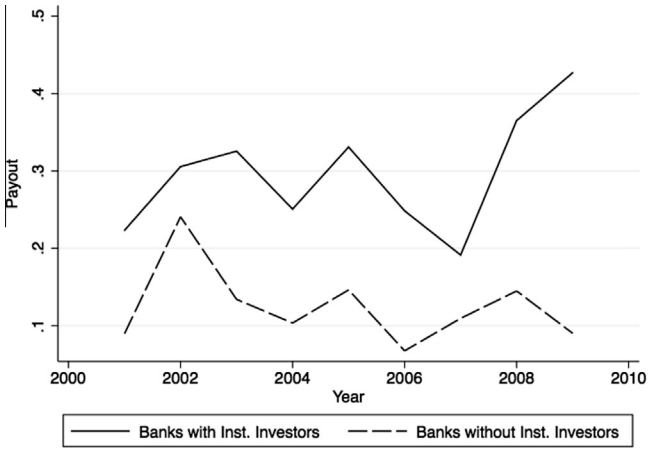

Fig. 1. Evolution of the payout ratio. The dashed line shows the evolution of the average payout ratio for banks that have not issued any certificates of deposits (CDs) to institutional investors as of December 2007, and the solid line shows the average payout ratio for banks that have issued any amount of CDs to institutional investors as of the same date. *Source:* Authors.

In unreported tests, we also find that the average standard deviation of the percent change in earnings is somewhat larger for closely held banks than for publicly traded banks and that the frequency of large changes in the payout ratio is greater for closely held banks than for publicly traded banks. Closely held banks are also more likely to omit dividends. These results are consistent with those of Michaely and Roberts (2012), who find that equity markets play a role in smoothing dividends. The results also suggest that dividends are not simply a smooth wage channel for manager-owners.

4.2. Regression results

Table 4 presents the results of the estimation of Eq. (1), and column (1) shows the results of a pooled Tobit estimation. The coefficient β_1 indicates that for a 1 percentage point increase in the share of assets funded by CDs held by institutional investors, banks increase the payout ratio by 0.15 percentage points during normal times. This relationship is stronger during the crisis: the coefficient β_3 for the interaction variable indicates that a 1 percentage point increase in *institutional investors* during the 2008 crisis causes the expected payout ratio to increase by an additional 0.68 percentage points above the 0.15 percentage points due to β_1.

Table 4
This table presents the regression results for the estimation of the main model described in Section 3.

	Expected sign	P-Tobit All banks	(2) IV-Tobit All banks	(3) P-Tobit Closely held	(4) P-Tobit Other banks	(5) P-Tobit placebo crisis All banks	(6) IV-Tobit placebo crisis All banks
Variables of interest							
Institutional investors	(+)	0.153**	0.240***	0.190**	0.130	0.222***	0.308***
		(2.69)	(3.04)	(2.55)	(1.46)	(3.65)	(3.69)
Crisis (dummy)		−0.148*	−0.125	−0.131	−0.143	−0.146	−0.124
		(−1.78)	(−1.48)	(−1.12)	(−1.20)	(−1.46)	(−1.51)
Institutional investors × crisis	(+)	0.678***	0.605***	0.426*	0.949***	−0.115	−0.190
		(3.05)	(3.03)	(1.68)	(2.74)	(−0.93)	(−1.18)
Control variables							
CD interest rate	(−)	−4.610	−5.366*	−6.144	−9.597***	−4.504	−5.275*
		(−1.34)	(−1.78)	(−0.93)	(−2.94)	(−1.28)	(−1.73)
Return on assets (ROA)	(+)	3.157***	3.139***	1.971***	5.093***	3.14***	3.130***
		(8.10)	(8.02)	(3.99)	(7.59)	(8.05)	(7.96)
Firm size	(+)	0.090***	0.088***	0.063***	0.126***	0.090***	0.088***
		(7.63)	(7.12)	(3.94)	(7.82)	(7.64)	(7.10)
Capital (L1)	(+/−)	−0.372***	−0.339***	−0.271**	−0.655***	−0.376***	−0.345***
		(−3.66)	(−3.22)	(−2.04)	(−4.12)	(−3.67)	(−3.25)
Leverage (L1)	(+/−)	−0.011***	−0.033***	−0.014**	−0.001	−0.013***	−0.012***
		(−2.78)	(−2.64)	(−2.40)	(−1.27)	(−3.06)	(−2.86)
Governmental	(−)	−0.078	−0.057			−0.0720	−0.054
		(−1.37)	(0.86)			(−1.26)	(−0.81)
Publicly traded	(−)	−0.259***	−0.254***			−0.230***	−0.232***
		(−3.18)	(−2.84)			(−2.64)	(−2.59)
Foreign subsidiaries	(−)	−0.301***	−0.291***			−0.302***	−0.292***
		(−7.16)	(−6.88)			(−7.13)	(−6.86)
Growth in credit	(−)	−0.012	−0.012	0.002	−0.030	−0.013	−0.013
		(−0.72)	(−0.76)	(0.08)	(−1.00)	(−0.76)	(−0.80)
Credit risk	(−)	−0.949***	−0.938***	−0.637	−1.001	−0.988***	−0.975***
		(−2.85)	(−2.54)	(−1.33)	(−2.05)	(−2.98)	(−2.63)
Year dummies		Yes	Yes	Yes	Yes	Yes	Yes
Number of observations		1082	1082	524	558	1082	1082
Number of banks		168	168	88	91	168	168
Log-likelihood		−729.0	−407.7	−358.5	−356.7	−734.7	−410.7

The dependent variable is the payout ratio, defined as total payouts divided by earnings, and the covariates are defined in Table 1. Column (1) uses a pooled Tobit estimation, and column (2) uses instrumental variables to address the potential endogeneity of institutional investors. The instruments are the variable big bank and the lagged values of institutional investors. In columns (3) and (4), we use pooled Tobit estimations, and the sample is restricted to closely held banks and other bank types, respectively. Columns (5) and (6) are identical to columns (1) and (2), respectively, except that they use a placebo crisis dummy. All models have year dummies. The absolute values of the t-statistics of the coefficients of the covariates are shown in parentheses. The symbols *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

The negative coefficient for the *crisis* dummy indicates that, *ceteris paribus*, the expected payout ratio of banks without any deposits from institutional investors is 14.8 percentage points smaller during the 2008 turmoil than in the other years. For the average bank, the expected marginal net effect of the crisis on the payout ratio is an increase of 2.2 percentage points.[12] For a bank in the 3rd quartile of the distribution of institutional investors in the pre-crisis period, the effect is an increase of 6.7 percentage points in the payout ratio.

The results in column (2) of Table 4 show the coefficient estimates when the variable *institutional investors* is instrumented (IV-Tobit) by *past levels of institutional investors* and the variable *big bank*.[13] The coefficient for *institutional investors* (β_1) increases in the IV-Tobit regression relative to that for the original regression, and more important, our main coefficient of interest, β_3 (the coefficient of *institutional investors* × *crisis*), decreases only slightly, maintaining the same significance level. The coefficients for all the control variables differ only slightly from those obtained in the original Tobit estimation.

Because institutional investors are more information sensitive and more reactive to bad news than other depositors, one might expect that any attempt to expropriate debtholders using dividends (a "cash out" movement) would be quickly perceived by institutional investors, who would immediately withdraw their deposits. If a dividend cash out occurred, one might expect it to occur in banks with less reactive depositors. Taken together, the results for the *crisis* dummy and the interaction term *institutional investors* × *crisis* do not support the alternative hypothesis of a "cash out" during the crisis.

One could argue that the inclusion of publicly traded banks, governmental banks and subsidiaries of foreign banks might distort the results because these banks would have many different signaling targets and because some of them face minimum dividend requirements. Conversely, closely held domestic banks have only debtholders as potential signaling targets and do not face minimum dividend requirements in practice. To address this issue, we run our main model for a subsample that includes only closely held banks. The results (Table 4, column (3)) are qualitatively similar to those for the entire sample (column (1)). Of particular interest is the general stability of the magnitudes of the coefficients of interest, β_1, β_2 and β_3, relative to their magnitudes in column (1). The coefficient for *institutional investors* × *crisis* remains positive and statistically significant (although at only the 10% level, possibly because the sample size is smaller in the regression with closely held banks than in the other regressions). The total expected effect of reliance on institutional investors on dividend payouts during the crisis ($\beta_1 + \beta_3$) is nearly identical to that found for the full sample: the expected partial effect of a 1 percentage point increase in the fraction of assets funded by institutional investors

[12] The average value for the variable *institutional investors* during the crisis is 0.253. As such, the net effect of the crisis for the average bank is $25.3 \times 0.67 - 14.8 \approx 2.2$. The 3rd quartile of the distribution is 0.32. The net effect of the crisis is thus $0.32 \times 0.67 - 0.148 \approx 0.067$.

[13] To save space, we do not report the first-stage regression results. *Big banks* is negatively and significantly related to *institutional investors*, as expected. Tests for overidentification indicate that the instruments are not weak.

during the crisis increases the payout ratio by 0.845 (0.240 + 0.605) percentage points (the *F*-test for the sum of coefficients indicates that the effect is statistically significant at the 1% level) for closely held banks compared with 0.831 (0.153 + 0.678) percentage points for the full sample.

Regressions for other bank types (governmental, foreign and publicly traded) provide qualitatively similar results (reported in column (4) of Table 4): β_3 is positive and significant, and β_1 remains positive but less statistically significant. These results are also consistent with the debtholder-signaling hypothesis, although alternative explanations, such as shareholder signaling, are more difficult to refute with this sample.

To further confirm the effect of the interaction term *institutional investors* × *crisis* on the payout ratio, we run a series of alternative placebo models in which the crisis dummy takes a value of 1 for all years other than 2008. Columns (5) and (6) of Table 4 report the results of pooled Tobit and IV-Tobit placebo regressions (the crisis dummy takes a value of 1 for 2006 and 0 otherwise). As expected, the *placebo crisis dummy* × *institutional investors* interaction is not significant, whereas all other variables maintain their sign and significance level. Repeating this placebo test for all other years in our sample period, we obtain similar results (unreported). Additionally, we run placebo tests for all further models presented in the paper and obtain similar results (unreported).

Finally, our inferences would be incorrect if some unobserved feature correlates with *institutional investors* and increases banks' propensity to pay dividends during the crisis. Although we find it implausible that any possible unobserved features with such characteristics exist, we investigate whether reliance on institutional investors affects the two main components of payouts (dividends and interest on equity) differently. If this variable affects dividends and interest on equity differently (or the choice between them), our results would differ for each form of payout. Running regressions with the *dividends ratio* and *interest on equity ratio*[14] on the same covariates as in the main model, we obtain positive values for β_1 and β_3 in both regressions (results unreported). Therefore, if any other factors (such as taxes) are related to the choice between the two main forms of payout, they are unrelated to the debtholder-signaling effect. In other words, these factors would be complementary determinants of each form of payout, not alternative explanations for the debtholder-signaling effect that we observe in our tests.

In contrast to the evidence presented by Acharya et al. (2013) for the US, our results show that the hypothesis that shareholders in Brazilian banks cashed out during the crisis is implausible. One possible difference driving our results is that Brazilian banks were not as distressed as banks in developed countries, such as the US; thus, the charter value of Brazilian banks (i.e., the value of banks as a going concern) could exceed the value "cashed out" by such banks. Another possibility is that this result arises because the shareholders of a closely held bank have very little incentive to "cash out" when the bank is in financial distress because the Brazilian regulatory system imposes severe penalties on the controlling shareholders of banks that fail to meet regulatory capital standards. These penalties include intervention, civil and criminal lawsuits and, more important, personal account freezes.

Our results for the control variables are consistent with previous findings in the dividend literature. Given the rationale that the cost of dividend signaling is positively related to the marginal cost of funding, the negative (although not statistically significant in some regressions) coefficient for *CD interest rates* supports Kauko's (2012) theory that dividends are negatively related to the costs of funding.

Consistent with previous empirical evidence, our results show that one of the most influential factors in dividend payouts is *ROA*. The profitability of a bank has a direct influence on its dividend policy. The smaller coefficient obtained for closely held banks (1.97) compared with other bank types (5.09) suggests that this relationship is derived, at least in part, from the minimum dividend requirements imposed on publicly traded banks but not on closely held banks. Our estimates in column (1) of Table 4 indicate that a 1 percentage point increase in ROA is associated with an expected 3.2 percentage point increase in the payout ratio.

The negative coefficient for capital indicates that more highly capitalized banks pay fewer dividends or, alternatively, that banks that are more capital constrained pay larger dividends. The coefficient indicates that a 1 percentage point increase in *capital adequacy* causes the expected payout ratio to decrease by 0.37 percentage points relative to earnings. This result indicates that highly levered banks have a greater need to signal their ability to generate future cash flows. The greater importance of the signaling effect relative to the regulatory effect (which would imply that less-capitalized banks pay lower dividends) may arise because most Brazilian banks have capital adequacy ratios that substantially exceed the 11% regulatory minimum. Thus, bank managers would not be seriously concerned about not meeting the regulatory requirements. The positive coefficient for *size* indicates that larger banks are more likely to pay higher amounts of cash to their shareholders, which is consistent with previous findings for US banks and for nonfinancial firms in Brazil (Mayne, 1980; Dickens et al., 2002; Martins and Novaes, 2012).

Closely held banks pay larger dividends than any other class of bank (publicly traded, governmental and foreign banks), *ceteris paribus*.[15] Consistent with theory and past empirical evidence (e.g., Dickens et al., 2002), investment opportunities, proxied by *growth in loans*, are negatively related to dividend payouts, although the effect is not statistically significant.

Finally, *loan risk* is negatively related to dividend payouts, indicating that risk of the loan portfolio reduces payouts by banks. When facing an increase in nonperforming loans, banks reduce their payouts to increase their capital cushion, consistent with the financial literature.

4.3. Other robustness checks

The first issue that we address concerns the possibility that use of an interaction term between the *crisis* and *institutional investors* may interfere with other coefficients because of either multicollinearity or variance inflation. The second issue concerns alternative explanations for our previous results. Third, we further examine the possible endogenous relationship between funding by institutional investors and dividend payouts.

Our main model employs an interaction variable (*institutional investors* × *crisis*) that may interfere with the results for other coefficients. To ensure the robustness and efficiency of the coefficients, we run an alternative Tobit model without this interaction term to confirm our previous findings regarding the association of all the variables with dividend payouts. The results in columns (1) and (2) of Table 5 for a Tobit model and IV-Tobit model, respectively, show that the values for the coefficients of interest are

[14] The dividends ratio and the interest on equity ratio are defined analogously to the payout ratio as *dividends*/*earnings* and *interest on equity*/*earnings*, respectively.

[15] Considering the *ceteris paribus* condition for this result is very important; closely held banks are, on average, smaller than other bank types, and because the effect of size is positive, simply concluding that closely held banks have, on average, larger expected payout ratios than other banks would be incorrect. In fact, as shown in Table 2, the average payout ratio is slightly smaller for closely held banks than for publicly traded banks.

Table 5
Robustness checks. Columns (1) and (2) present the results of re-estimations of the main model, excluding the interaction term *crisis* × *institutional investors*, using Tobit and IV-Tobit specifications, respectively.

Dependent variable	Payout ratio		Dummy = 1 for payout ratio > 40%		
	(1) Tobit	(2) IV-Tobit	(3) Probit	(4) IV-Probit	(5) Probit
	All banks	All banks	All banks	All banks	Closely held banks
Variable of interest					
Institutional investors	0.207***	0.206***	0.594***	0.816***	0.562***
	(3.65)	(3.43)	(4.40)	(4.71)	(2.96)
Control variables: Interest rate paid on CDs, ROA, bank size, regulatory capital, leverage, loan growth, loan risk					
Bank type dummies	Yes	Yes	Yes	Yes	No
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	1082	1082	1082	1082	524
Number of banks	168	168	168	168	88
Log-likelihood	−729.0	1097.7	−647.4	−350.9	−331.8

The dependent variable is the payout ratio, and the covariates are defined in Table 1. Columns (3)–(5) present the results of Probit regressions. The dependent variable, which is a dummy indicating a large payout ratio, is equal to 1 when the payout ratio is greater than or equal to 40% and 0 otherwise. Column (3) uses a standard Probit regression, and column (4) uses instrumental variables to address the potential endogeneity of institutional investors. The instruments are the variable big bank and the lagged values of institutional investors. Column (5) presents results for the same estimation from column (3) but with the sample restricted to closely held banks. All models have year dummies. The absolute values of the *t*-statistics of the coefficients of the covariates are shown in parentheses. The symbols *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

nearly identical to those obtained for the main model in Table 4 (we do not report the results for the control variables, but they are only marginally altered). Because the magnitudes and significance levels of the coefficients are unchanged in this test, the robustness of the main model (using the interaction variable) is confirmed. If the model suffers from specification issues, changes in the estimated coefficients in the main model would be observed. Thus, the model is robust with respect to the specification.

One could argue that the effects of the financial crisis were still present through the end of 2009, which would imply that the crisis dummy should take a value of 1 in both that year and 2008. Running our main specification but adopting this alternative definition for the crisis dummy (results unreported), we obtain positive and significant values for β_1 and β_3, although the coefficients decrease in magnitude.

Next, we check the robustness of our results to the use of alternative dependent variables. First, we create a binary variable that takes a value of 1 for banks that pay dividends greater than or equal to 40% of earnings and 0 otherwise. Columns (3) and (4) present the results of Probit and IV-Probit estimations.[16] *Institutional investors* is positively related to the high payout dummy after we control for several sources of bank heterogeneity and other factors that affect dividend policy. Both coefficients are statistically significant at the 1% level. We repeat the Probit regressions with a subsample composed of closely held banks only. Again, reliance on *institutional investors* returns a positive and significant (at the 1% level) coefficient. Additionally, we run an IV-Probit regression with the same subsample and obtain qualitatively unaltered results (unreported). Finally, when we alter the threshold defining a high payout ratio to 50% (results unreported), our inferences are upheld (the coefficients of interest are smaller in magnitude, but they retain their statistical and economic significance).

Two other possible concerns could arise if any unobserved bank characteristic is related to both the level of the payout ratio and reliance on institutional investors or if an increase in the payout ratio may be due to a decrease in earnings (a denominator effect). To address both of these issues, we investigate whether the percent change in payout is correlated with past levels of *institutional investors* during normal times and during the crisis. We define the *percent change in payout* of bank *i* in year *t* as follows:

$$\%\Delta Payout_{i,t} = 2 \times \frac{Cash\,payout_{i,t} - Cash\,payout_{i,t-1}}{Cash\,payout_{i,t} + Cash\,payout_{i,t-1}}, \quad (2)$$

where *cash payout*$_{i,t}$ is the total cash payout of bank *i* at time *t*. This measure, which approximates the log change in the cash payout, has the advantage of considering observations in which the cash payout changes from or to zero, which would be dropped if the traditional log change measure is used. These observations are particularly important for the analysis because they capture dividend initiations and omissions.

Columns (1)–(4) of Table 6 present the results of regressions in which *percent change in payout* is used as the dependent variable in our main model. The regressions in columns (1) and (2) are run on the whole sample, whereas those in columns (3) and (4) include only closely held banks. As expected, the results show that the past level of *institutional investors* has no significant effect on the *percent change in payout* during normal times. During the crisis, however, the effect is positive and significant in all 4 specifications. The crisis dummy is negative in all cases and indicates an expected reduction of approximately 5% (6% for closely held banks) in dividend payouts from 2007 to 2008 for those banks without any CDs issued to institutional investors, with other factors controlled for. Using the results of the POLS estimation in column (1), we find that the expected net partial effect of the crisis on the average bank is a 6.2% increase in dividends.[17] For a bank in the 3rd quartile of the distribution of institutional investors in the pre-crisis period, the effect is a 13.8% increase in dividends. Columns (5) and (6) present the results for POLS estimations for the *percent change in payout* using a *placebo crisis dummy*. As expected, the coefficients β_1, β_2 and β_3 are not statistically significant.

To further address the alternative explanation that institutional investors select banks for their profitability and that they thus choose to hold CDs of banks with a greater likelihood of paying larger dividends, we investigate which factors affect this selection. Using bank fixed effects and our control variables as regressors, we examine which factors determine the percentage of CDs held by institutional investors out of the total volume of CDs issued by the bank. As an alternative, we create a dynamic version of the model that includes the past level of institutional investors as an explanatory variable.

Columns (1) and (2) of Table 7 show that neither past levels of *ROA* nor the *payout ratio* is positively related to *institutional investors*. The coefficient for *payout ratio* is not statistically significant. Moreover, the coefficient for *ROA* is negative, indicating that institutional investors hold more deposits in banks with lower ROAs, with other factors controlled for. The results in Table 7 also indicate that institutional investors select larger banks and banks with

[16] In the IV-Probit specification, we use the same instruments as in the IV-Tobit specification described above.

[17] The calculation is as follows: the average value of the variable *institutional investors* during the pre-crisis period is 19.4%. The expected net effect of the crisis on the change in dividends for the average bank is thus $0.599 \times 0.194 - 0.054 \approx 6.2\%$. The 3rd quartile of the distribution of institutional investors during the pre-crisis period is 32%. The expected net effect of the crisis for the bank in the 3rd quartile of the distribution is thus an increase of $0.599 \times 0.32 - 0.054 \approx 13.8\%$ in dividends. For closely held banks, the average is 0.198, and the expected effect is $0.528 \times 0.198 - 0.061 \approx 4.4\%$.

Table 6
Robustness checks. This table presents the regression results for the main model with the percent change in payout as the dependent variable.

Dependent variable	Percent change in payout					
	(1) POLS All banks	(2) IV-OLS All banks	(3) POLS Closely held banks	(4) IV-OLS Closely held banks	(5) POLS placebo crisis All banks	(6) POLS placebo crisis Closely held banks
Variable of interest						
Institutional investors	−0.011	−0.042	0.039	−0.076	0.131	0.127
	(−0.07)	(−0.20)	(0.29)	(−0.32)	(0.80)	(0.60)
Crisis (dummy)	−0.064**	−0.063**	−0.061**	−0.064**	0.022	0.024
	(−2.51)	(−2.46)	(−2.02)	(−2.17)	(0.95)	(0.72)
Institutional investors × crisis	0.799*	0.815*	0.728*	0.820*	−0.562	−0.373
	(1.90)	(1.85)	(1.87)	(1.80)	(−1.05)	(−0.72)
Control variables: Interest rate paid on CDs, ROA, bank size, regulatory capital, leverage, loan growth, loan risk						
Bank type dummies	Yes	Yes	No	Yes	Yes	No
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	792	792	417	417	792	417
Number of banks	137	137	72	72	137	72
R^2	0.093	0.094	0.104	0.103	0.092	0.101
Log-likelihood	−1289.24	–	−665.39	–	−1289.72	−665.40

The covariates are defined in Table 1. Columns (1), (2) and (5) use the full sample, and columns (3), (4) and (6) use the subsample containing only closely held banks. Columns (1), (3), (5) and (6) use POLS estimations, and columns (2) and (4) use instrumental variables to address the potential endogeneity of institutional investors. The instruments are the variable big bank and the lagged values of institutional investors. Columns (5) and (6) use a placebo crisis dummy. All models have year dummies. The absolute values of the *t*-statistics of the coefficients of the covariates are shown in parentheses. The symbols *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 7
This table shows the factors that affect the selection of banks by institutional investors.

Dependent variable	% of institutional investors (1)	% of institutional investors (2)
% of institutional investors (L1)		0.393***
		(8.03)
Return on assets	−0.417**	−0.290*
(ROA)	(−2.28)	(−1.89)
Payout/earnings	−0.013	−0.009
	(−0.55)	(−0.50)
CD interest rate	0.988	1.224
	(0.88)	(1.19)
Crisis (dummy)	−0.138***	−0.093***
	(−3.71)	(−3.06)
Firm size	0.048**	0.039**
(SIZE)	(2.44)	(2.51)
Capital (L1)	−0.223**	−0.138**
	(−2.59)	(−2.17)
Leverage (L1)	−0.008**	−0.005*
	(−2.19)	(−1.75)
Growth in credit	−0.005	0.001
	(−0.65)	(0.06)
Credit risk	−0.416*	−0.279
	(−1.85)	(−1.49)
Constant	−0.218	−0.261
	(−0.82)	(−1.25)
Year dummy	Yes	Yes
Fixed effects	Yes	Yes
Number of observations	1082	1082
R^2	0.076	0.224

The dependent variable in columns (1) and (2) is the ratio of the value of CDs held by institutional investors to the total value of CDs issued by banks. Column (1) presents the results for a fixed effects static panel, whereas column (2) presents results for a fixed effects dynamic panel data. All models have dummies for years. The *t*-statistics of the coefficients of the independent variables are shown in parentheses. The symbols *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

lower *capital adequacy ratios*, *leverage* and *credit risk*. As expected, *past levels of institutional investors* is positive and statistically significant.

Finally, for our story to be credible, it is necessary that managers believe that signaling with dividends is capable of actually preventing a bank run (or halt an ongoing one). To check whether dividends may be able to help in deposit recovery, we split the sample into high-payers (those banks with a payout ratio above the median) and low payers (those with a payout ratio below the sample median) in 2008. We find that the average change in deposits from institutional investors (from Dec/08 to Dec/09) for high payers is 38%, whereas for low payers it is 23%. This evidence suggests that dividends may have played a role in increasing deposits, but it would be naive to directly identify a causal relationship between the change in deposits and dividends, as deposits may have changed for many other reasons correlated to dividends (interest rates paid on CDs, and other bank fundamentals).

5. Conclusions

This paper investigates whether banks' debt composition affects their payout policies. Specifically, we examine whether banks use dividends to signal their asset quality and liquidity to information-sensitive depositors. We exploit distinctive features of the Brazilian banking industry, such as the existence of several types of banks with respect to both ownership and funding profile, for this analysis. Further, we exploit the existence of several closely held banks—banks owned and managed by small groups of shareholders—that can circumvent minimum dividend requirements and that are unlikely to engage in shareholder-targeted signaling.

For this analysis, we use annual data from 168 banks in Brazil for the period between 2001 and 2009. An advantage of our database is that it includes balances of CDs issued to institutional investors as well as annual weighted average interest rates paid on CDs by each bank.

Our main finding is that depositors are indeed the targets of dividend signaling. We show that with other bank characteristics controlled for, banks with a greater percentage of deposits issued to information-sensitive depositors (institutional investors) pay larger dividends. We further find that this behavior is even more pronounced during financial crises, when asset opaqueness and informational asymmetry are exacerbated and when the informational content of dividends is greater. Therefore, bank dividends are not used as a tool to expropriate debtholders, as found by Acharya et al. (2013) for US banks. Our evidence strongly suggests that depositor expropriation did not occur in Brazil during the 2008 crisis, as both closely held banks and other bank types that

exhibited greater reliance on institutional investors for funding paid larger dividends after the 2008 turmoil. If a "cash out" movement occurred, banks that rely on other, less information-sensitive, types of depositors for funding would have paid larger dividends. Thus, a "cash out" movement appears to be implausible.

In addition, we find that dividend payouts by Brazilian banks are positively related to both *profitability* and *size* and negatively related to the marginal cost of funding (the interest rate paid on CDs), *capital adequacy* and *growth of the loan portfolio*. We also find that governmental banks pay smaller dividends than their privately owned counterparts. These findings are consistent with both the signaling theory (i.e., banks use dividends as a costly signal of bank asset quality) and the notion that banks with greater investment opportunities retain more earnings.

The necessity to increase dividends during a financial crisis to signal asset quality and liquidity decreases banks' lending capacity even further, thereby exacerbating the well-known pro-cyclical implications of regulatory capital requirements. The third Basel accord seeks to address and mitigate the pro-cyclicality created by the requirements of the previous accords. Our study demonstrates a hidden facet of the pro-cyclical characteristics of capital requirements. As such, our results support the imposition of limits on dividend payments during financial crises to mitigate pro-cyclicality in bank lending.

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