Cash Holdings and Collateral Value. Evidence from a Natural Experiment

Abstract

I make use of the major credit reform and the new bankruptcy law, empreended by Brazil at the end of 2004 and in early 2005, to investigate the effect of a rise in collateral value in cash holdings. I find that more tangible firms reduced its cash holdings and cashflow sensitivity of cash after the law, compared to less tangible firms. Also, results suggest that more tangible firms reduced short-term debt, corroborating the financial flexibility hypothesis. This result is important to public policy, as it makes firms funds available to more efficient allocation.

1.1 Introduction

Firms hold cash for precautionary reasons (Keynes, 1936), or, in a more abroad sense, due to agency costs (Jensen & Meckling, 1976). In addition, financial frictions force firms to hold cash to prevent underinvestment when the cost of external financing rise, or when its cash inflows fall. In that sense, an increase (decrease) in the wedge between external financing costs and internal financing costs will cause firms to increase (decrease) its cash holdings, preventing from forgoing positive investment opportunities (Gao et al., 2013; Harford, 1999)

One source of increase in external financing costs is weak protection of creditors (La Porta et al., 1999). In February 2005, Brazil passed a new bankruptcy law in an attempt to increase creditor protection and decrease external financing costs (Ponticelli & Alencar, 2016; Araujo et al., 2012), by limiting the amount to be paid as labor debt to 150 minimum wages. This change is important: before this law, management and directors used to sue the company in order to get all of the value from the asset sale, leaving nothing for creditors. The new law also changed the priority order, putting secured creditors in second to receive - only after labor claims. These two changes made the amount creditors could expect to receive in a bankruptcy process rise from 0% to 20%, according the doing business database.

In August 2004, Brazil passed a major credit reform, known as Fiduciary law, which made easier for the lender to repossess the collateral; also, the borrower could not use anymore the same asset as collateral in different debt contracts with different banks (Assuncão et al., 2013).

Araujo et al. (2012) argue that the new bankruptcy law increased debt capacity of firms that are capable of issuing debt/contracting loans against tangible assets, as they apparently increased leverage, when compared to firms in Argentina, Colombia, and Chile over the same time period. Ponticelli & Alencar (2016) find that firms operating in regions with shorter congestion experienced a more intense growth and issued more secured debt (especially firms with technological reasons as they operate in industries with a need for more tangible assets). These two reforms (The Credit Reform and the Bankruptcy law) affected the debt capacity of firms due to both lower risk for the lender and increased collateral value.

One important point from firms' financial policy is the substitution effect between cash and debt to fund investments, as firms' that do not have access to the debt market accumulate cash to prevent under-investment (Almeida et al., 2004). In that sense, an increase in collateral value, and consequently a rise in debt capacity, would reduce the firms' need to accumulate cash.

I use both the Brazilian Bankruptcy Law Reform (Araujo et al., 2012; Ponticelli & Alencar, 2016) and the Fiduciary Law (Assuncão et al., 2013) as a natural experiment that exogenously changed the value of firms' tangible assets because of the creditors' rights enforcement. Thus, the objective of this paper is to investigate the effect of a rise in collateral value on firms' cash holdings and on cash flow sensitivity of cash.

Using a DiD identification strategy, building upon Ponticelli & Alencar (2016), I find that the new bankruptcy law had different effects for firms according to its tangibility. In particular, I define firms with higher tangibility as treated and firms with lower tangibility

as controls, and I consider the treatment (control) firms on the top (bottom) 3 deciles of tangibility distribution at the end of 2003.

This setting shows that after the rise in collateral value, more tangible firms reduce its cash holdings on almost 34%, which accounts for 30.4 million Brazilian Reais for the representative firm, even after controlling for all the determinants of cash holdings exposed (Gao et al., 2013) and for potential macroeconomics shocks for specific industries, as suggested by Gormley & Matsa (2013) and employed by Gao et al. (2013). Additionally, regarding cash flow sensitivity of cash, more tangible firms add almost 2.2 p.p less to cash holdings after the law compared to less tangible firms. This result also suggests a perception of managers of a certain alleviation on financing constraints.

About the other real effects, although Ponticelli & Alencar (2016) and Araujo et al. (2012) found an increase in secured debt and overall leverage. Using a different data set - only with public companies -, I could not reject the null that both less tangible firms issued the same debt as more tangible ones. Our results suggest that more tangible companies reduced short-term debt (almost 2.5%, accounting for a reduction of 23 million Brazilian Reais for the representative firm) after the credit reform, which can be interpreted as companies valuing financial flexibility. The results also suggest that the treatment and control groups did not differ on Payout, Capex, or asset growth.

There is a growing literature on the impact of changes in legal environment and its effects on financial policies. Vig (2013) and Lilienfeld-Toal et al. (2012) analyzed the impact of a new bankruptcy law in India and found that firms issued less secured debt and increased its cash holdings because of a liquidating bias that emerged from creditors. Ponticelli & Alencar (2016) links the impact of the Brazilian reform with the efficiency of the judiciary, after the introduction of the new bankruptcy law in Brazil. Firms that had more tangible assets issued more secured debt and invested more, with greater effect on municipalities that had less court congestion. Araujo et al. (2012) also find that firms in Brazil increased leverage after the law, compared to firms in Argentina, Mexico, Chile and Colombia. Assunção et al. (2013) investigated the impact of the major credit reform on the auto loan market, since the credit

reform made it easier for the lender to repossess the collateral, the results shows that banks lent more. Looking at eastern Europe credit reforms, Campello & Larrain (2015) find that an increase in the menu of possible collaterals led to an increase of secured debt issuance, more efficiency and profitability and also, affected firms hired more.

Although changes in collateral value and its effects on financial policies have been analyzed before, for example Gan (2007) shows how the negative shock on Real State value in Japan led to a decrease in borrowing by tangible firms. Benmelech & Bergman (2009) find that the use of redeployable collateral lowers the cost of capital and increases debt capacity. Chaney et al. (2012) show that a decline in collateral value led to firms investing less. Related to cash holdings, Lei et al. (2018), using a cross country analysis, find that exists a sensibility of cash holdings to tangibility, and that financial development lowers this connection. Dittmar et al. (2003) using a cross country setting shows that firms in countries with higher investor protection hold less cash. To the best of our knowledge this is the first paper to investigate the impact of an exogenous increase in collateral value on firms' cash holdings and cash flow sensitivity of cash.

The remainder of this paper is structured as follows: Section 1.2 discusses the sample and methodology; Section 1.3 highlights the results, and Section 1.4 concludes.

1.2 Sample and Methodology

The sample consists of publicly traded companies on the Bolsa, Brazil, Balcão, also known as B3, in the period from 2001 to 2006. Excluding utilities, telecommunications, and the financial sector due that they are highly regulated by the Brazilian Government and the Central Bank of Brazil. Additionally, companies that exhibited negative equity, negative cash and positive depreciation in some period covered by the research were also excluded. Annually data was used, and to check the effect of a raise in collateral value on cash holdings', Gao et al. (2013) cash holdings model was estimated (model 1), using as treated (control)

group firms that were in top (bottom) 3 deciles based on the net tangibility (fixed assets over total assets net of cash) distribution in the end of 2003, as after this the tangibility was endogenously determined by both new bankruptcy law and the fiduciary law.

$$\ln(Cash)_{it} = \beta_0 + \beta_1 Afterlaw_t + \beta_2 Treatment_i + \beta_3 Treatment_i \times \backslash Afterlaw_t + \beta_4 \ln(Assets)_{it} + \beta_5 Leverage_{it} + \beta_6 Netnwc_{it} + \beta_7 Capex_{it} + \beta_8 Q_{it} + \beta_9 OCF_{it} + \beta_{10} Payout_{it} + \epsilon_{it}$$

Where the dependent variable is the natural logarithm of cash and equivalents over net assets (total assets-cash). And as the variable of interest is the interaction between tangibility (fixed assets over net assets) and afterlaw (dummy variable equals one for the years of 2005 and 2006, 0 otherwise). This interaction shows the effect of tangible assets on cash holdings in the years after the new bankruptcy law was passed. in this sense, I can check using a natural experiment if more debt capacity induces firms to hold less cash in its balance.

1.3 Empirical results

1.3.1 Descriptive Statistics

Table 1 provide summary statistics for the sample. The mean company have 816 million in assets net of cash, with 0.28% of it financed with debt, and use cash to balance its net working capital, since its negative without cash. Invest 7% of net assets per year and have a Q net of cash higher than one. The operating cash flow is 12% of assets net of cash and pays 3% of it to shareholders. The cash holdings represent 13% of net assets and 10% of total assets. The log was used to make results interpretation more straight forward.

Table 1: Summary Statistics

Variables	N	Mean	SD	p25	Median	p75
$Ln(Assets)$	854	20.51	1.74	19.32	20.51	21.58
$Ln(NetCash)$	854	-3.14	1.86	-4.20	-2.85	-1.79
$Leverage$	854	0.28	0.21	0.11	0.26	0.41
$NetNWC$	854	-0.00	0.26	-0.11	0.00	0.14
$Capex$	854	0.07	0.09	0.02	0.05	0.10
Q	854	1.05	0.96	0.51	0.83	1.25
OCF	854	0.12	0.09	0.05	0.10	0.17
$Payout$	854	0.03	0.05	0.00	0.02	0.04
$SDocf$	854	0.04	0.03	0.01	0.03	0.05
$NetCash$	854	0.13	0.18	0.01	0.06	0.17
$Cash$	854	0.04	0.03	0.01	0.03	0.05
$Tangibility$	854	0.39	0.22	0.23	0.40	0.55

To give an intuition of the general effect of the major credit reform, Table 2 exhibits the mean test comparing the period before both laws with the period after. It is possible to infer that the company's size is not statistically different, the leverage was reduced, and investment increased. The proxy for investment opportunity shows that after the law the companies had a higher Q. Also, the payout and operating cash flow increased, and firms' cash holdings got statistically higher after the law. from 9% to 10%.

Table 2: Mean Test

	Before	After	Difference	T test

	N	Mean	N	Mean	2-4	
$Lnassets$	327	20.49	527	20.52	-0.027	-0.226
$Leverage$	327	0.305	527	0.266	0.038	2.65
$Netnwc$	327	-0.014	527	0.003	-0.017	-0.982
$Capex$	327	0.061	527	0.073	-0.012	-2.111
Q	327	0.799	527	1.207	-0.408	-6.144
Ocf	327	0.108	527	0.121	-0.012	-2.063
$SdOCF$	327	0.035	527	0.037	0.002	-0.932
$Payout$	327	0.025	527	0.035	-0.009	-2.984
$NetCash$	327	0.118	527	0.136	-0.017	-1.394
$Cash$	327	0.089	527	0.102	-0.012	-1.647
$Tangibility$	327	0.396	527	0.389	0.007	0.485

1.3.2 Parallel Trends

Figure 1 shows the parallel trends of cash over net assets, the graph shows that more tangible firms had less cash holdings over the research period, suggesting that as tangible firms have more debt capacity, there is no need to hold much cash. Besides, both lines seem to walk side by side before the major credit reform (considered in this study as the end of 2004, since the fiduciary law took place in late 2004 and the bankruptcy law in early 2005). After the credit reform, tangible firms reduced its cash holdings, and intangible firms immediately rose its liquidity cushion, the reason for this movement can be explained by a crowding out effect, since Lilienfeld-Toal et al. (2012) argues that in the face of a credit reform, there is no new credit, only a distribution channel from the less benefited group (less tangible firms) to the more benefited group (more tangible firms). It is expected that knowing this, less tangible firms rose its cash holdings since there would be less credit available to them.

Another way to test for parallel trends is to check the statistical difference between cash holdings for the treated and control groups. Table 3 reports the result. The difference between groups is not statistically different from 0 (besides 2002 for 10% threshold) in the pre-treatment period.

Figure 1 Parallel Trends

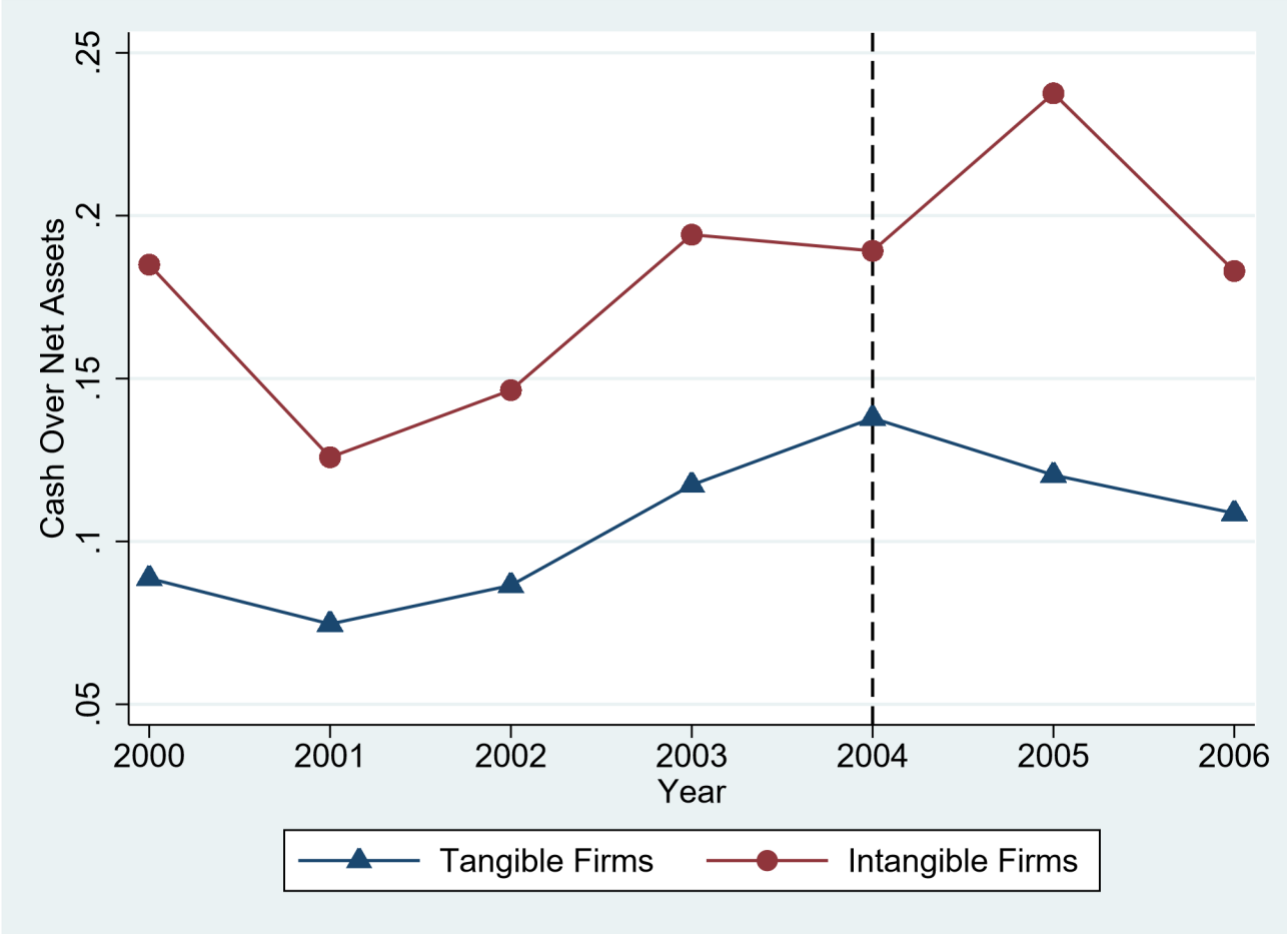

Table 3: Parallel Trends

	Ln(Cash/(Assets-Cash)			(Cash/(Assets-Cash)		
Year	Control	Treatment	P Value	Control	Treatment	P Value
2001	-3,87	-3,52	0,2098	0,125	0,074	0,1083
2002	-3,91	-3,39	0,0718*	0,146	0,086	0,082*
2003	-3,79	-3,38	0,1498	0,197	0,117	0,1237

This evidence suggests that without the credit reform, both treated and control group would continue to follow the same trend.

1.3.3 Change in Collateral Value and Cash Determinants

Table 4 summarizes the results from estimating model 1, it statistically corroborates the graphical analysis from Figure 1. The results suggest the negative impact of an increase in collateral value on the cash holdings. Model 1, was estimated only with variables that were not directly affected by the reforms, to avoid the case of bad controls (Angrist & Pischke, 2008). For the firms that had higher tangibility, controlling for industry fixed effects - to rule out possible effects from unobservable industry heterogeneity -, the reduction in cash holdings over net assets was of 31% ($e^{-0.371} - 1$), with year fixed effects added, this effect remained almost the same. In column 3, with firm and year fixed effects, the reduction in cash holdings over net assets gets smaller, 29% ($e^{-0.342} - 1$). This estimate increase to 38% ($e^{-0.471} - 1$) when controlling for possible demand or supply shocks in particular industries, suggesting that shocks occurred to some industries that made firms' pile up cash.

As the interpretation for cash over net assets is somewhat less intuitive, multiplying the effect and the mean proportion of cash holdings after the reform gives the approximated effect on cash over assets, for example, using column 4, 38% × (1-0.102) = 33%, i.e. a reduction in cash over assets of 33%.

Table 4: Cash Determinants

After is a dummy that takes value 1 for years 2005 and 2006, 0 otherwise. Tangibility is a dummy set to one if the firm is at the top tercile of the distribution, 0 otherwise. Ln(Assets) it's the natural logarithm of total assets and Q is the Market Cap divided by book value of Equity. OCF is Operating Cash Flow divided by Assets. Standard Errors are clustered at firm level.

	(1)	(2)	(3)	(4)
VARIABLES	Ln(Cash/(Assets-Cash)			
After	0.226	FE	FE	FE
	(0.161)			
Tangibility	0.244	0.240	FE	FE
	(0.339)	(0.340)		

After × *Tang*	-0.366*	-0.371*	-0.342*	-0.471**
	(0.210)	(0.211)	(0.202)	(0.204)
Ln(*Assets*)	-0.010	-0.006	-0.799***	-0.772**
	(0.102)	(0.104)	(0.270)	(0.302)
Q	0.458***	0.460***	0.354***	0.374***
	(0.116)	(0.121)	(0.109)	(0.132)
OCF	3.181***	3.301***	2.394***	2.466***
	(0.829)	(0.870)	(0.821)	(0.926)
Constant	-3.852*	-3.897*	12.259**	11.718*
	(2.038)	(2.079)	(5.470)	(6.145)
Observations	523	523	523	523
R-squared			0.145	0.213
Number of id	135	135	135	135
Firm FE	No	No	Yes	Yes
Year FE	No	Yes	Yes	No
Industry FE	Yes	Yes	No	No
Industry * Year FE	No	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

For the representative firm, with net total assets of 816 million and as cash holdings represent 10% of total assets, cash holdings amount for 92.2 million, a reduction of 33% leads to 30.4 million for the firm to invest in assets that give a higher return, to pay debt, or return it to shareholders as dividends.

Table 4 also shows that cash holdings are positively associated with Q, as firms with higher investment opportunities hold more cash to decrease the risk of forgone good investment opportunities (Harford, 1999; Gan, 2007). Cash holdings are also positively associated with operating cash flow. Additionally, cash holdings are negatively associated with size, as bigger firms have less probability of default and bankruptcy they do not need to

hold as much cash as the smaller and younger firms' and due to economies of scale (Gao et al., 2013; Opler et al., 1999; Dittmar et al., 2003).

Table 5: Cash Determinants

After is a dummy that takes value 1 for years 2005 and 2006, 0 otherwise. Tangibility is a dummy set to one if the firm is at the top tercile of the distribution, 0 otherwise. Ln(Assets) it's the natural logarithm of total assets and Q is the Market Cap plus Debt divided by book value of Equity. OCF is Operating Cash Flow divided by Assets. Standard Errors are clustered at firm level. Leverage is Debt over Assets. NetNWC is the Net Working Capital minus Cash divided by Total Assets and Capex is Investment in Fixed Assets over Total Assets. SDOCF is the Standard Deviation of the Operating Cash Flow. Payout is dividends paid over Total Assets. Standard Errors are clustered at firm year level.

	(1)	(2)	(3)	(4)	(5)
	Tang = 1 (0) if top (bottom) 3 deciles of tangibility in 2003			Ln(Cash/(Assets-Cash)	Continuous Tangibility
After	0.215	FE	FE	FE	FE
	(0.155)				
Tangibility	0.262	0.265	FE	FE	FE
	(0.361)	(0.363)			
After × *Tang*	-0.356*	-0.363*	-0.353*	-0.443**	-0.683*
	(0.199)	(0.199)	(0.188)	(0.186)	(0.389)
Ln(*Assets*)	-0.030	-0.034	-0.828***	-0.756***	-0.776***
	(0.105)	(0.108)	(0.233)	(0.267)	(0.216)
Leverage	0.496	0.477	0.231	0.359	0.872**
	(0.454)	(0.460)	(0.459)	(0.461)	(0.387)
NetNWC	0.101	0.098	0.216	0.113	0.265
	(0.438)	(0.436)	(0.481)	(0.485)	(0.397)
Capex	1.021	1.094*	1.342**	1.141*	0.734
	(0.647)	(0.661)	(0.644)	(0.638)	(0.526)
Q	0.379***	0.365***	0.290***	0.296**	0.244**
	(0.098)	(0.104)	(0.095)	(0.125)	(0.102)
OCF	1.943**	2.041**	1.348	1.455	1.282
	(0.873)	(0.895)	(0.872)	(0.931)	(0.809)

SdOCF	-0.347	-0.297	-0.736	-0.646	-1.330
	(1.602)	(1.593)	(1.634)	(1.375)	(1.360)
Payout	6.597***	6.798***	6.048***	5.854***	3.431*
	(1.837)	(1.858)	(1.541)	(1.512)	(2.017)
Constant	-3.599*	-3.470	12.758***	11.245**	11.812***
	(2.070)	(2.129)	(4.728)	(5.415)	(4.394)
Observations	523	523	523	523	847
R-squared			0.192	0.251	0.164
Number of id	135	135	135	135	221
Firm FE	No	No	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	No
Industry FE	Yes	Yes	No	No	No
Industry * Year FE	No	No	No	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 shows the results using the full model, it suggests that the results from Table 4 are robust, since even after adding more controls the coefficients remain almost the same as its counterparts from Table 4. Additionally, column 5 report the results estimated using tangibility as a continuous treatment, the coefficient remains negative and statistically significant at the 10% threshold, it says that after the credit reform an increase of 1 (p.p) in tangibility is related to a decrease of 0.7% of net cash holdings, i.e., an increase of one standard deviation in tangibility (22 percentage points) leads to a decrease in net cash holdings of approximately 15.4%. Again, as net cash holdings is less intuitive than cash holdings, an increase of 1 p.p in tangibility after the credit reform is related to an increase of 0.61% (0.7% × (1 − 0.102)).

Briefly on the controls, firms cash holdings are positively related to investment (CapEx), as with Q, Operating Cash flow and Payout, and negatively related to size.

From table 4 and table 5 it is possible to say that a rise in collateral value is related to a reduction on cash holdings, indicating a substitution effect between debt capacity and cash holdings.

1.3.4 Change in Collateral Value and Cash Flow Sensitivity of Cash

Another channel that a rise in collateral value could affect cash holdings is through cash flow sensitivity of cash (Almeida et al., 2004), since one reason to increase firm's liquidity cushion is due to a perception of the firms' management of a possible difficult in raise external finance, then, firms would increase or decrease the amount of cash flow received that its used to build up cash holdings. Since a rise in collateral value increase companies' debt capacity, it is reasonable to expect that tangible firms have decreased the amount of cash flow hoard.

To investigate if a rise in Collateral Value decreases firms cash flow sensitivity of Cash, I estimated the following model, based on (Almeida et al., 2004) cash flow sensitivity of cash model.

$$\Delta Cash_{it} = \beta_0 + \beta_1 Afterlaw_t + \beta_2 Treatment_i + \beta_3 Treatment \times Afterlaw_t + \beta_4 Ln(Assets)_{it} + \beta_5 Q_{it} + \beta_6 OCF_{it} + \epsilon_{it}$$

Where Δ Cash is the difference between cash over assets from period t to cash over assets from period t-1. Afterlaw is a dummy variable equal 1 if the year is 2005 and 2006, 0 otherwise. Treatment is equal 1 (0) for firms that were in the top (bottom) 3 deciles based on tangibility distribution at the end of 2003. Ln(Assets) is the natural logarithm of Total Assets, Q is the ratio between Market value plus Debt and Total Assets, and OCF is operating cash flow over

total assets.

β_3 is the coefficient of interest and show the difference in operating cash flow that is used to build cash reserves.

Table 6 shows the estimation of a cash flow sensitivity of cash model, according to column 1 -without any fixed effects - more tangible firms before the reform added 0.7 p.p more cash than less tangible, after both laws, the less tangible firms saved 0.7 p.p more cash and more tangible firms started to save less 1.1 (-1.8+0.7) p.p. Using column 6 - with firm and industry × year fixed effects - this value goes up to 2.2 p.p less hoarding cash. Corroborating the reasoning that with more debt capacity, firms' will decrease the amount used to build up its liquidity cushion.

Table 6: Cash Flow sensitivity of Cash

Δ Cash is the difference between cash over assets from period t to cash over assets from period t-1. Afterlaw is a dummy variable equal 1 if the year is 2005 and 2006, 0 otherwise. Treatment is equal 1 (0) for firms that were in the top (bottom) 3 deciles based on tangibility distribution at the end of 2003. Ln(Assets) is the natural logarithm of Total Assets, Q is the ratio between Market value plus Debt and Total Assets, and OCF is operating cash flow over total assets. Standard Errors are clustered at firm year level.

	(1)	(2)	(3)	(4)	(5)	(6)
			Δ*Cash*			
After	0.007	0.007	FE	0.016**	FE	FE
	(0.007)	(0.007)		(0.007)		
Tangibility	0.007	0.007	0.007	FE	FE	FE
	(0.008)	(0.008)	(0.008)			
After × *Tang*	-0.018*	-0.018*	-0.018*	-0.026**	-0.027**	-0.022*
	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)
Ln(*Assets*)	-0.002*	-0.002	-0.002*	-0.050***	-0.047**	-0.050**
	(0.001)	(0.001)	(0.001)	(0.019)	(0.020)	(0.020)
Q	0.007	0.007	0.007	0.019***	0.020***	0.017**
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.007)
OCF	0.108***	0.108***	0.113***	0.147**	0.172**	0.188**
	(0.040)	(0.042)	(0.040)	(0.065)	(0.066)	(0.072)

Constant	0.029	0.028	0.043*	0.992**	0.952**	0.982**
	(0.021)	(0.023)	(0.023)	(0.388)	(0.399)	(0.410)
Observations	523	523	523	523	523	523
R-squared				0.077	0.093	0.163
Number of id	135	135	135	135	135	135
Firm FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	Yes	No	Yes	No
Industry FE	No	Yes	No	No	No	No
Industry * Year FE	No	No	No	No	No	Yes

*** p<0.01, ** p<0.05, * p<0.1

To check if more tangible firms hoard less cash as cash holdings, I estimated a triple differrences model, interacting the *After* × *Tang* with *OCF*, table 7 report the results. From column 1, for a firm with 12% of assets as operating cash flow (OCF), more tangible firms saved 0.64 (-0.011+0.145×0.12) p.p more cash than less tangible firms before the credit reform, after both laws passed, less tangible firms started to save 0.73 (0.001+0.053×0.12) p.p more cash, meanwhile tangible firms decrease its cash hoarding 1.572 (0.12-0.231×0.12) p.p less cash. Controlling for firm's constant unobserved heterogeneity and for possible industry shocks column 6 - this effect gets even bigger, as more tangible firms saved -2.3 (0.018-0.342 × 0.12) p.p less cash. Both DiD and DiDiD conclude the same, showing the robustness of results and how a rise in collateral value is related to a decline in cash flow sensitivity of cash for affected firms.

Table 7: Cash Flow Sensitivity of Cash

Δ Cash is the difference between cash over assets from period t to cash over assets from period t-1. Afterlaw is a dummy variable equal 1 if the year is 2005 and 2006, 0 otherwise. Treatment is equal 1 (0) for firms that were in the top (bottom) 3 deciles based on tangibility distribution at the end of 2003. Ln(Assets) is the natural logarithm of Total Assets, Q is the ratio between Market value plus Debt and Total Assets, and OCF is operating cash flow over total assets. Standard Errors are clustered at firm year level.

	(1)	(2)	(3)	(4)	(5)	(6)
				$\Delta Cash$		
After	0.001	0.002	-0.011	0.006	FE	FE
	(0.009)	(0.009)	(0.011)	(0.009)		
Tangibility	-0.011	-0.012	-0.016*	FE	FE	FE
	(0.010)	(0.010)	(0.010)			
After × *Tang*	0.012	0.011	0.016	0.013	0.017	0.018
	(0.013)	(0.013)	(0.013)	(0.018)	(0.017)	(0.019)
OCF	0.069	0.064	0.069	0.077	0.086	0.077
	(0.087)	(0.088)	(0.088)	(0.099)	(0.094)	(0.105)
After × *OCF*	0.053	0.052	0.047	0.106	0.100	0.109
	(0.094)	(0.094)	(0.095)	(0.079)	(0.081)	(0.087)
Tang × *OCF*	0.145	0.155	0.182	0.197	0.268**	0.310**
	(0.111)	(0.116)	(0.112)	(0.130)	(0.124)	(0.128)
After × *Tang* × *OCF*	-0.231*	-0.230*	-0.265**	-0.318**	-0.360***	-0.342**
	(0.124)	(0.124)	(0.124)	(0.139)	(0.136)	(0.149)
Ln(*Assets*)	-0.002	-0.001	-0.002	-0.048**	-0.043**	-0.045**
	(0.001)	(0.001)	(0.001)	(0.019)	(0.019)	(0.020)
Q	0.007	0.007	0.008	0.019***	0.019***	0.016**
	(0.005)	(0.005)	(0.005)	(0.007)	(0.006)	(0.008)
Constant	0.026	0.027	0.044	0.944**	0.866**	0.884**
	(0.025)	(0.026)	(0.026)	(0.381)	(0.391)	(0.406)
Observations	523	523	523	523	523	523
R-squared				0.090	0.111	0.178
Number of id	135	135	135	135	135	135

Firm FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	Yes	No	Yes	No
Industry FE	No	Yes	No	No	No	No
Industry * Year FE	No	No	No	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Also, Table 6 and 7 shows that bigger firms save less cash and that firms with more investment opportunities save more. Additionally, from column 6 - Table 6 - Brazilian firms' save - at the mean - 18 cents of each one real of operating cash flow as cash reserves, showing financially constrained firms' behavior.

1.3.5 Placebo Tests and Dynamic Effect

To check if the results from tables 4,5,6 e 7 are robust, as they can be the result of a particular shock to high tangible firms, I estimate both the cash determinants and the cash flow sensitivity of cash using 2002 as the false reform treatment shock. Table 7 results indicate that no systematic difference is found when a different period is considered as afterlaw, both for cash determinant - columns 1 and 2 - and cash flow sensitivity of cash - columns 3 and 4. This placebo test suggests that the difference found in tables 4,5,6 and 7 are due the credit reform.

Table 8: Placebo Test

After is a dummy that takes value 1 for years 2005 and 2006, 0 otherwise. Tangibility is a dummy set to one if the firms is at the top tercile of the distribution, 0 otherwise. Ln(Assets) it's the natural logarithm of total assets and Q is the Market Cap plus Debt divided by book value of Equity. OCF is Operating Cash Flow divided by Assets. Standard Errors are clustered at firm level. Leverage is Debt over Assets. NetNWC is the Net Working Capital minus Cash divided by Total Assets and Capex is Investment in Fixed Assets over Total Assets. SDOCF is the Standard Deviation of the Operating Cash Flow. Payout is dividends paid over Total Assets. Standard Errors are clustered at firm year level.

	(1)	(2)	(3)	(4)

VARIABLES	20-20	20-20	20-20	20-20
After × *Tang*	-0.226	-0.300	-0.013	-0.006
	(0.235)	(0.272)	(0.016)	(0.018)
Ln(*Assets*)	-0.816***	-0.758***	-0.047**	-0.049**
	(0.235)	(0.267)	(0.020)	(0.020)
Q	0.288***	0.289**	0.020***	0.017**
	(0.096)	(0.127)	(0.006)	(0.007)
OCF	1.297	1.293	0.158**	0.170**
	(0.952)	(1.000)	(0.070)	(0.074)
Leverage	0.288	0.409		
	(0.475)	(0.478)		
NetNWC	0.193	0.131		
	(0.472)	(0.481)		
Capex	1.401**	1.287*		
	(0.665)	(0.670)		
SdOCF	-0.743	-0.673		
	(1.677)	(1.451)		
Payout	5.884***	5.715***		
	(1.596)	(1.573)		
Constant	12.501***	11.259**	0.936**	0.990**
	(4.770)	(5.409)	(0.406)	(0.411)
Observations	523	523	523	523
R-squared	0.183	0.240	0.083	0.156
Number of id	135	135	135	135
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
Industry FE	No	No	No	No
Industry * Year FE	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Additionally, to trace out the year-by-year effects of the credit reform and new bankruptcy law, I run the same cash determinants model from table 5 and 4, and the cash flow sensitivity of cash from table 6. Where, instead of a binary period, before = 0 and after = 1, the treated dummy is interacted with year dummies. Table 9 report the results.

Table 9: Dynamic Effects

Tangibility is a dummy set to one if the firms is at the top tercile of the distribution, 0 otherwise. Ln(Assets) it's the natural logarithm of total assets and Q is the Market Cap plus Debt divided by book value of Equity. OCF is Operating Cash Flow divided by Assets. Standard Errors are clustered at firm level. Leverage is Debt over Assets. NetNWC is the Net Working Capital minus Cash divided by Total Assets and Capex is Investment in Fixed Assets over Total Assets. SDOCF is the Standard Deviation of the Operating Cash Flow. Payout is dividends paid over Total Assets. Standard Errors are clustered at firm year level.

	(1)	(2)	(3)	(4)
VARIABLES	Lncash	Lncash	Delta Cash	Delta Cash
2003 × *Tang*	0.011	-0.015	0.008	0.013
	(0.233)	(0.300)	(0.019)	(0.021)
2004 × *Tang*	-0.067	-0.145	-0.007	0.005
	(0.238)	(0.262)	(0.019)	(0.020)
2005 × *Tang*	-0.483*	-0.651**	-0.038**	-0.038*
	(0.281)	(0.299)	(0.019)	(0.021)
2006 × *Tang*	-0.602*	-0.699*	-0.027	-0.018
	(0.332)	(0.362)	(0.019)	(0.020)
Ln(*Assets*)	-0.842***	-0.763***	-0.048**	-0.050**
	(0.240)	(0.268)	(0.019)	(0.020)
Q	0.281***	0.292**	0.019***	0.017**
	(0.096)	(0.126)	(0.006)	(0.008)
OCF	1.456	1.652*	0.169**	0.187**

	(0.925)	(0.985)	(0.067)	(0.072)
Leverage	0.239	0.361		
	(0.460)	(0.457)		
NetNWC	0.262	0.144		
	(0.476)	(0.482)		
Capex	1.394**	1.188*		
	(0.636)	(0.627)		
SdOCF	-1.014	-0.987		
	(1.626)	(1.391)		
Payout	5.998***	5.789***		
	(1.481)	(1.429)		
Constant	13.045***	11.175**	0.962**	0.951**
	(4.862)	(5.452)	(0.393)	(0.409)
Observations	523	523	523	523
R-squared	0.206	0.266	0.101	0.177
Number of id	135	135	135	135
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
Industry FE	Yes	Yes	No	No
Industry * Year FE	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

With 2002 as the base year, from column (1) and (2) it is possible to see that the effect of the reform only takes place after the end of 2004, as for the cash flow sensitivity of cash, the only year that shows statistical difference from 2002 is 2005. This is another way to rule out alternative explanations and to show parallel trends.

1.3.6 Change in Collateral value and debt capacity and the real effects

Table 10 shows the possible effects that the introduction of the new bankruptcy law could have on how the firms pay its shareholders, the estimates from column 1 suggest that this change in collateral value and increase in debt capacity did not affect the firm's payout to its shareholders, where although positive, the coefficient of interest is not statistically significant.

As the new bankruptcy law affected positively firms that have more tangible assets, could it be that these firms invested more in fixed assets since they did not have the need to hold cash. In that sense, I estimated the Fazzari et al. (1988) cash flow sensitivity of investment, with our variable of interest the interaction between 2004 tangibility and after the passage of new bankruptcy law. Table 6, column 2, suggests that tangible firms did not invest differently than less tangible firms in the period after bankruptcy law.

Table 10: Real Effects

After is a dummy that takes value 1 for years 2005 and 2006, 0 otherwise. Tangibility is a dummy set to one if the firms is at the top tercile of the distribution, 0 otherwise. Ln(Assets) it's the natural logarithm of total assets and Q is the Market Cap plus Debt divided by book value of Equity. OCF is Operating Cash Flow divided by Assets. Standard Errors are clustered at firm level. Leverage is Debt over Assets. NetNWC is the Net Working Capital minus Cash divided by Total Assets and Capex is Investment in Fixed Assets over Total Assets. SDOCF is the Standard Deviation of the Operating Cash Flow. Payout is dividends paid over Total Assets. Standard Errors are clustered at firm year level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Payout	Capex	Leverage	St Debt	Lt Debt	Asset Growth	NetNWC
After ×*Tang*	0.001	-0.005	-0.039	-0.025*	-0.014	-0.017	0.036
	(0.004)	(0.016)	(0.025)	(0.013)	(0.025)	(0.038)	(0.031)
Ln(*Assets*)	-0.004		-0.002	-0.016	0.014	0.302***	0.191***

	(0.005)		(0.038)	(0.016)	(0.034)	(0.049)	(0.049)
Q	0.007	-0.005	0.044	0.046**	-0.004	-0.056	0.009
	(0.005)	(0.014)	(0.030)	(0.021)	(0.021)	(0.037)	(0.027)
Capex	0.008						-0.120
	(0.014)						(0.087)
OCF	0.201***	-0.096	-0.536***	-0.343***	-0.184**	0.760*	0.353*
	(0.043)	(0.089)	(0.143)	(0.120)	(0.087)	(0.402)	(0.192)
SDOCF	-0.139*		-0.393*	-0.107	-0.292	-0.405	0.258
	(0.073)		(0.202)	(0.197)	(0.184)	(0.657)	(0.235)
Leverage	-0.019						-0.290**
	(0.014)						(0.132)
Payout						-0.065	-0.491
						(0.547)	(0.440)
Constant	0.093	0.049***	0.341	0.449	-0.108	-6.172***	-3.875***
	(0.105)	(0.015)	(0.777)	(0.326)	(0.695)	(0.998)	(1.000)
Observations	523	523	523	523	523	523	523
R-squared	0.254	0.029	0.209	0.159	0.057	0.360	0.187
Number of id	135	135	135	135	135	135	135
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As Araujo et al. (2012) indicate, as the creditors' expected to receive more in case of bankruptcy, and there was an increase in the enforcement of collateral, it is expected that Brazilian firms' increase their debt levels. To check this relation, a Rajan & Zingales (1995) regression was estimated. Table 10, column 3, suggest that more tangible firms did not issue more debt than less tangible firms. Also, Leverage in Brazil is closely related to operating cash flow and investment opportunities. Column 4 shows that more tangible firms had

statistically significant less short-term debt than intangible firms, the reasoning can be that with more debt capacity and less cash needed, the management decided to pay the short-term debt to preserve financial flexibility. As the representative firm has 10% of its assets financed by short-term debt, a decrease of 2.5% represents 23 million less in short-term debt, which is almost the decrease of cash holdings that tangible firms had from table 4.

Another channel that the increase in collateral value can have real effects is the general asset growth of the company, although I cannot reject the hypothesis that tangible and intangible firms experienced the same growth.

1.4 Final Remarks

One major topic in corporate finance literature is which factors affect firms cash holdings. Since Opler et al. (1999) it is known that the amount of leverage, growth opportunities and size, affects the amount that firms have as a liquidity cushion. This paper aggregate on the cash holdings literature showing that a positive exogenous shock to collateral value is related to a decrease in the amount that firms have as cash holdings. This result corroborates the precautionary hypotheses of cash holdings - that cash holdings serves as internal financing source to future investment opportunities - as, with an increase in debt capacity, firms decrease cash holdings. Additionally, firms decrease the amount from cash flow that is used to build up cash reserves. Besides, real effects show that managers in Brazil used the cash reserves to pay up short term debt and increase the financial flexibility. This result is important to emerging markets due the less availability of resources to fund investments, in this sense, when public policy raise the value of collateral, it makes companies allocate cash resources more efficiently.

References

Almeida, H., Campello, M., & Weisbach, M. S. (2004). The cash flow sensitivity of cash. *The Journal of Finance*, *59*(4), 1777–1804.

Angrist, J. D., & Pischke, J.-S. (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press.

Araujo, A. P., Ferreira, R. V., & Funchal, B. (2012). The brazilian bankruptcy law experience. *Journal of Corporate Finance*, *18*(4), 994–1004.

Assunção, J. J., Benmelech, E., & Silva, F. S. (2013). Repossession and the democratization of credit. *The Review of Financial Studies*, *27*(9), 2661–2689.

Benmelech, E., & Bergman, N. K. (2009). Collateral pricing. *Journal of Financial Economics*, *91*(3), 339–360.

Campello, M., & Larrain, M. (2015). Enlarging the contracting space: Collateral menus, access to credit, and economic activity. *The Review of Financial Studies*, *29*(2), 349–383.

Chaney, T., Sraer, D., & Thesmar, D. (2012). The collateral channel: How real estate shocks affect corporate investment. *American Economic Review*, *102*(6), 2381–2409.

Dittmar, A., Mahrt-Smith, J., & Servaes, H. (2003). International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative analysis*, *38*(1), 111–133.

Fazzari, S., Hubbard, R. G., & Petersen, B. (1988). Investment and finance reconsidered. *Brookings Papers on Economic Activity*, *1*, 141–206.

Gan, J. (2007). Collateral, debt capacity, and corporate investment: Evidence from a natural experiment. *Journal of Financial Economics*, *85*(3), 709–734.

Gao, H., Harford, J., & Li, K. (2013). Determinants of corporate cash policy: Insights from private firms. *Journal of Financial Economics*, *109*(3), 623–639.

Gormley, T. A., & Matsa, D. A. (2013). Common errors: How to (and not to) control for unobserved heterogeneity. *The Review of Financial Studies*, *27*(2), 617–661.

Harford, J. (1999). Corporate cash reserves and acquisitions. *The Journal of Finance*, *54*(6), 1969–1997.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics*, *3*(4), 305–360.

Keynes, J. M. (1936). *The general theory of employment, interest, and money*. Macmillan Cambridge University Press, New York.

La Porta, R., Lopez-de Silanes, F., & Shleifer, A. (1999). Corporate ownership around the world. *The Journal of Finance*, *54*(2), 471–517.

Lei, J., Qiu, J., & Wan, C. (2018). Asset tangibility, cash holdings, and financial development. *Journal of Corporate Finance*, *50*, 223–242.

Lilienfeld-Toal, U. v., Mookherjee, D., & Visaria, S. (2012). The distributive impact of reforms in credit enforcement: Evidence from indian debt recovery tribunals. *Econometrica*, *80*(2), 497–558.

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics*, *52*(1), 3–46.

Ponticelli, J., & Alencar, L. S. (2016). Court enforcement, bank loans, and firm investment: evidence from a bankruptcy reform in brazil. *The Quarterly Journal of Economics*, *131*(3), 1365–1413.

Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? some evidence from international data. *The Journal of Finance*, *50*(5), 1421–1460.

Vig, V. (2013). Access to collateral and corporate debt structure: Evidence from a natural experiment. *The Journal of Finance*, *68*(3), 881–928.