The Brazilian bankruptcy law experience

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A B S T R A C T

In early 2005, the Brazilian Congress approved a new bankruptcy law. The new legislation increased creditor protection and improved the efficiency of the bankruptcy system. This paper evaluates the empirical consequences of a bankruptcy reform on a poorly developed credit market. Using data from Brazilian and non-Brazilian firms, we estimated, using two different models, the effect of the bankruptcy reform on contractual and non-contractual debt variables. In general, both models yielded similar results. Concerning contractual debt variables, we found a significant increase in the total amount and the long-term debt and a reduction in the cost of debt. For the non-contractual debt variable, we found no effect in the loans’ ownership structure.

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1. Introduction

Debt in its various forms is an essential instrument to finance most firms. However, in order to make it perform well, the legal environment must be designed so that creditors can enforce repayment efficiently. Bankruptcy laws play a key role in determining whether or not the legal environment enables creditors to do so.

Authors who have formalized theory on private credit argue that when lenders can easily force repayment they are more willing to extend credit at lower prices (see Aghion and Bolton, 1992, Hart and Moore, 1994, 1998; Townsend, 1979). Yet, the theory shows that loan size and price are not the only variables that respond to different legal mechanisms. Others debt characteristics, such as maturity and number of lenders, are also sensitive to creditors’ ability to force repayment (see Bolton and Scharfstein, 1996; Diamond, 2004; Gertner and Scharfstein, 1991).

Several empirical papers have examined how institutions such as the bankruptcy law affect credit markets and other economic outcomes (see La Porta et al. (1997, 1998), henceforth LLSV; Djankov et al. (2007, 2008), Levine (1998, 1999) and others). The evidence in the literature indicates the relevance of creditors’ legal protection in supporting the development of credit markets. However, as stated by Djankov et al. (2008), institutions that regulate insolvency usually perform poorly, mainly in developing countries. This happens because bankruptcy procedures in these countries are often extremely inefficient (too long and costly) and secured creditors rights are not well protected.

In this paper we focus on the effects of bankruptcy laws reform that have enhanced the efficiency and creditors protection in developing countries. From a policymaker’s perspective, it is crucial to understand how law design matters for firms’ debt financing and

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the credit market development. We contribute to the literature by documenting and shedding some light on the role of creditor protection in explaining financial deepening in developing countries. To address this issue, we took advantage of Brazilian bankruptcy law reform in 2005 to analyze how it affected contractual and non-contractual debt variables, such as size, maturity, price and loan ownership structure.

Most previous empirical works have looked for cross-country correlations between creditors’ rights and financial policies. This approach tends to produce results that are sometimes hard to interpret, mostly due to endogeneity problems and the existence of several omitted factors in cross-country studies. Our paper, in contrast, focuses on a natural experiment that has affected creditors’ rights and bankruptcy efficiency occurred in only one country (Brazil). This narrower scope can work to our advantage, since the analysis of a specific reform makes it easier to identify the causal effect of creditors’ protection on financial policies. By comparing the same country in two different periods – each period with a different law regulating bankruptcy procedures – to countries with similar economic environments, we can better control these omitted variables that pose a problem for cross-country studies. Also, the reform helps us to address the challenge of actually measuring creditor rights.

Following a quasi-experimental approach, we compare Brazilian firms (our treatment group) to non-Brazilian firms from Argentina, Chile and Mexico (our control group), with respect to the behavior of debt related variables. This approach helps to control our analysis for shocks in the credit market common to these countries during our sample period.

We start our analysis by looking at the time series of aggregate data on private credit extended to firms and compare its path before and after the bankruptcy law reform, for the Brazilian and non-Brazilian markets. We then move to firm-level panel data and estimate the impact that changes in the bankruptcy law had on contractual and non-contractual debt characteristics. First, we use a difference-in-difference model in which Brazilian firms are the treatment group and non-Brazilian firms compose the control group. To check whether the results were driven by changes in macroeconomic conditions in Brazil instead of the reform, we perform a battery of falsification tests that replicate our estimation, under slightly different conditions. The falsification tests are based on data from before the reform, which we use to replicate our empirical exercise in counterfactual situations. The placebo tests try to capture possible pre-reform trends through the inclusion of binary explanatory variables for the years before the reform came into effect.

The diff-in-diff approach works best in an ideal setting, in which both groups display similar behavior in credit variables prior to the bankruptcy reform. However, this is not a straightforward property to attain. And since the identification of average treatment effects using diff-in-diff estimation relies on the assumption that treatment and control units experience common trends (as emphasized by Blundell and Dias (2002)), the use of a standard diff-in-diff method may not consistently estimate the average treatment effect on the treated. Because our sample contains firms from four different countries, it would be unrealistic to assume that all firms are subject to the same macro trends. In fact, differential trends might arise in the evaluation of the bankruptcy reform effect if treated and controls operate in different financial markets, which is exactly our case. Because of this, we use as a second approach a modified version of the basic diff-in-diff model to allow for different firm trends within our treatment and control groups.

Some important conclusions can be drawn from the results. First, our findings from the diff-in-diff model with different trends point to a reduction of approximately 8% in the cost of debt and to increases of 10% and 23% in the amount of both total debt and long-term debt, respectively. Since secured creditors have benefited more from the new law than unsecured ones, the effect is more pronounced on long-term debt, which is known to be more correlated with secured debt. In addition, we found no statistically significant effect on short-term debt. Finally, we found no significant changes concerning loan ownership structure. Thus, our results suggest that policies that strengthen creditors’ protection and increase bankruptcy efficiency have a positive impact on lenders’ willingness to supply credit, improving firms’ access to external finance and expanding firms’ investments capability.

Our paper relates to previous studies that investigate the impact of laws and institutions on external financing. In a micro level analysis, Qian and Strahan (2007) and Bae and Goyal (2009) studied the effect of creditor rights on loan contracts characteristics (such as price, size, maturity, etc.) using cross-country differences. Focusing only on distressed companies, Davydenko and Franks (2008) used a sample of small firms in France, Germany and U.K. to study how differences in creditors’ rights make banks adjust their lending practices. They showed that the level of collateral requirements varies with banks’ ability to realize assets upon default. Giannetti (2003), using a database of unlisted companies from Europe, showed that firms in countries with creditor rights above the average have easier access to loans to finance investments in intangible assets without collateral (e.g., R&D). Also, creditor rights are important for guaranteeing access to long-term debt. Beck et al. (2008) investigates the heterogeneous effect of institutions on firms’ financing relative to their size. We should mention that unlike the mentioned studies, our paper deals with an experiment that helps to control for the existence of unobservable factors present in these cross-country studies. This allows us to improve on the existing literature from a methodological standpoint, since we can use the Brazilian experience to identify the causal effect of creditors’ protection on firms’ financing policies.

This paper also adds to the literature on a macro level. LLSV were the first to stress the important role of both legal protection of creditors and efficiency of debt enforcement in supporting these markets. Djkov et al. (2008) analyzed institutions more deeply by looking at 88 countries and investigating how different legal systems would deal with an identical case of an insolvent firm. As LLSV, they found that efficiency of debt enforcement – measured by its cost, time and asset disposition – is an important factor for the development of debt markets across countries. Djkov et al. (2007) added to LLSV by introducing the effect of information on credit markets. Also in this line, Jappelli and Pagano (2000, 2002), Pagano and Jappelli (1993) and Sapienza (2002) showed the relevance of this factor in determining credit availability. Brown et al. (2009) found evidence of the same effect on

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1 See for example La Porta et al. (1997), Djkov et al. (2007, 2008), Qian and Strahan (2007), Bae and Goyal (2009) and others.
2 See Mulherin (2007).
3 The author argues that listed companies have easier access to international financial market, which may bias the results.

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transition economies, with stronger correlation for opaque firms than transparent ones. Our contributions to this literature are mainly two: first, we bring new results on how creditors’ protection and bankruptcy efficiency relate to financial development in developing countries; second, since we do not need to make use of a specific measure of creditor protection and bankruptcy efficiency, our results are not subject to an arbitrary index that defines the toughness or the weakness of a law.

The remainder of the article is organized as follows: section two discusses the Brazilian bankruptcy law reform; section three presents the data base; section four reports the results; and section five concludes.

2. The new Brazilian bankruptcy law

Most of the old legislation regulating the Brazilian bankruptcy procedures was enacted in 1945. Despite prescribing both liquidation and reorganization – the latter called concordata (composition with creditors) and intended to prevent or reduce the liquidation of viable enterprises – in practice the insolvency process was ineffective in maintaining the value of firms’ assets and protecting creditors’ rights in liquidation. The bankruptcy priority rule was very punitive to creditors. It was specified in the following order: first, labor claims; second, tax claims; third, secured creditors’ claims; and finally unsecured creditors’ claims (including trade debts).

The process through which the assets were made available to creditors was slow and highly ineffective, mainly because of procedural inefficiency, lack of transparency and the so-called succession problem, whereby tax, labor, and other liabilities, including off-balance sheet liabilities, were transferred to the buyer of an asset sold in liquidation. This liability transfer depressed the market value of an insolvent company’s assets. In addition, the priority given to labor and tax claims had the pernicious effect of eliminating any protection to other creditors.

The old reorganization procedure, the concordata, basically only postponed debt payment and did not lead to actual restructuring, with no renegotiation between parties. The procedure also incentivized an informal use of the system to promote consensual renegotiations, notwithstanding an insufficient legislative framework capable of fostering workouts.4 The old bankruptcy procedures’ inadequate design, distorted incentives and lack of effective mechanisms to support corporate restructuring resulted in disproportional default rates of potentially viable companies.

Fig. 1 illustrates one of the dimensions of inefficiency that characterized the former bankruptcy procedures. For a comparative analysis, we use seven groups of countries: the Organization for Economic Cooperation and Development (OECD), Latin America and the Caribbean (LAC), the Middle East and North Africa (MENA), Europe and Central Asia (ECA), East Asia and the Pacific (EAP), South Asia (SAS) and sub-Saharan Africa (SSA).5 Notice that the average time to close a business in Brazil was more than twice the average for Latin America. This situation eroded the value of assets and thus lowered the amount received by creditors. Creditor recovery rates from before the reform illustrate the ultimate effect of an inefficient procedure with poor creditor protection. In Brazil, the recovery rate in case of bankruptcy was a mere 0.2%, while the averages for Latin American and OECD countries were 26% and 72%, respectively. The basic reason for such low recovery was the priority order, since creditors ranked behind labor and tax claims. Thus, the remaining amount from the bankruptcy process used to pay creditors was usually insignificant or even nil. Since this fact was known to creditors ex-ante, they increased the interest rate charged to firms. This was the main reason for the extremely high interest rate spread in Brazil before the new law.6

4 A workout is an informal renegotiation of loans that takes place outside the judicial courts.

5 The Latin American and Caribbean block is composed of Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

6 The interest rate spread confirms the tightness of the Brazilian market: the Brazilian spread (49%) is more than four times larger than the average spread in Latin American countries (11%) and more than 12 times larger than the average for OECD countries (3.87%). All values refer to the 1997–2002 period. See Araujo and Funchal (2005).
On June 9, 2005 the new bankruptcy legislation (Law 11,101/05) came into effect. The new law improved on existing rules by integrating the insolvency system into the country's broader legal and commercial systems, providing in- and out-of-court options to reorganize, and striking a reasonable balance between liquidation and reorganization. It also significantly improved the flexibility of the insolvency legal system by allowing the conversion of reorganization proceedings into liquidation, by establishing a period in which debtors can apply for rehabilitation in response to liquidation proceedings filed against them, and by introducing a new out-of-court reorganization system for prepackaged restructuring plans. Also, the new law imposed a new constraint on debtors’ bankruptcy requests: the value of the ending liabilities must exceed 40 times the minimum monthly wage. All these changes have helped to dissuade debtors from misbehaving.

The new liquidation procedure introduced six key changes. First, the top-tier labor credits are now limited to an amount equal to 150 times the minimum monthly wage to each worker, and the remaining labor credit has priority together with unsecured credit. Second, secured credits are now given priority over tax credits. Third, unsecured credits are given priority above some of the tax credits. Fourth, the distressed firm may be sold (preferably as a whole) before the creditors’ list is constituted, which can speed up the process and increase the firm’s value in the event of bankruptcy. Fifth, tax, labor, and other liabilities are no longer transferred to the buyer of an asset sold in liquidation. Finally, any new credit extended during the reorganization process is given first priority in the event of liquidation. The first two changes have had a direct impact on secured creditors’ expected recovery rates. Since under the former bankruptcy law, secured creditors came after all labor and tax claims, the priority given to secured creditors has increased significantly. The third one has increased unsecured creditors’ priority. The fourth, fifth and sixth changes, in turn, have increased the value of firms in bankruptcy. Following Townsend (1979), Aghion and Bolton (1992) and Hart and Moore (1994, 1998), we expect a shift in the supply of credit, increasing the total amount of firms’ debt and reducing the cost of capital. Also, as argued by Scott (1977), the stronger effect should appear in the types of credit that benefited the most from the improvement in priority. Therefore, we would expect to see a greater boost in long-term debt, which is more correlated to secured debt.

Brazil’s new reorganization procedure was inspired by Chapter 11 of the U.S. Bankruptcy Code. Whereas under the previous bankruptcy law, secured creditors came after all labor and tax claims, the priority given to secured creditors has increased significantly. The third one has increased unsecured creditors’ priority. The fourth, fifth and sixth changes, in turn, have increased the value of firms in bankruptcy. Following Townsend (1979), Aghion and Bolton (1992) and Hart and Moore (1994, 1998), we expect a shift in the supply of credit, increasing the total amount of firms’ debt and reducing the cost of capital. Also, as argued by Scott (1977), the stronger effect should appear in the types of credit that benefited the most from the improvement in priority. Therefore, we would expect to see a greater boost in long-term debt, which is more correlated to secured debt.

Fig. 2. Evolution of bankruptcy related variables before and after the reform.

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makes a sweeping proposal for recuperation that must either be accepted by workers, secured creditors and unsecured creditors (including trade creditors) or the distressed firm will be liquidated. Therefore, creditors play a more significant role in the current procedure than in the previous one, including negotiating and voting for the reorganization plan. These changes motivate creditors to participate more actively in the bankruptcy process. Following arguments in Diamond (2004), we expect to see less short-term debt in firms’ capital structure, as lenders become less passive. However, by reducing the cost and length (see Fig. 1) associated with financial distress, the new bankruptcy law made reorganization more efficient, which according to Gertner and Scharfstein (1991) enables firms to use more of this type of credit, since the roll-over risk is reduced. These effects go in opposite directions and, therefore, the net effect on short-term debt is ambiguous, depending on which effect dominates.

This new design of Brazilian bankruptcy procedures brings new incentives to the interested parties. The incentive for debtors to default strategically is reduced, for two main reasons: first, the conditions under which debtors can file for bankruptcy are limited to those prescribed by law; and second, a reorganization procedure can be converted to liquidation at creditors’ discretion, a feature that nearly eliminates the use of reorganization as a bargaining mechanism.

Fig. 2A and B gives a clear indication of this change in incentives. They show, respectively, the number of liquidation requests and the number of reorganization requests, both before and after the Brazilian bankruptcy reform. Notice that in both cases the number of requests dropped abruptly after the reform, which is in line with what would be expected as a consequence of reducing incentives to strategic defaults.

Creditors, on the other hand, now face new incentives to actively participate in the bankruptcy procedures, due to three key changes: first, now creditors play a more significant role in the procedures than they previously did, including negotiating the reorganization plan and then voting on its validity; second, they can file for out-of-court reorganization; and third, their credits’ priority in case of liquidation is higher now than it was under the previous legislation. Observe, in Fig. 2C, that the number of liquidation requests, which previously was more than ten times greater than reorganization requests, dropped to practically the same as the number of reorganization requests. This illustrates the more active behavior of creditors.

As a consequence of the bankruptcy reform, in 2006 the creditor recovery rate increased to 12% in Brazil, while the averages of Latin American and OECD countries remained stable (29% and 67%, respectively). It continued to grow in the following years, reaching 17% in 2009. Also, the average time to close a business in Brazil has fallen from 10 to 4 years, which works in favor of reducing depreciation of assets. The reduction of incentives for debtors to default strategically and the increase in creditors’ recovery rates can also bring changes in loan structure ownership. Bolton and Scharfstein (1996) argued that lower incentives to strategic default reduce the need for multiple borrowers, while the increase in the firm’s value reduces the need for fewer creditors. Both effects induce changes in the loan ownership structure.

3. Data set

Our sample contains firm-specific fiscal-year-end accounting data on 698 publicly traded firms, from 1999 to 2009. Financial institutions were excluded from our sample since their financial policies differ strongly from those of firms in other sectors and they are not subject to the Brazilian bankruptcy law. About half of these firms (338) are Brazilian and belong to the treatment...
group; the rest of them belong to the control group, which is divided as follows: 108 firms are Mexican, 82 are Argentine, and the remaining 170 are Chilean firms. The data were obtained from Economatica.

We consider as firm debt the sum of balance sheet short-term and long-term debt, plus suppliers' accounts (also called trade credit). We also have information on debt concerning its source (bank or public debt). The cost of debt is calculated, for each firm, as total year's interest expenses, divided by its total debt (except trade debt) over the same period. We divided the five different debt variables into two groups:

- Contractual debt terms: cost of debt, short-term debt, long-term debt and total debt;
- Non-contractual debt terms: bank-to-public debt ratio.

To act as controls, we also collected fiscal-year-end information on the firms' total assets, price-to-book ratio, return on assets and earnings before interest and taxes (EBIT).

Also, since the reform may affect firms' debt variables in a heterogeneous way, depending on some borrower characteristics, we included the following measures:

1. Tangibility: tangible assets are easier to collateralize, thus having a direct effect on debt characteristics. The straightforward approach is to expect firms with a higher proportion of tangible assets to benefit the most from the new law, since the reform made secured creditors climb one position in the priority order, placing them right in front of tax claims and second only to labor claims. Nonetheless, one must consider that in an economic environment where creditors' rights are weak, collateralized debt plays a significant role in insolvency situations, inasmuch as creditors are allowed to collect the asset placed as collateral as soon as debtors become insolvent. We capture asset tangibility through the ratio between PP&E (property, plant and equipment) and total assets.

2. Tax intensity: firms that pay more taxes should benefit more from the bankruptcy law reform, since the new law improved the priority of secured creditors over tax claims. We tried to capture tax intensity by the ratio between tax expenditures (EBIT minus Net Profit) and revenue.

3. Risk of liquidity bankruptcy: Firms more likely to experience liquidity problems should face a greater risk of bankruptcy. This forces lenders to increase interest rates in order to break even, which in turn encourages this type of firm to default strategically. By increasing creditors' recovery rate, the new law should mitigate these problems, making the effect of the reform stronger for firms with a greater risk of experiencing liquidity problems. Following Asquith et al. (1994), Andrade and Kaplan (1998) and Almeida et al. (2011), we employ the twelve-month variation of interest coverage ratios (EBIT divided by financial expenses) as a measure of risk of liquidity bankruptcy.

4. Results

This section presents our estimation results. We start with some evidence from aggregate data on the Brazilian and the non-Brazilian private credit markets for firms, and then move to a firm-level analysis, presenting the findings from the standard difference-in-difference model and the difference-in-difference model with different trends.

4.1. Evidence from aggregate data

To gain a broader perspective on the aftermath of the bankruptcy reform in Brazil, we start by examining the evolution of the credit market in that country, and then compare this evolution with similar figures for Argentina, Chile and Mexico. The data we use in this section is monthly, obtained from the central banks of these four countries. All monthly time series begin in January 2001, except for the time series of Argentina, which begins in January 2003. The variable that measures the size of firms' credit market is the total amount of credit provided by the private sector to firms, as a percentage of the gross domestic product (GDP).
This table presents the results of the regressions performed on aggregate data from Brazil, Argentina, Chile and Mexico. In the first two columns, the dependent variable is the ratio between private credit to firms and GDP. We have data ranging from January 2001 through December 2010 for all countries except Argentina, whose time series start at January 2003. In the first regression, we include the bankruptcy law dummy, codified as one for post-2005 Brazilian observations, and zero otherwise; a dummy codified as one from 2005 onwards; and the country dummies (one for each country except Brazil). In the second regression, along with the dependent variables present in the first regression, we also add quadratic and linear trend terms, as well as interactions between these terms and the country dummy variables. In the last two regressions, the dependant variable is a measure of the size of the Brazilian private credit market to firms relative to the average size of this market in Argentina, Chile and Mexico. For each year, this measure was built by dividing the ratio between private credit to firms and GDP for Brazil by the average of the same ratio for the other countries in our sample. Column three presents the results for the time series regression in which we add only the bankruptcy reform dummy as explanatory variable. The last column presents the results of the fourth regression, in which we also add a linear and a quadratic trend term as explanatory variables. We also include the intercept term in all regressions. Only point estimates and p-values (in parentheses) for the main variables are reported.

### Table 1
Aggregate time series and panel data estimates.

<table>
<thead>
<tr>
<th>Bankruptcy reform dummy</th>
<th>Private credit to firms GDP</th>
<th>Relative size of private credit market in Brazil</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8239</td>
<td>0.7239</td>
<td>0.1399</td>
</tr>
<tr>
<td>0.000</td>
<td>0.016</td>
<td>0.000</td>
</tr>
<tr>
<td>1.6910</td>
<td>0.3967</td>
<td>–</td>
</tr>
<tr>
<td>0.000</td>
<td>0.077</td>
<td>–</td>
</tr>
<tr>
<td>Linear trend term</td>
<td>–</td>
<td>0.0554</td>
</tr>
<tr>
<td>–</td>
<td>0.092</td>
<td>–</td>
</tr>
<tr>
<td>Quadratic trend term</td>
<td>–</td>
<td>0.0011</td>
</tr>
<tr>
<td>–</td>
<td>(0.000)</td>
<td>–</td>
</tr>
<tr>
<td>Column</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Data</td>
<td>Panel</td>
<td>Panel</td>
</tr>
<tr>
<td>Observations</td>
<td>456</td>
<td>120</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.9286</td>
<td>0.9679</td>
</tr>
<tr>
<td></td>
<td>0.6982</td>
<td>0.9357</td>
</tr>
</tbody>
</table>

Fig. 3 depicts the evolution of this measure of credit market development for Brazil. It shows a marked shift around the time the new law was implemented, in the direction suggested by the theory. From 2001 to 2005, the level varies around 10% of GDP, and just after the new bankruptcy law took effect, we see a change in its trend, leading to an increase in its level to something like 15% of GDP in 2008, an expansion of approximately 50% in relative terms. The average private credit to GDP ratio before the reform was 9.36%, while it is 12.88% after the reform.

Fig. 4 introduces information on the same variable for Argentina, Chile and Mexico, with January 2003 normalized to 100 since only this is the period when we start to have information for all four countries. Notice that around mid-2005 all series are close to each other, and as time progresses Brazil detaches itself from the other countries.

The statistical significance of the aggregate impact is measured by regressing the firms’ private credit market variable on a post-law dummy, which is equal to 1 for Brazil after the new law was implemented and zero otherwise. Table 1 shows the results using four different specifications. The first two specifications are panel regressions with country fixed effects. The differences in means are significantly different from zero at the 1% level (regression 1).

Regression 2 addresses the fact that common trends could be driving the results in regression 1, although Figs. 3 and 4 suggest otherwise. To deal with this issue, we introduce a quadratic trend in our panel regression and we interact it with country fixed effects. It reduces the difference of means before and after the reform, but still produces statistically significant results. Regressions 1 and 2 point to increases of 20% and 8% in the Brazilian private credit market for firms.

Regression 3 and 4 are time series regressions. In this case, we use a relative measure of credit market size, dividing the Brazilian private credit to GDP ratio by the non-Brazilian ratio. The results from regression 3, without the quadratic trend, and regression 4, with the quadratic trend, are similar to the panel regression results. They are highly significant and show a relative increase of between 12% and 28%, approximately.

### 4.2. Difference-in-difference

Turning to the firm-level analysis, we now compare the average change in the outcome variable of units in the treatment group before and after the bankruptcy reform, to the average change for units in the control group, after controlling for time-invariant non-observables and for common shocks.

The difference-in-difference model can be specified as the following firm fixed-effect linear regression model:

\[
y_{it} = \eta_i + \psi_t + \beta dBL_{it} + \Gamma X_{it} + u_{it}
\]

13 Since we are running a time series regression, if we add Argentina we lose about 20% of our sample. Therefore, in this specification, we decided to use only Chile and Mexico, with equal weights.

The right hand side of the equation includes the firm’s fixed effects \( (\psi_i) \), to control for specific factors that are fixed over time; the time-dependant term \( \phi_t \), to control for common shocks that vary over time; the vector of controls, \( X_{it} \); and the coefficient \( \beta \), whose estimate should provide a value of the impact of the Brazilian bankruptcy reform on debt variables. The variable \( BL_d = 1 \) whenever the new bankruptcy law was in effect in year \( t \) and whether firm \( i \) is Brazilian.

Table 2 presents the results estimated by employing this model to our data set. Regressions 1 and 4 point to an increase in the total amount of debt and in the long-term debt after the enactment of the new bankruptcy legislation. In fact, point estimates indicate an increase of 17.8% in total debt and of 74% in long-term debt. There is no evidence of changes in short-term debt (regression 2), and a significant fall in trade credit. We did not expect a big increase in this type of credit, since its holders were not benefitted by the new law as were secured creditors. In fact, the need for trade credit falls as the availability of debt financing increases. Finally, regression 5 suggests a reduction of approximately 16% in the cost of debt financing.

These results are in line with the theoretical literature on credit (Aghion and Bolton, 1992; Hart and Moore, 1994, 1998; Scott, 1977; Townsend, 1979). Creditors now have a higher chance of recovering a larger portion of their loans. And the more they expect to receive when their debtors become insolvent, the less they will require firms to pay while still solvent, and the more they will be willing to lend. Thus, these are signs that the Brazilian bankruptcy reform had a positive effect on the supply of credit.

We also have results on debt maturity. Notice that long-term debt increases while short-term debt remains stable, leading to a higher proportion of long-term debt in the average firm’s capital structure. This result is somewhat similar to what both Qian and Strahan (2007) and Bae and Goyal (2009) found. The new bankruptcy law design encourages lenders to participate in bankruptcy procedures more actively, eliminating the need to extend only short-term debt as a discipline mechanism and leading, after the reform, to a debt structure with longer maturity (see Diamond, 2004).

We also investigate how the effect of bankruptcy reform relates to tax intensity (Taxes/Revenue), likelihood of liquidity default and asset tangibility (PP&E/Total Assets) introducing the interaction variable between each one of them and the bankruptcy reform dummy. Most of their estimates showed no statistical or economic significance, pointing to a homogenous effect of the law on firms’ debt financing.\(^ {15} \)

After focusing on the general effect the new bankruptcy law had on contractual debt variables, we now move our attention to a non-contractual debt variable. Contrary to the results for contractual debt variables, the diff-in-diff estimates for bank debt/public debt did not find any significant change. According to Bolton and Scharfstein (1996), a possible explanation for this result could be an increase in firm value coinciding with fewer incentives for debtors to default strategically.\(^ {17} \) The first change tends to reduce the need for borrowing from fewer creditors while the second change reduces the incentive to borrow from multiple creditors.\(^ {18} \)

Table 2

<table>
<thead>
<tr>
<th>Total debt</th>
<th>Short-term</th>
<th>Trade debt</th>
<th>Long-term</th>
<th>Cost of debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy reform dummy</td>
<td>0.1780</td>
<td>0.0061</td>
<td>−0.1984</td>
<td>0.7423</td>
</tr>
<tr>
<td>(0.064)</td>
<td>(0.954)</td>
<td>(0.049)</td>
<td>(0.000)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Taxes/total revenue</td>
<td>−2.1799</td>
<td>−2.3065</td>
<td>−0.1208</td>
<td>−0.8566</td>
</tr>
<tr>
<td>(0.000)</td>
<td>(0.001)</td>
<td>(0.81)</td>
<td>(0.39)</td>
<td>(0.645)</td>
</tr>
<tr>
<td>Likelihood of liquidity defaults</td>
<td>−0.0001</td>
<td>−0.0001</td>
<td>−0.0001</td>
<td>−0.0001</td>
</tr>
<tr>
<td>(0.351)</td>
<td>(0.454)</td>
<td>(0.245)</td>
<td>(0.480)</td>
<td>(0.406)</td>
</tr>
<tr>
<td>PP&amp;E</td>
<td>0.3538</td>
<td>0.3694</td>
<td>0.2598</td>
<td>0.4885</td>
</tr>
<tr>
<td>(0.110)</td>
<td>(0.256)</td>
<td>(0.170)</td>
<td>(0.147)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Total assets</td>
<td>2.4175</td>
<td>2.6002</td>
<td>3.4375</td>
<td>1.1935</td>
</tr>
<tr>
<td>(0.000)</td>
<td>(0.002)</td>
<td>(0.000)</td>
<td>(0.0780)</td>
<td>(0.512)</td>
</tr>
<tr>
<td>EBIT</td>
<td>12.8475</td>
<td>11.3379</td>
<td>−3.6195</td>
<td>24.5218</td>
</tr>
<tr>
<td>(0.013)</td>
<td>(0.041)</td>
<td>(0.438)</td>
<td>(0.00)</td>
<td>(0.800)</td>
</tr>
<tr>
<td>Return on assets</td>
<td>−0.0046</td>
<td>−0.0051</td>
<td>0.0056</td>
<td>−0.0104</td>
</tr>
<tr>
<td>(0.089)</td>
<td>(0.085)</td>
<td>(0.047)</td>
<td>(0.007)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Price-to-book ratio</td>
<td>0.0098</td>
<td>0.0457</td>
<td>0.0293</td>
<td>−0.0357</td>
</tr>
<tr>
<td>(0.566)</td>
<td>(0.014)</td>
<td>(0.063)</td>
<td>(0.245)</td>
<td>(0.502)</td>
</tr>
<tr>
<td>Column</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Observations</td>
<td>3143</td>
<td>3143</td>
<td>3069</td>
<td>2621</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0892</td>
<td>0.1559</td>
<td>0.2645</td>
<td>0.0093</td>
</tr>
</tbody>
</table>

\(^{15}\) Given that most results are not significant, we decided not to include them in the table.

\(^{16}\) A proxy for the firm’s liquidation value is the creditor recovery rate. It used to be 0.2 cents on the dollar before the reform, but it went to 17 cents on the dollar right after the reform.

\(^{17}\) See the dynamics of liquidation and reorganization requests in Figs. 2 and 3.

\(^{18}\) Given that most results are not significant, we decided to suppress them from the table.
Nonetheless, these results could have been driven by changes in macroeconomic conditions in Brazil instead of the reform. To deal with this concern we perform a battery of falsification and placebo tests that replicate our estimation, under slightly different conditions.

The falsification tests are based on data from before the reform, which we use to replicate our empirical exercise as if the reform was implemented not in 2005, but in 2003 or 2004 instead. These tests aim to verify whether any effect we may find – and attribute to the new law – is in fact particular to the post-2005 years or if it is just the expression of a more general trend, already present in Brazil in the years prior to the new law. In this exercise, we used no data from 2005 onwards.

In these tests, when we estimate the values of the coefficients associated with the “false bankruptcy reforms” of 2003 and 2004, we expect to find no effect – or at least an effect different from the one found when we estimated the impact of the true reform. If the falsification results turned out to be similar to those obtained through the estimation of Eq. (1), then we would most likely not be able to attribute our diff-in-diff results to the new law instead of some broader macroeconomic movement.

We also run placebo tests that try to capture possible pre-reform trends through the inclusion of binary explanatory variables for the years before the reform came into effect. In these tests, in addition to the bankruptcy law dummy variable, other coefficients are introduced to capture any existing pre-reform trend. For each outcome variable, we introduce up to two dummies relative to the years immediately before the bankruptcy reform.

Table 3 reports the falsification and placebo tests. The falsification tests found no statistically significant pre-reform effects similar to our main results, for all debt variables. Regarding the placebo tests, we also found no statistically significant estimates undermining our main results or pointing to the existence of preexisting factors influencing them. Therefore, one could argue that the effect previously estimated is probably linked to the bankruptcy law reform.

4.3. Diff-in-diff with different trends

One basic feature of diff-in-diff models is the assumption that both the treatment and the control groups are subject to the same macro trend influencing their outcomes. Nonetheless, although this is arguably a valid assumption if both groups display similar behavior prior to the bankruptcy reform, this is not a property easily attained. In fact, differential trends might arise in the evaluation of the bankruptcy reform effect if treated and controls operate in different financial markets, which is exactly our case. Because of this, we use a modified version of the basic diff-in-diff model to allow for different firm trends within our treatment and control groups.

The model specification we adopt is a panel data model, with fixed effects and a firm-specific trend. We estimate for each of the dependent variables the following model:

\[ y_{it} = \eta_i + \delta_i t + \beta_d BL_{it} + X_i \Gamma + u_{it} \]

Most of the terms in the equation above are also present in the previous models. The exception is the linear firm-specific trend term, which generalizes the diff-in-diff assumption that all units are subject to a common macro trend.

### Table 3

Tests for contractual debt variables.

This table presents the results of falsification and placebo tests performed on contractual debt variables. With the exception of cost of debt, all outcome variables are in logarithms. We include the same controls as in Table 2 – as well as the intercept term – but do not report their estimates. All variables (with the exception of the dummy variables) are winsorized at 5%. Only point estimates and p-values (in parentheses) are reported.

**Panel A: Falsification tests for contractual debt variables**

<table>
<thead>
<tr>
<th></th>
<th>Total debt</th>
<th>Short-term</th>
<th>Long-term</th>
<th>Cost of debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>One if firm is Brazilian and year is 2003 or 2004</td>
<td>0.0302 (0.669)</td>
<td>0.0955 (0.246)</td>
<td>0.0451 (0.786)</td>
<td>-0.0102 (0.889)</td>
</tr>
<tr>
<td>One if firm is Brazilian and year is 2004</td>
<td>-0.0425 (0.523)</td>
<td>-0.0133 (0.857)</td>
<td>-0.0899 (0.534)</td>
<td>-0.035 (0.526)</td>
</tr>
<tr>
<td>Observations</td>
<td>1722</td>
<td>1722</td>
<td>1722</td>
<td>1414</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0433</td>
<td>0.0435</td>
<td>0.0479</td>
<td>0.0647</td>
</tr>
</tbody>
</table>

**Panel B: Placebo tests for contractual debt variables**

<table>
<thead>
<tr>
<th></th>
<th>Total debt</th>
<th>Short-term</th>
<th>Long-term</th>
<th>Cost of debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy reform dummy</td>
<td>0.1974 (0.046)</td>
<td>0.2191 (0.031)</td>
<td>0.003 (0.978)</td>
<td>0.7742 (0.000)</td>
</tr>
<tr>
<td>One if firm is Brazilian and year is 2004</td>
<td>0.0998 (0.175)</td>
<td>0.1233 (0.118)</td>
<td>0.0469 (0.582)</td>
<td>0.0809 (0.371)</td>
</tr>
<tr>
<td>One if firm is Brazilian and year is 2003</td>
<td>-0.0102 (0.229)</td>
<td>-0.1483 (0.134)</td>
<td>-0.1623 (0.407)</td>
<td>-0.1971 (0.421)</td>
</tr>
<tr>
<td>Observations</td>
<td>3143</td>
<td>3143</td>
<td>3143</td>
<td>2621</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0529</td>
<td>0.0533</td>
<td>0.0367</td>
<td>0.0515</td>
</tr>
</tbody>
</table>

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This specification has the advantage of allowing for a great deal of heterogeneity among firms of different countries – even among firms within the same country – through both the incidental parameter $\eta_i$ and the idiosyncratic linear trend term $\delta_i$. It is a specification general enough not only to contemplate the case in which firms from the same country are affected by a common linear trend, but also to include any case in which a subset of the firms in our sample is jointly influenced by a linear trend.

The identification strategy we follow consists in taking the first difference of Eq. (2) to eliminate the incidental parameter, arriving at the first-differenced form of the equation:

$$\Delta y_{it} = \delta_i + \beta \Delta dB_{it} + \Delta X_{it} \Gamma + \epsilon_{it}$$

We then estimate this differenced equation, as if $\delta_i$ was a regular fixed-effects term.

Table 4 reports the results of the diff-in-diff model with different trends. It shows that the estimates are qualitatively the same as those from our previous specification. The results for total debt and long-term debt (labeled as regressions 1 and 3) are highly significant and point to an increase of approximately 10 and 23 log points, respectively. The estimation for short-term debt produced a negative point estimate, but a non-significant one. However, even if the amount of short-term debt remained stable after the bankruptcy reform, the increase in long-term debt is enough to indicate that the debt structure of the average firm in the post-2005 years has a longer maturity.

It is interesting to note that the magnitudes from the aggregate data presented previously are similar to our results for firm-level data, in both models, even though the aggregate data contain all kinds of firms, not only publicly traded ones. Our aggregate data regressions 2 and 4 give us an increase between 8% and 12% respectively. Our estimation from firm-level data points to an average increase between 10% and 17%, for the diff-in-diff with different trends and for the diff-in-diff, respectively.

The results for cost of debt are also consistent with those from the previous model. Regression 4 reports a significant decrease of approximately 7.8% in the cost of debt after the enactment of the new bankruptcy law.

Finally, as in the results of the diff-in-diff estimation, the estimation produced no significant evidence of a change in the ratio between bank debt and public debt. Also, since most of the estimated heterogeneous effects were not significant, it seems fair to conclude that this model suggests a homogeneous effect on the firms of our sample.19

5. Conclusion

The enactment in 2005 of new bankruptcy legislation in Brazil aimed, among other things, to improve creditors’ protection and the bankruptcy system’s efficiency. The previous law was considered to have numerous flaws concerning not only the weak protection of creditors, but also the timing of liquidation, the succession problem and the lack of creditors’ influence in reorganization procedures, to name a few. Many of these issues were addressed by the new law, so we would expect to see some positive developments in the credit market.

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Table 4
Diff-in-diff with different trends panel robust estimates.

This table presents the estimation results of panel robust diff-in-diff with different trends. The outcome variables are: total debt, short-term debt, long-term debt and cost of debt. Control variables are the same as in Table 2. All explanatory variables (with the exception of the dummy variable) are winsorized at 5%. Only point estimates and p-values (in parentheses) are reported.

<table>
<thead>
<tr>
<th></th>
<th>Total debt</th>
<th>Short-term</th>
<th>Long-term</th>
<th>Cost of debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bankruptcy reform dummy</td>
<td>0.0998</td>
<td>−0.1530</td>
<td>0.2346</td>
<td>−0.0778</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.122)</td>
<td>(0.026)</td>
<td>(0.063)</td>
</tr>
<tr>
<td>PPE</td>
<td>0.0763</td>
<td>−0.5421</td>
<td>1.0258</td>
<td>−0.3395</td>
</tr>
<tr>
<td></td>
<td>(0.796)</td>
<td>(0.229)</td>
<td>(0.116)</td>
<td>(0.242)</td>
</tr>
<tr>
<td>Taxes/total revenue</td>
<td>−0.9123</td>
<td>−1.2424</td>
<td>−0.1509</td>
<td>−0.1896</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.240)</td>
<td>(0.838)</td>
<td>(0.567)</td>
</tr>
<tr>
<td>Likelihood of liquidity defaults</td>
<td>0.0202</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>(0.808)</td>
<td>(0.574)</td>
<td>(0.782)</td>
<td>(0.367)</td>
</tr>
<tr>
<td>EBIT</td>
<td>0.0012</td>
<td>−0.0008</td>
<td>0.0001</td>
<td>0.0044</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.013)</td>
<td>(0.060)</td>
<td>(0.171)</td>
</tr>
<tr>
<td>Return on assets</td>
<td>−0.0062</td>
<td>−0.0190</td>
<td>−0.0008</td>
<td>−0.0051</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.802)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Price-to-book ratio</td>
<td>−0.0379</td>
<td>−0.0539</td>
<td>−0.0589</td>
<td>−0.0002</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.151)</td>
<td>(0.073)</td>
<td>(0.989)</td>
</tr>
<tr>
<td>Total assets</td>
<td>0.0003</td>
<td>0.0008</td>
<td>0.0002</td>
<td>−0.0002</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.000)</td>
<td>(0.011)</td>
<td>(0.220)</td>
</tr>
<tr>
<td>Column</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Observations</td>
<td>2356</td>
<td>2101</td>
<td>1893</td>
<td>1819</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.0309</td>
<td>0.0287</td>
<td>0.0226</td>
<td>0.0192</td>
</tr>
</tbody>
</table>

19 Once again, we decided to suppress these results from the table, for being non-significant.
Empirical evidence of these developments was investigated in the research that led to this paper, and the results were laid out in the previous section. We started by looking at the time series of the total amount of credit supplied by the private sector to firms in Brazil, Argentina, Mexico, and Chile, employing standard time series and panel data regression techniques. We then shifted our attention to firm-level data and proceeded to identify and estimate the effect of the new law based on two model specifications: first, we employed a diff-in-diff model using Brazilian firms as the treatment group, and firms from Argentina, Chile, and Mexico as the control group; then, seeking to make the difference-in-difference model more flexible, we turned to a diff-in-diff model with different trends.

Both firm-level specifications pointed to a positive effect of the new Brazilian bankruptcy law on the total amount of debt and long-term debt. For total debt, the estimated effect on Brazilian firms varied from 10% to 17%. For long-term debt, the diff-in-diff and the diff-in-diff model with different trends estimated effects of 74% and 23%, respectively. We found no evidence of a change in short-term debt. Finally, we found evidence of a reduction in the cost of debt financing between 7.8% and 16.8%, depending on which model specification we chose. We also found no evidence of changes in the loan ownership structure.

Finally, with regard to heterogeneous effect of the Brazilian bankruptcy reform concerning tax intensity, likelihood of liquidity default and asset tangibility, the results point to a homogenous effect of the law on firms’ debt financing.

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References