Corporate Governance and Credit Access in Brazil: The Sarbanes-Oxley Act as a Natural Experiment

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ABSTRACT

Manuscript Type: Empirical Research Question/Issue: This study seeks to examine the effect of changes in corporate governance levels on the choice of firms’ debt financing in a relevant emerging economy, taking advantage of the Sarbanes-Oxley Act as a natural experiment. Research Findings/Insights: Our empirical method uses an experimental design in which we control for observed and unobserved firm heterogeneity via a difference-in-differences estimator. We show that firms subjected to this new regulation, which raised governance requirements, observed a positive effect on their access to the credit market, increasing their total debt significantly, via long-term and private debt, and reducing the cost of debt, indicating that SOX produced economic gains in this aspect. Theoretical/Academic Implications: The main contribution of the present paper is to measure the corporate governance effects on firms’ debt financing policies, isolated from other contemporaneous events. Furthermore, we develop a simple theoretical model to help in the understanding of the main sources of SOX’s effects. Finally, the natural experimental approach deals with the endogenous relation between corporate governance and firms’ choices on debt financing, and presents an alternative to instrumental variables techniques. Practitioner/Policy Implications: This paper offers insights to policymakers of emerging economies interested in the development of the credit market. Using laws and regulations like the Sarbanes-Oxley Act, we show that it is possible to improve firms’ governance, with a positive impact on firms’ ability to access credit.

Keywords: Corporate Governance, Credit, Experiment

INTRODUCTION

Frictions in credit markets hinder companies from raising funds to finance investment projects with positive net present value. On the micro level, these financial constraints reduce the chance of firms’ growth and survival (Aghion, Angeletos, Banerjee, & Manova, 2005; Musso & Schiavo, 2008). On the macro level, the economic development literature has established a connection between credit market development and economic growth (e.g., King & Levine, 1993; Levine, Loyaza, & Beck, 2000). The empirical evidence suggests that institutions help the development of financial markets (e.g., Araujo, Ferreira, & Funchal, 2012; Coelho, Mello, & Funchal, 2012; Djankov, McLiesh, & Shleifer, 2007; La Porta, Lopez-de Silanes, Shleifer, & Vishny, 1997 La Porta, Lopez-de Silanes, Shleifer, & Vishny, 1997 and 1998).

After the failures of Enron, WorldCom, Adelphia and others, there was a great deal of discussion among academics, politicians and the press regarding a special type of institution: corporate governance.1 In the United States these huge bankruptcies spurred legislative reform, chiefly the Sarbanes-Oxley Act (henceforth SOX), to improve governance schemes. In addition, the debate in the media pointed to increasing attention of corporations on governance issues.2 In this paper, we focus on the effect of corporate governance on firms’ access to debt financing.

Unlike most studies that focus on other types of agency problems, like the manager compensation literature (Berle & Means, 1932; Fama, 1980; Jensen & Meckling, 1976; among others) or the ownership concentration literature (e.g., Demsetz, 1983; Demsetz & Lehn, 1985; Zingales, 1994), we shed some light on the benefits that improvements in corporate governance have on the reduction of information asymmetry between companies and lenders.

The problem of accessing credit markets is more severe in developing countries (e.g., Araujo et al., 2012; La Porta et al., 1997). Poorly designed institutions that deepen the asymmetric information problems explain their current situation. Therefore, from a policy perspective it is crucial to understand, theoretically and empirically, how improvements in governance schemes affect firms’ debt financing, especially for companies located in developing countries.

To conduct our study we use the Sarbanes-Oxley Act as a natural experiment as it imposed an exogenous shock at the corporate governance level. Also, we focus on the effect on...
Brazilian companies. We do this for two reasons: first, we want to shed some light on the effect of changes in governance on a relevant emerging economy; second, Brazil is the developing economy with the most cross-listed companies in US equity markets (therefore, subject to SOX regulation) and the use of Brazilian companies provides us better tools for our identification strategy.

Leuz (2007) points out that the main problem in assessing the effects of SOX is the difficulty of finding a control group of firms not affected and comparable to firms affected by SOX. This shortcoming makes it difficult to remove market-wide effects that are unrelated to SOX. In addition, Coates (2007) states that existing studies of SOX are confounded by the presence of contemporaneous economic and legal events, as the legislation was enacted amidst sharp financial and economic changes.

To deal with this problem, several authors use cross-listed companies to shed some light on the effects of SOX (e.g., Berger, Feng, & Wong, 2005; Li, Pincus, & Rego, 2008; Litvak, 2007; Smith, 2007). Berger et al. (2005 compare returns of cross-listed foreign companies to returns of US issuers. According to Litvak (2007), this allows evaluation of cross-sectional variation in reactions based on home-country characteristics, but does not allow assessment of overall investor reaction to SOX, because of the lack of a control group of companies to which SOX does not apply. Smith (2007) adopts an event study approach to test the impacts of SOX and Litvak (2007) applies a natural experiment approach, controlling for contemporaneous events using a control group.

To isolate the effect of SOX on debt financing policy from other shocks, we have to find treatment and control groups that are subject to the same shocks, except for SOX implementation. To do this, we use the difference-in-differences approach, which accounts for unobservable time effects. Under this approach, the Sarbanes-Oxley Act (SOX) is our natural experiment used to test the effect of changes in the level of corporate governance on the terms of debt, as the law causes an exogenous shock to governance requirements to all US public companies and to non-US firms with American depositary receipts (ADRs) listed at levels 2 and 3, and does not apply to foreign companies not listed or listed with ADR levels 1 or 144A. Brazil is a good choice in this respect. Large Brazilian firms extensively use American depositary share (ADS) programs, implying that part of our sample is subject to SOX regulation.

Our main results suggest that the average interest rate of companies subject to the Sarbanes-Oxley Act dropped after the law came into force, consistent with an expected reduction in moral hazard costs due to gains in corporate governance. We estimate a reduction in the cost of newly issued debt varying from 7 percent to 11 percent relative to matched firms not subject to SOX regulation, most of which comes from debt contracts issued in Brazil. As a consequence, we find an increase in the total amount of debt around 15 percent, consistent with a positive shift in the supply curve of credit. This increase in the amount of debt is driven mainly by long-term debt and private loans. Analyzing debt according to maturities, we find an increase of 23.9 percent in long-term credit, while on the other hand, we find a decrease of 9 percent in short-term credit. This indicates an increase in the average debt maturities. Concerning the source of credit, public and private loans, we found an increase between 12 and 20 percent for private debt and a reduction between 2 and 4 percent for public debt.

Together, these results suggest that the Sarbanes-Oxley Act had a positive impact on the terms of credit, lowering the cost and increasing the amount, consistent with a positive shift in the credit supply curve. Since SOX brought better information, manager punishment and monitoring, creditors could expect better corporate governance due to a reduction in managers’ moral hazard action. This reduction of asymmetric information cost increased the probability of success of investment projects. This effect reduced the risk of lending, motivating creditors to supply more credit with better terms.

In addition to these average effects on the treated group, we investigate the heterogeneous effect from the gains on governance. The only heterogeneity comes from the source of credit. Companies with lower levels of cash holdings (our proxy for probability of solvency) and monitoring benefit more from public and private loans respectively.

Our results also show an increase in long-term private debt contracts, such as term loans, in the post-SOX year, which corroborates the findings that SOX led to debt with longer maturity. Since borrowers’ financial health could change significantly over a long period, this result suggests that improved governance allowed private lenders to take on riskier debt contracts. With improvements in firms’ governance schemes, the risk of default declined, which explains both the shift in the supply curve of debt and the shift of debt from short term to long term.

Our paper belongs to a group of studies that examine the effect of asymmetric information related to corporate governance on firms’ financing policy and the terms of credit. In a broad way, Barath, Pasquariello, and Wu (2009) evaluate if information asymmetry drives decisions on capital structure. Concerning asymmetric information in corporate governance, Anderson, Mansi, and Reeb (2004) analyze the effect of board size and independence on the cost of debt. Concerning accounting system and accounting quality, Armstrong, Guay, and Weber (2010) show that the accounting system plays two important roles in reducing the agency costs that arise in the debt contracting process. Biddle and Hilary (2006) provide evidence of the relation between accounting quality and access to debt markets. Finally, Cremers, Nair, and Wei (2007) and Qiu and Yiu (2009) study the relationship between corporate control and the cost of debt.

Further, our results bring new evidence of a specific benefit of SOX, as we are exploring the gains of firms in the terms of credit. Much research has been carried out regarding the net effects of SOX (e.g., Engel, Hayes, & Wang, 2007; Kamar, Karaca-Mandic, & Talley, 2005; Leuz, Triantis, & Wang, 2008; Piotroski & Srinivasan, 2008; Sneller & Langendijk, 2007; among others).

Relating SOX and debt, Andrade, Bernille, and Hood (2014) point to a potential relationship between reliability of corporate reporting and cost of debt. The authors found a decrease in the cost of debt, provided by increased corporate transparency perceived by investors. Carter (2013) argues that an increase in firms’ financial reporting transparency induced by SOX promoted a reduction in the information asymmetry between managers and investors, increasing firms’ debt financing.
Costello and Wittenberg-Moerman (2011) study the trade-off between financial reporting quality and the use of financial covenants. Our paper is closely related to Andrade et al. (2014) and Carter (2013). In this study, we contribute to the literature by analyzing the existence of a specific benefit of SOX, isolated from other contemporaneous events, on the terms of debt finance. Furthermore, this natural experimental approach gets around the concern that corporate governance and debt are endogenous,4 and presents an alternative to instrumental variables techniques.

An important issue to be considered here is how steady the cross-listing decision is, as it may influence our identification strategy. Because of the significant increase in costs brought about by SOX, the listing decision is endogenous to the regulation and therefore companies can go dark after SOX, biasing our estimation. Leuz et al. (2008) documented a significant increase in the going dark decision, and attributed it to the Sarbanes-Oxley Act. However, Marosi and Massoud (2008) argue that foreign firms find delisting extremely difficult (they “can check in, but they can’t check out”).5

Brazil is also a good choice in this respect. None of the Brazilian firms cross-listed through level 2 or 3 ADR delisted in the post-SOX period, which contributes to our identification strategy by reducing the survivor bias problem. An estimation using countries with delisting tends to be biased in the direction of the average remaining firms, ignoring the fact that the event was the reason for the delisting decision. Hostak, Karaoglu, Lys, and Yang (2013) show that the delisting decision is positively associated with firms having poor governance. They argue that deregistration was motivated to protect the control rents of managers or controlling shareholders.

Brazilian firms have a particularly large benefit from issuing bonds in the US market, as they face extremely high interest rates6 due to poor legal enforcement7 and creditors’ protection in Brazil. For example, in 2002, the year that SOX was implemented, the Brazilian ratio of private credit to GDP was 0.35, while the average of OECD countries was 1.02 and of Latin America and Caribbean countries it was 0.44. Moreover, the Brazilian interest rate (49 percent) is more than four times larger than the average interest rate in Latin American countries (11 percent) and more than 12 times larger than the average for OECD countries (3.87 percent).8 Therefore, even with the addition of the SOX costs, the cross-listed credit market “outside option” inhibits their decision to go dark.

In summary, understanding the benefits of improvements in corporate governance schemes on debt capacity is important, at the micro level, to enable firms to enhance their financial capacity and, at the macro level, for countries to promote their credit market development and growth, crucial to emerging economies.

The remainder of this paper is organized as follows. The next section describes the relation between the Sarbanes-Oxley Act and corporate governance. The third section describes the empirical design. The fourth section presents the database and the main descriptive statistics, and the main results on the effect of corporate governance on firms’ debt financing are presented in the fifth section. The final section presents the conclusions.

THE SARBANES-OXLEY ACT AND CORPORATE GOVERNANCE

The Sarbanes-Oxley Act, officially called the Public Company Accounting Reform and Investor Protection Act, forced changes that affected executive compensation and fraud punishment, required stronger board and shareholder monitoring, established a new audit committee, heightened the potential liability of senior executives, and put in place many other rules to reduce information asymmetry (see Holmstrom & Kaplan, 2003).

To be more precise, one provision related to executive payments requires the CEO and CFO to give back any profits from bonuses and stock options during the 12-month period that follows a financial report that is subsequently restated due to misconduct. This provision increases their risk of selling a large amount of stock or options in any one year while still in office, inducing more conservative behavior until they are no longer in those positions before selling equity or exercising options. Also, this requirement acts as a deterrent to negligent or deliberate misreporting.

Shareholder-related provisions also enhance financial disclosure. SOX requires more detailed disclosure of off-balance-sheet financing and special purpose entities, which should make it more difficult for companies to manipulate their financial statements in a way that boosts the current stock price. The Act also includes several provisions designed to improve board monitoring. These focus largely on increasing the power, responsibility, and independence of the audit committee. SOX requires that the audit committee choose the outside auditor and that the committee consist entirely of directors with no other financial relationship with the company. Such changes in monitoring practices increase the chances of misconduct being identified, reducing the expected gains from moral hazard actions.

Finally, the law increases the responsibility of the CEO, CFO, and board for financial reporting and the criminal penalties for misreporting. This issue clearly increases their cost of misconduct, probably inducing less opportunistic behavior. Table 1 summarizes the set of mandates of SOX.

To sum up, the requirements imposed by SOX induce an improvement in the corporate governance system, as they reduce the potential gains to managers and increase their chances of being caught and the cost of misconduct.

The Sarbanes-Oxley Act and Cross-Listed Companies

Although the new law was enacted to address domestic US problems, it applies to all “issuers”, including foreign companies listed on the US stock market. In addition, the provisions concerning auditor oversight and independence apply to all accounting firms, including non-US ones. The application of SOX to foreign private issuers produced strong reactions from foreign executives and national regulators (Berger et al., 2005). Given the frequent conflicts between legal and regulatory regimes, the extraterritorial application of Sarbanes-Oxley has produced challenging areas of interpretation and implementation for the SEC and the companies subject to its provisions.

Additionally to the previous section, we describe a summary of new requirements, with limited relief, for foreign issuers:
A Simple Model

In this section, we try to elucidate the channels that link changes produced by SOX and the terms of credit. Several classic papers model the effect of information asymmetry on firms’ financing policy.

One of the seminal papers on the subject, Leland and Pyle (1977), develops a model with information asymmetry on the quality of the project to be financed. The information asymmetry explains the capital structure and the level of debt, as equity financing serves as a signal for good projects. In this paper, we are interested in another type of asymmetric information, the moral hazard that comes from the borrowers’ behavior.
Our model is closely connected with Diamond (1991) and Diamond and Verrecchia (1991). Both studies deal with borrowers’ moral hazard. Diamond (1991) shows that debt financing from banks has a positive effect on alleviation of moral hazard due to bank monitoring. This result shows that monitoring serves to screen borrowers, and the demand for monitoring will tend to be higher for companies without reputation that want to establish a good track record. Diamond and Verrecchia (1991), on the other hand, analyze the effect of information asymmetry on cost of capital. The authors show that disclosure improves liquidity of a firm’s securities, and this reduces its cost of capital. Our paper introduces monitoring and disclosure in the model to measure their effect on manager/borrower behavior and their impact on the terms of debt.

To analyze the potential effect of the law, let us consider an asymmetric information problem with regard to the level of effort and fraud that managers of debt-financed firms choose when they pursue projects. In this model, we ignore the moral hazard between managers and owners, since our focus is on the borrower-lender relationship and its effect on cost of credit. Since lenders do not observe the effort and fraud variables, they are not able to know whether a borrowing firm has chosen the optimal effort level. The managers can allocate their time to effort (e) to pursue the project’s success or fraud (f) to divert gains of the project to themselves by some means. Thus, their time is divided between effort and fraud, which is equal to the time spent in the firm a (a = e + f). A manager’s decision regarding effort and fraud affect the chance of being caught and the success of the firm’s investment. We assume that the probability of success of the investment project increases with the manager’s effort level. In precise terms, we assume that the probability of the firm being solvent (psolv(e)) is differentiable, strictly increasing, and strictly concave in the effort variable e, such that:

$$\lim_{e \to 0} p'_{\text{solv}}(e) = \infty,$$

meaning that it is efficient for the firm to choose a positive effort level and that psolv(e) < 1 for the insolvency state is always possible. Also, since there is a chance of a manager being caught, we assume that this probability increases with the manager’s fraud level (f) and the monitoring level (M). In precise terms, the probability of the manager being caught (q(f,M)) is differentiable and strictly increasing on the fraud level (f) and monitoring variable (M), and that q(f,M) < 1 for fraud not discovered is always possible.

The manager’s gains from fraud are a positive function of the level of fraud G(f) and its cost C(f) is the punishment imposed by the legislation. Figure 1 illustrates the dynamics of this problem. The figure represents the manager’s expected return as a function of his choice between fraud and effort. The firm can succeed and be solvent, providing a return of V. After the payment to creditors F (debt face value), the amount that remains for the manager is $V - F$. If the manager commits fraud and is not caught, he adds the gains from fraud ($V - F + \text{Fraud Gains}$), whereas if he is caught, he receives a punishment (Cf). The firm can go into bankruptcy, providing a return of zero for managers and for creditors (where $v < F$). If the manager commits fraud and is not caught, his gains come only from fraud (like personal benefits obtained during the management period, it can be pecuniary or non-pecuniary), whereas if he is caught, the punishment (Cf) is applied.

Thus, from the manager’s perspective and, for simplicity, assuming risk neutrality, he chooses the level of effort and fraud to maximize his expected wealth:

$$\max_{f,e} E(W) = p(e) [q(f,M)(-C_f) + (1 - q(f,M))(V - F + G(f))] + f e$$

$$v \left[ q(f,M)(-C_f) + (1 - q(f,M))(G(f)) \right]$$

subject to $a = e + f$.

The problem can be simplified and rewritten as:

$$\max_{f} E(W) = p(a-f)(1 - q(f,M))(V - F)$$

$$+ (1 - q(f,M))G(f) - q(f,M)C_f$$

The manager commits fraud until his marginal gain is equal to the marginal cost. The optimal level of fraud is a function of gains from solvency, gains from fraud, level of monitoring, level of punishment, etc. Thus, we can write the optimal choice of fraud as:

$$f^* = f(V - F, a, G(\cdot), M, C_f).$$

Notice that the Sarbanes-Oxley Act directly affects the last two exogenous variables (M and Cf). So, the question that we address is: How can an increase in the levels of monitoring (M) and punishment for fraud (Cf) affect the manager’s decision on fraud and effort on the firm’s projects? To see the effect, we take the manager’s expected wealth and divide it into three parts:
(1) Benefit from solvency:

\[ p(a - f)(1 - q(f, M))(V - F) \]  

(2) Benefit from not being caught:

\[ (1 - q(f, M))G(f) \]  

(3) Cost of fraud:

\[ q(f, M)C_f \]  

Suppose that the monitoring level increases from \( M \) to \( M' \). In this case, for a higher monitoring level, the level of fraud \( f \) has a stronger effect on the probability of being caught (since \( \frac{\partial q(f, M)}{\partial f} > 0 \)), reducing the marginal benefits from fraud (equations (1) and (2), respectively). In addition, it increases the marginal cost of fraud, as it increases the expected cost (3). Therefore, since a higher level of monitoring reduces the marginal benefit from fraud and increases its marginal cost, the optimal level falls from \( f^t \) to \( f^* \).

We can apply the same idea for the punishment level \( C_f \). Let us suppose an increase in \( C_f \), where \( C_f > C_f \). In this case, there is no change in the benefit (1 and 2), but the marginal cost of fraud (3) rises. Therefore, because the marginal cost increases, the optimal level falls from \( f^t \) to \( f^* \), where \( f^* > f^t \). Therefore, since we observe a fall in the fraud level, more time will be expended on the firm’s projects (since \( a = e + f \)), reducing the moral hazard problem.

Proposition 1. An increase in the monitoring level \( M \) reduces the moral hazard problem.

Proposition 2. An increase in the cost of fraud \( C_f \) reduces the moral hazard problem.

With a reduction in the fraud level \( f \), the time allocated (effort) by the manager to the firm’s project increases \( e \), making the solvent state of nature more likely (it increases its chance of success \( p(e) \)) and insolvent is less likely. This effect reduces the risk of lending by creditors, making the terms of credit better to the firm and, as a consequence, motivating the firm’s debt financing.

To see the effect on interest rates and the amount of credit, consider that the borrowing firm has a project that requires capital, \( I \), which the firm must raise externally. The firm promises to repay creditors the face value of a debt contract \( F \), where \( F = I(1 + r) \) and \( r \) is the interest rate charged by the lender. However, if the firm is insolvent, the repayment is the firm’s value of liquidation. Thus, the project can return a value, \( v \), where the firm is solvent if \( v \geq F \) and insolvent if \( v < F \). Two states are possible in the future, one if the firm is solvent and the other if it is not. The solvency and insolvency states return to the firm \( vsolv \) and \( vins \), respectively, where \( vsolv \geq F > vins \). The probability of solvency is \( p(e) \); the probability of insolvency is \( (1 - p(e)) \). This implies that the expected value of the project is \( E(v) = p(e) vsolv + (1 - p(e)) vins \).

Because the credit market is competitive, \( F \) is the largest sum that creditors can demand to fund the project, given the probabilities of solvency and insolvency and the firm’s value in the insolvency state of nature. The risk-free interest rate is assumed to be zero, and, therefore, the borrowing firm’s interest rate is a function only of the riskiness of its project.

Creditors that lend \( I \) should expect to receive \( I \) in return, as the market is competitive. This expectation can be written as follows:

\[ I = p(e)F + (1 - p(e)) vins \]

and

\[ F = I(1 + r) = \frac{I - (1 - p(e)) vins}{p(e)} \]

The firm’s interest rate is defined by \( r = (F/I) - 1 \), which is an increasing function of the debt contract’s face value \( F \); this is the value that the firm is required to repay in the solvency state. To simplify, suppose that the investment is normalized to one. Denoting by \( vins \) the per-unit-of-investment \( (I = 1) \) counterparts of \( vins \), we also have:

\[ r = \frac{(1 - p(e))}{p(e)} [1 - vins] \]

Therefore, the more the creditor expects to receive in the insolvency state, due to higher probability of success, the less it will require the firm to repay in the solvency state, reducing the interest rate.

Proposition 3. An increase in the probability of success \( p(e) \) reduces the interest rate.

As consequence, lower interest rates motivate the firm’s debt financing.

Proposition 4. An increase in the probability of success \( p(e) \) increases the firm’s debt financing.

From Propositions 1–2, we develop the following hypotheses to be tested:

Hypothesis 1a. The Sarbanes-Oxley Act increased firms’ debt financing.

Hypothesis 2b. The Sarbanes-Oxley Act reduced the interest rate in debt contracts.

**EMPIRICAL DESIGN**

In this section, we describe our experiment and the difference-in-differences method used in the paper.

**The Sarbanes-Oxley Act as an Experiment**

The basic idea of exploiting the implementation of SOX regulation is that it provides a way to identify the effect of changes in corporate governance on firms’ debt financing policies. The problem of dealing with the relation between corporate governance and the level of debt financing is their endogenous
relation. To approach this issue, our identification strategy requires the governance level to be variable enough to allow comparison across firms. Also, the variation of the corporate governance level needs to be exogenous and independent of firms’ financing policies. SOX represents an exogenous shock on the corporate governance level that is independent of firms’ financing policies.

Several studies use the Sarbanes-Oxley Act as an identification strategy. For example, Litvak (2007) compares returns to cross-listed companies subject to SOX (cross-listed at level 2 or 3) to returns of matching non-cross-listed companies from the same industry and country and similar in size. Carter (2013) uses Canadian firms to examine the effect of SOX on long-term debt ratios. Costello and Wittenberg-Moerman (2011) rely on SOX’s internal control reports to measure financial reporting quality. They analyze how material internal control weakness affects the use of financial covenants.

The major problem concerning the use of SOX as an experiment is the fact that it is difficult to disentangle its effects from other shocks occurring simultaneously in the financial and economic fields. The legislation was enacted amidst sharp financial, economic and political changes. To isolate the effect of SOX on debt financing from the other shocks, we have to find treatment and control groups that are subject to the same shocks, except for the SOX implementation. The cross-listing situation allows us to screen groups. Companies that have ADR level 2 or 3 programs require the US depositary bank to register the ADRs representing the issuer’s securities under the Securities Act by filing out Form F-6, following SOX rules. If a company has a class of securities registered under the Exchange Act, it is required to file periodic reports with the SEC. Form 20-F is the annual reporting form used by foreign private issuers. The only difference between levels 2 and 3 is that the latter program allows the issuer to raise capital through a public offering of ADRs in the US in addition to the creation of a trading market for the issuer’s equity securities. On the other hand, level 1 programs do not involve the listing of the ADRs on a US stock exchange, being traded through the over-the-counter market, and therefore, it is not required to register the securities under the Exchange Act and the issuer is not subject to SOX. In addition, foreign private issuers can raise capital by issuing ADRs pursuant to Rule 144A, which provides an exemption from the registration requirements of the Securities Act for securities issued in compliance with the rule. Due to this exemption, the foreign private issuer will not become subject to the periodic reporting requirements of the Exchange Act and of SOX.

Since the law provides an exogenous shock on governance requirements to all non-US firms issuing level 2 or 3 ADRs (treatment group), and it does not apply to foreign companies not listed or listed with ADR levels 1 or 144A, the existence of cross-listed firms presents a natural experiment.

Finally, we have to consider in the model the cross-listing decision, as it may influence our identification strategy. The listing decision is endogenous to changes in regulation and therefore it can produce a bias in our estimation. With the adoption of SOX, the costs of cross-listing increased, inducing firms to “go dark” (see Leuz et al., 2008). Using data on Brazilian firms, we can avoid this estimation problem as they extensively use ADS programs – implying that part of our sample is subject to SOX regulation – and none of the cross-listed firms in the ADR level 2 or 3 program delisted in the post-SOX period, which allows our identification strategy.

**Difference-in-differences Estimators**

We want to test whether firms altered their decision on debt financing policy after SOX took effect. Our objective is to develop an identification strategy that represents a “random” experiment, that is, any Brazilian publicly traded firm had a positive chance to be regulated by SOX. As we are interested in quantifying the impact of changes in the corporate governance level on terms of credit, we need to carefully identify a group containing firms that are virtually similar to those that suffered a change in their corporate governance, except for the fact that they did not suffer this shock. That is, we need to pin down the counterfactual firm financing policy in the period of SOX because it would represent the financing policy of the firms without the changes in the corporate governance level.

The matching estimator is closer to the idea of a randomized experiment. This procedure isolates treated observations – in this case firms subject to SOX – and then, from the untreated observations, searches for controls that best match the treated observations in several dimensions, called covariates, i.e., their characteristics are the closest to the treated ones.

Instead of representing a model that tries to fully explain the endogenous variable, the specification focuses on ensuring that variables can both influence the selection into treatment and that observed outcomes are appropriately accounted for in the estimation. While there are several theories to justify the inclusion of debt determinants, we only include in our estimations covariates that can make a reasonable case for simultaneity in the treatment outcome relation. It is commonly accepted that the covariates capture a lot of otherwise unobserved firm heterogeneity. Therefore, in matching, the set of counterfactuals are represented by the matched controls, or in other words, we assume that the treated group would have behaved the same as the control group if those firms had not been treated. The matches are made in the pre-treatment period, to ensure that both groups of observations have identical distributions along the covariates chosen.

In this paper we use the nearest-neighbor matching initially suggested by Abadie and Imbens (2006), with bias correction for average treatment effect. As Abadie and Imbens (2006, 2011) propose in their studies, the implementation of bias correction removes the conditional bias of matching asymptotically such that the resulting estimator is consistent. Without bias correction, the matching estimators include a conditional bias term, usually when few continuous variable are used for matching or when one does not have the exact match for discrete variables in a small sample. As a result, matching estimators may not be consistent. Nearest-neighbor matching estimation allows matching each treated firm with one or more control firms, for categorical and continuous variables. In our estimation, we use the nearest-neighbor matching with replacement and three matches per observation, reducing the expected variance of the treatment effect estimator. Finally, since we want to implement a matching difference-in-differences estimator, we model the outcomes in differenced form, which represents the time difference (the first difference), comparing both groups, which represents the group-
difference (the second difference). Therefore, we are comparing the changes in terms of debt financing across the groups.

Since the Sarbanes-Oxley Act was enacted in 2002, we compare how the outcomes behaved from pre-SOX to post-SOX between both treatment and matched control groups. We considered three period variations: from 2001 to 2003; from 2001 to 2003 and 2004; and from 2001 to 2003, 2004, and 2005. To be more precise, our variable of interest is the variation $\Delta y$ from 2001 to 2003. To capture long-run effects and also to increase the number of observations, we first add variation from 2001 to 2004 and then variation from 2001 to 2005. We expect a significant difference in outcomes between groups, with lower tendency of interest rate and higher tendency of amount of credit for the treatment groups compared to its counterfactual.

In addition to the matching estimator, we also run an OLS regression. We do this for two reasons: first, this enables us to capture the heterogeneous effect of SOX on debt policy behavior using interactions between variables that we cannot do with matching; second, this allows us to check the robustness of our results to changes in the empirical method.

Thus, our second estimation method is a difference-in-differences panel model with fixed effects, which compares the outcomes in the treatment group before and after the change in regulation with outcomes in the control group while controlling for time-invariant heterogeneity (ownership structures, for example). Unlike the matching estimator, the difference-in-differences panel model does not work with variables in difference. Thus, we use data from 2001 to 2009 in our estimation and we include a set of year dummies to account for all common shocks (pure time series) and therefore macroeconomic or political shocks that affect all Brazilian companies are controlled by this set of dummies, as well as control variables to account for firms’ heterogeneities.

However, it is fair to argue that since ADR issuers have access to the US financial markets, the difference of terms of credit for both groups of companies (with and without ADRs) could be driven by the Brazilian macroeconomic moment. Because of this, the treatment group consisted of Brazilian firms with ADRs listed at levels 2 and 3, and the control group consisted of Brazilian companies with level 1 or 144A ADRs. In summary, the identifying variation was the difference (at the firm level) between treatment and control groups, before and after adoption of the law. More specifically, we measured the effect of the law by estimating the following model:

$$y_{it} = \alpha_i + \delta_t + \beta_1 \text{DID}_{it} + \beta_2 \text{DID}_{it} \cdot \text{CH}_{it} + \beta_3 \text{DID}_{it} \cdot \text{Monit}_{it}$$

$$+ \sum \phi_j X_{ij} + \epsilon_{it}$$

where $y_{it}$ is the credit variable (amount, source, price, etc.) for firm $i$ in year $t$. The right-hand side of the equation includes a full set of firm dummies ($\alpha_i$), which control for all pure cross-section invariant unobserved heterogeneity, and a full set of year dummies ($\delta_t$) that control for all common macroeconomic shocks. The diff-in-diff variable (DID) is a dummy variable that assumes a value of 1 for companies cross-listed at level 2 and 3 and after SOX was enacted, and zero otherwise. The parameter associated with the difference-in-differences variable, $\beta_1$, is our main coefficient of interest. Also, we added the cash holdings variable (CH), a proxy for the probability of solvency. Acharya, Davydenko, and Strebulaev (2012) argue that cash-rich firms should have lower probability of default and lower credit spreads, other things equal. As Propositions 3 and 4 show, we expect that a higher probability of solvency induces lower cost of debt and larger amounts of debt, and the effect of SOX should be weaker for companies with better solvency situation. The parameter that captures this heterogeneous effect is $\beta^3$.

Additionally, following Propositions 3 and 4, we expect a heterogeneous effect of SOX on firms with different pre-SOX levels of monitoring. We use the monitoring cost variable (Monit) to interact with the DID variable, and the parameter $\beta^3$ estimates this heterogeneous effect. To measure the monitoring cost, we use the sub-indexes of Brazilian Corporate Governance Index of 2002, which measure disclosure and board composition and functioning.\textsuperscript{11} We believe that firms with more disclosure allow creditors/investors to access their accounting and financial information more easily, reducing the monitoring cost. In addition, better board composition and functioning may exert an initial monitoring effect on companies’ management, reducing the creditors’ monitoring cost as well.\textsuperscript{12}

Among the list of remaining variables used as controls, we have:

(i) total assets, to control for effects of scale;
(ii) cash holdings, as firms with different levels of cash holdings have different repayment capacity;
(iii) accrued profit, to capture the contemporaneous profitability;
(iv) fixed assets, as it can be used as collateral in debt contracts, and;
(v) equity, as it helps to measure how distressed companies are.

**DATA AND DESCRIPTIVE STATISTICS**

Our data come from two distinct sources, “Capital IQ” and “Economatica”. The first source has information on the firms’ debt contracts, such as type of debt, principal, spread, index, and maturity. We use this database to measure the real interest rate paid by the companies and maturity. Data on balance-sheet information on publicly traded Brazilian firms comes from the second source. Both data sets cover the period from 2001 to 2009.

**Debt Contracts Database**

Our database concerning debt contracts is from Capital IQ – Standard and Poor’s. Capital IQ reports the stock debt contracts that each company holds per year. This database has a total of 30,937 observations of debt contracts from 291 firms, for a period that runs from 2001 to 2009. However, several contracts have some missing information. We dropped contracts if: the contract does not have information on interest rate spread (9,889 observations); the information is duplicated (2,831 observations); and the contract does not have information on principal (5,541 observations). Finally, some of the publicly traded Brazilian companies took credit from the
National Bank for Economic and Social Development (BNDES) at subsidized rates (TJLP, or long-term interest rate, plus a modest spread). This type of credit is closely related to political decisions, and because of such characteristics, we also dropped all companies that use this type of credit (717 firm-year observations and 5,436 contracts). The remaining sample has 4,429 contract observations, and 890 firm-year observations. For cost of debt, we also discard 206 firm-year observations leaving 684 firm-year observations, 226 firms overall and 22 firms with ADR level 2 or 3.

Each contract has information about its type, interest rate index, interest rate spread, date of issue, principal amount, maturity, and others. Concerning the price of debt contracts, they have their own coupon rate characteristics. The coupon rate can be fixed or floating and in the latter case, it is composed of the interest rate index and spread. Thus, for floating rates, they can be indexed by: Libor, CDI (Interbank Deposit Certificates), TJLP (government subsidized rate), Selic (Central Bank benchmark rate), IGP-M (Brazilian general market price index), CPI (US inflation rate), and others.13

Our challenge here is to make the price of debt comparable in order to aggregate it to calculate an average of ex-ante real interest rates faced by each firm each year.14 To do this, we have to follow the specific characteristics of debt contracts issued inside Brazil or outside the country. Brazil has compound interest rates, and because of this for all contracts indexed by a Brazilian index we compounded the interest rate index with the spread, deflating by the expected IGP-M. For contracts with foreign indexes, mainly Libor and CPI, we used the linear interest rates, deflating by the expected CPI.

Having the real interest rate of each debt contract, the next step is to calculate the average real interest rate paid by each company each year. To do this we use the share of the principal of each debt contract to the total amount of debt issued by the firm in the specific year to define the weight of each contract in the firm’s average interest rate. We decided not to

### TABLE 2
Descriptive Statistics and Median Tests

This table presents descriptive statistics and median tests of our covariates and terms of credit (differenced) for the year immediately before the Sarbanes-Oxley Act took effect. Our sample is identified by merging firms listed in “Capital IQ” and “Economatica”. The first source has information on firms’ debt contracts. Balance-sheet information of publicly traded Brazilian firms comes from the second source and is scaled by total assets. For this specific year, we have 34 firms composing our treatment group (cross-listed firms at levels 2 and 3) and 257 firms composing our non-treatment group (firms that are either not specifically subject to the Act (cross-listed firms at levels 1 and 4) or not subject to any US regulation at all (no ADR firms)). Panel A presents descriptive statistics considering all firms. Panel B presents median tests comparing treatment firms with non-treatment firms and firms matched with same characteristics as firms in treatment group (control group). The Mann-Whitney median test was used. See Appendix A for variable definitions.

#### Panel A: Descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Median</th>
<th>Q1</th>
<th>Q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total credit</td>
<td>0.30</td>
<td>0.42</td>
<td>0.23</td>
<td>0.08</td>
<td>0.38</td>
</tr>
<tr>
<td>Cost of credit</td>
<td>4.67</td>
<td>5.93</td>
<td>3.72</td>
<td>0.99</td>
<td>7.56</td>
</tr>
<tr>
<td>Maturity</td>
<td>4.12</td>
<td>3.21</td>
<td>3.50</td>
<td>1.93</td>
<td>5.20</td>
</tr>
<tr>
<td>Firm size</td>
<td>3131</td>
<td>4382</td>
<td>1059</td>
<td>320</td>
<td>3374</td>
</tr>
<tr>
<td>Cash holdings</td>
<td>0.12</td>
<td>0.21</td>
<td>0.06</td>
<td>0.02</td>
<td>0.16</td>
</tr>
<tr>
<td>Equity</td>
<td>0.43</td>
<td>0.22</td>
<td>0.42</td>
<td>0.25</td>
<td>0.60</td>
</tr>
<tr>
<td>PPE</td>
<td>0.40</td>
<td>0.25</td>
<td>0.39</td>
<td>0.20</td>
<td>0.58</td>
</tr>
<tr>
<td>Accrued profit</td>
<td>-0.09</td>
<td>0.32</td>
<td>0.00</td>
<td>-0.03</td>
<td>0.00</td>
</tr>
</tbody>
</table>

#### Panel B: Mann-Whitney median tests

<table>
<thead>
<tr>
<th></th>
<th>Treatment</th>
<th>Non-treatment</th>
<th>P-value</th>
<th>Treatment</th>
<th>Control</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total credit</td>
<td>0.22</td>
<td>0.12</td>
<td>0.24</td>
<td>0.22</td>
<td>0.34</td>
<td>0.67</td>
</tr>
<tr>
<td>Cost of credit</td>
<td>1.46</td>
<td>3.41</td>
<td>0.04</td>
<td>1.46</td>
<td>3.50</td>
<td>0.15</td>
</tr>
<tr>
<td>Maturity</td>
<td>3.50</td>
<td>4.00</td>
<td>0.98</td>
<td>3.50</td>
<td>4.00</td>
<td>0.97</td>
</tr>
<tr>
<td>Firm size</td>
<td>8329</td>
<td>728</td>
<td>0.00</td>
<td>8329</td>
<td>6074</td>
<td>0.11</td>
</tr>
<tr>
<td>Cash holdings</td>
<td>0.05</td>
<td>0.03</td>
<td>0.00</td>
<td>0.05</td>
<td>0.07</td>
<td>0.83</td>
</tr>
<tr>
<td>Equity</td>
<td>0.43</td>
<td>0.35</td>
<td>0.00</td>
<td>0.43</td>
<td>0.48</td>
<td>0.06</td>
</tr>
<tr>
<td>PPE</td>
<td>0.51</td>
<td>0.40</td>
<td>0.00</td>
<td>0.51</td>
<td>0.61</td>
<td>0.83</td>
</tr>
<tr>
<td>Accrued profit</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.77</td>
</tr>
</tbody>
</table>
aggregate debt contracts issued within and outside Brazil for two reasons: first, we want to investigate if the impact on interest rates depends on the place that the contract was issued; second, these contracts are issue in different currencies and therefore present an exchange rate risk. If we aggregated these contracts, firms could simply migrate from one to another and the change in interest rate could be due to differences in exchange rate instead of changes brought about by SOX.

Firms’ Balance Sheet Database

Firms accounting data comes from the Economatica database. We used year-end information on amount of debt (total, short term, and long term), public and private debt, total assets, cash holdings, accrued profit, fixed assets, and equity. The amount of debt variables are the variables of interest, while the other accounting/financial variables are used in the fixed effects panel model as controls and in the matching procedure as covariates.

Descriptive Statistics

To proceed with our empirical tests, we use data merged from the Capital IQ and Economatica databases. Our final sample is composed of observations of 291 Brazilian companies, where 34 had ADS (level 2 and 3 cross-listed firms), from 2001 to 2009, disregarding observations from financial institutions, as their financing policies differ greatly from those of firms from other sectors. We call this subsample of 34 firms that use the ADS program the treatment group, as these firms were subject to the changes brought about by SOX. The remaining firms either are not listed outside Brazil or are listed at ADR levels 1 or 144A, called the untreated group.

Now we present the descriptive statistics, concerning our covariates and credit variables. We removed all observations that appear to be misreported (such as negative numbers for credit or zero assets). To keep firm size from influencing the accounting variables (amount of credit, cash holdings, equity, fixed assets, and accrued profits), we use the variables divided by total assets.

Panel A of Table 2 presents the descriptive statistics for the whole sample and for the year immediately before the Sarbanes-Oxley Act took effect. Panel B presents the median values of our covariates and terms of credit (differenced) again for the year immediately before the Sarbanes-Oxley Act took effect. For this specific year, we have 34 firms composing our treatment group and 257 firms that are not specifically subject to the Act. From this group of 257 companies, 18 firms are cross-listed firms at levels 1 and 144A, and the remainder (239) are not cross-listed at any level. Panel B compares the treatment group with all publicly traded firms not affected by SOX, representing the untreated group. Notice that for the pre-SOX period, both groups have similar medians for the amount of credit, unlike that observed for the covariates, which present a significant difference between the treatment and non-treatment medians. The treated firms are bigger, with higher cash holdings, equity, and fixed assets. However, potential similarities were not expected, as we are not running a truly random experiment.

The benefit brought by the matching estimators is to control for these distributional differences, which can affect both the selection in the treatment group and the post-SOX outcomes. We perform again the same Mann-Whitney median test but in comparison with the control group, identified by the matching procedure from Abadie and Imbens (2006). In this case, if two observations of the opposite treatment group are equally close to that being matched, we allowed both to be used. Observe in Panel B that there is no highly significant statistical difference between the control and the treatment group for all the covariates. Apart from equity, which is significant at 10 percent, no others are statistically different.

To illustrate the potential impact of SOX implementation, we compare the evolution of the credit-assets ratio between firms in the control group against the control group. Figure 2 shows a strong increase in the amount of total credit after SOX became effective only for the treatment group. The annual mean of total credit to assets ratio increased from 0.66 to 0.82 for the treatment group, while it remained almost the same for the control group, which means a variation of 24 percent for the treatment group. The results are qualitatively the same for long-term and short-term credit-to-assets ratio.

As illustrated in Figure 3, the annual average cost of newly issued credit presents dynamics consistent with that related
with amount of total credit. The figure shows a strong decrease in the cost of newly issued credit after SOX became effective only for the treatment group. The annual average real cost of newly issued credit decreased from 2.45 percent to 1.16 percent for the treatment group while it rose from 4.05 percent to 4.25 percent for the control group, which means variations of approximately –53 percent and 5 percent for the treatment and control groups, respectively. To sum up, the descriptive statistics show that after Sarbanes-Oxley there was a strong increase in credit for the treatment group, unlike the control group, which remained stable or even dropped. In terms of cost of newly issued credit, the descriptive statistics show that after Sarbanes-Oxley there was a strong decrease in the cost of credit for the treatment group, unlike the control group, which experienced a small decrease. The difference in the terms of credit behavior between treated and control groups gives us a nice picture to illustrate the potential effect of SOX. However, we cannot forget that such result could be driven by other factors that can influence the assignment in the experiment and the post-SOX outcome. To estimate SOX’s impact controlling for these facts, in the next section we present our results using the difference-in-differences estimators.

RESULTS

We now examine the firms’ debt financing policy behavior using information on the amount of credit–assets ratio (total, long-term, and short-term credit) and its cost, comparing treated and control firms, before and after the Sarbanes-Oxley implementation. Tables 3, 4 present the results for the variable credit–assets ratio, for matching and panel regression respectively.

Panels A, B, and C of Table 3 report the SOX effect estimation via the matching procedure for total amount of credit–assets ratio, short-term credit–assets ratio and long-term credit–assets ratio, respectively. For each credit variable we compare treated and control firms from 2001 (pre-SOX year) to three different post-SOX periods: 2003, 2003–2004, and 2003–2005. We found significant results of SOX implementation for all credit variables and periods of analysis. Focusing on the estimation that considers the post-SOX period from 2003 to 2005, we observed an increase of 15 percent on the total credit–assets ratio and 23.9 percent on long-term credit–assets ratio. Also, we found a decrease of 9 percent in the short-term credit–assets ratio.

The results of estimation using diff-in-diff in the panel regression are reported in Table 4. Panels A, B, and C present the SOX effect for total amount of credit, short-term credit and long-term credit, respectively. In this case, we use only companies with ADRs but not subject to the Act (cross-listed firms at levels 1 and 144A) as a control group. By not including firms that trade only in Brazil (non-ADR firms) in the control group, we intend to mitigate problems concerning unobservable characteristics among cross-listed and domestic firms like access to different credit markets.

Like our previous result, we found a positive and significant effect of SOX on treated firms compared with our control firms for total and long-term credit variables. The difference-in-differences point estimator is equal to 0.56 for total credit–assets ratio. This increase comes from the long-term credit as

**TABLE 3**

**Matching Difference-in-Differences Model: Amount of Credit**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>P-Value</td>
<td>Coefficient</td>
<td>P-Value</td>
<td>Coefficient</td>
<td>P-Value</td>
</tr>
<tr>
<td>Panel A:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent variable: Difference of total credit scaled by total assets</td>
<td>0.159</td>
<td>0.027</td>
<td>0.092</td>
<td>0.052</td>
<td>0.149</td>
<td>0.000</td>
</tr>
<tr>
<td>Number of observations</td>
<td>135</td>
<td></td>
<td>290</td>
<td></td>
<td>435</td>
<td></td>
</tr>
<tr>
<td>Panel B:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent variable: Difference of short-term credit scaled by total assets</td>
<td>-0.043</td>
<td>0.289</td>
<td>-0.133</td>
<td>0.000</td>
<td>-0.090</td>
<td>0.000</td>
</tr>
<tr>
<td>Number of observations</td>
<td>135</td>
<td></td>
<td>290</td>
<td></td>
<td>435</td>
<td></td>
</tr>
<tr>
<td>Panel C:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent variable: Difference of long-term credit scaled by total assets</td>
<td>0.202</td>
<td>0.003</td>
<td>0.225</td>
<td>0.000</td>
<td>0.239</td>
<td>0.000</td>
</tr>
<tr>
<td>Number of observations</td>
<td>135</td>
<td></td>
<td>290</td>
<td></td>
<td>435</td>
<td></td>
</tr>
</tbody>
</table>
the estimated effect is 0.65, significant at 5 percent. The short-term credit presents no statistical significance. Notice that results from regression without control variables provide coefficients closer to those from matching estimation.

The increase in the long-term debt after SOX is possibly explained by the Brazilian institutional environment and companies’ poor governance. It is well documented that before 2005, the Brazilian Bankruptcy Law was inefficient and did not guarantee proper protection of creditors (see Araujo & Funchal, 2005; Araujo et al., 2012). In economic environments where lenders face such risk, short-term debt is used to minimize this problem. With improvements in firms’ governance schemes, the risk of default declines (see Proposition 4), which explains both the shift in the supply curve of debt and the shift of debt from short term to long term.

Still in Table 4, the panel regression allows us to explore other effects on the terms of credit. In addition to the main results of SOX, we tested the effect of cash holdings on firms’ debt and the heterogeneous effect of SOX for different levels of monitoring costs as stated in the theoretical model. In line with Proposition 4, which states a positive relation between probability of solvency and credit financing, cash holdings
(our proxy for probability of solvency) has a positive impact on the total and long-term credit-assets ratio. Also, we investigate a consequence that follows from Proposition 1. Proposition 1 states that higher monitoring level reduces the moral hazard problem. Thus, we expect companies with higher pre-SOX level of monitoring to benefit less from the improvement in their governance. The coefficient of the variable that interacts monitoring and the diff-in-diff shows that, although the point estimator is negative, in harmony with the theory, it is not statistically significant. Therefore, we cannot say there is a heterogeneous effect that depends on the pre-SOX level of monitoring.

The next step is the analysis of price of credit. Here we use the data on debt contracts and, as described in the previous section, we measure the real interest rate paid by each firm each year. We call this variable the cost of newly issued credit. For this variable, we do our analysis screening debt contracts into two distinct groups: debt contracts issued inside Brazil (fixed rate contracts and floating rate contracts indexed by CDI, IGP-M, and Selic) and outside Brazil (floating rate contracts indexed by Libor and CPI).

Table 5 presents the results of matching estimators. The estimation shows, for all three periods of analysis, that the treatment group had a statistically significant reduction in the cost of newly issued credit compared with the control group. The ATT points to a reduction in the cost of newly issued debt varying from 7 percent to 11 percent. This result means that the interest rate paid by companies subject to SOX is statistically lower compared to the matched companies after SOX took effect. Most of this effect comes from debt issued in Brazil, and we found weak evidence on debt contracts indexed by Libor. The result concerning debt contracts indexed by Libor is not surprising. This type of debt is issued by global banks and is subject to more rigorous analysis than carried out by local banks. So it is possible that the debt is less risky than contracts issued within Brazil, and therefore less affected by SOX.

A similar, but economically and statistically weaker effect, was found through the diff-in-diff panel regression, presented in Table 6. Panel A shows that there is no significant change in the cost of newly issued credit for contracts issued outside Brazil. However, Panel B shows that the difference-in-differences coefficient for the cost of newly issued credit for contracts issued in Brazil shows a drop in such cost, presenting a reduction of 2.79 percent for the treated firms compared to the control firms.

We also investigate the effect of cash holdings on the cost of credit. Aligned to Proposition 3, which posits a negative relation between probability of solvency and the cost of credit, cash holdings (our proxy of probability of solvency) has a negative impact on the cost of credit indexed by national indexes. We could not perform the same test for monitoring level due to the significant loss of observations.

In sum, all the results concerning the improvement in governance are in line with theory. The Sarbanes-Oxley Act had a positive impact on terms of credit, lowering cost and increasing amount, consistent with a positive shift in the supply curve of credit. Since SOX brought better information, manager punishment, and monitoring, creditors could expect better corporate governance due to a reduction in managers’ moral hazard action (see Propositions 1 and 2). This reduction

| TABLE 5 | Matching Difference-in-Differences Model: Cost of Newly Issued Credit |
|-----------------|-----------------|-----------------|-----------------|
|                | Coefficient | P-Value | Coefficient | P-Value | Coefficient | P-Value |
| **Panel A: Dependent variable: Difference of the cost of credit** |           |           |           |           |           |           |
| Matching estimator (ATT) | -7.429 | 0.000 | -11.742 | 0.000 | -11.356 | 0.000 |
| Number of observations | 51 |       | 90 |       | 137 |       |
| **Panel B: Dependent variable: Difference of the cost of credit indexed by Libor** |           |           |           |           |           |           |
| Matching estimator (ATT) | 0.766 | 0.478 | -0.498 | 0.580 | -7.841 | 0.000 |
| Number of observations | 14 |       | 18 |       | 28 |       |
| **Panel C: Dependent variable: Difference of the cost of credit indexed by national indexes** |           |           |           |           |           |           |
| Matching estimator (ATT) | -8.151 | 0.000 | -14.298 | 0.000 | -15.625 | 0.000 |
| Number of observations | 47 |       | 83 |       | 121 |       |

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in asymmetric information cost increased the probability of success of investment projects, diminishing the chance of failure. This effect reduced the risk of lending, motivating creditors to supply more credit with better terms (see Propositions 3 and 4).

Given the similarity between firms that compose both groups, this evidence suggests the Sarbanes-Oxley Act really did affect firms’ debt financing policy choices. In order to verify that this result was not driven by some unobservable characteristics that could cause an increase in the amount of credit, we performed a placebo test that replicates our matching estimators in the pre-reform period, from 1999 to 2001. We were not able to perform the same test for the cost of debt because our contract database begins in 2001.

The results of the placebo test are presented in Table 7. Panels A, B, and C present the matching difference-in-differences estimation for the period before SOX. For all three cases, the treated and control firms have virtually the same debt financing behavior. The ATT differences have no statistical significance for total, short-term, and long-term credit. Therefore, we can conclude there was no difference in the terms of credit across the two groups of firms in the pre-treatment period. This result provides more evidence that the improvement in corporate governance schemes via SOX had a positive effect on the terms of credit and on firms’ debt financing policies.

Notice that our results add to the understanding of a specific benefit of the Sarbanes-Oxley Act. Like Carter (2013) and Andrade et al. (2014), we found a positive effect of SOX on terms of credit. Our model shows that the effect of SOX comes from a reduction in the information asymmetry between borrowers and lenders, mainly through three channels: disclosure, monitoring, and manager punishment. However, earlier papers in this literature point to the high costs introduced by SOX and its final effect on firms’ returns. Eldridge and Kealey (2005) examine the cost of the new internal control audit required by SOX. Analyzing stock returns, Zhang (2007) concludes that SOX and its provisions imposed significant net costs on firms. Li et al. (2008) and Litvak (2007) show that the costs of SOX compliance exceed its benefits, reducing the net benefits of cross-listings. What none of these papers did was analyze through which channels SOX contributed positively or negatively to cross-listed companies. With this information, it would be possible to enhance its benefits and manage its costs.

Finally, we also tried to shed some light on the main sources of funding, private versus public debt, affected by Sarbanes-Oxley Act. Diamond (1991) argues that debt financing from banks has a positive effect on alleviation of moral hazard
TABLE 7
Matching Difference-in-Differences Model: Placebo Test for Amount of Credit

This table presents the placebo test results of average change in total amount of credit, long-term credit, and short-term credit scaled by total assets from 1999 to 2001, comparing treated and control firms. The matching estimation measures the difference-in-differences between the two groups of firms over the years. The treated firms are defined as those that are subject to SOX (firms that are cross-listed at levels 2 or 3). The control firms are the subset of non-treated firms selected as the closest match (three firms at most) to the treated firms based on the covariates: industry sector, total assets (in logs), and cash holdings, equity, fixed assets and accrued profit (scaled by total assets). The ATT is the Abadie and Imbens average treatment effect for the treated biased corrected matching estimator. Heteroskedasticity-consistent errors are used. See Appendix A for variable definitions.

<table>
<thead>
<tr>
<th>Panel A: Dependent variable: Difference of total credit scaled by total assets</th>
<th>Coefficient</th>
<th>Robust standard error</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matching estimator (ATT)</td>
<td>0.02</td>
<td>0.08</td>
<td>0.78</td>
</tr>
<tr>
<td>Number of observations: 140</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Dependent variable: Difference of short-term credit scaled by total assets</th>
<th>Coefficient</th>
<th>Robust standard error</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matching estimator (ATT)</td>
<td>-0.09</td>
<td>0.06</td>
<td>0.15</td>
</tr>
<tr>
<td>Number of observations: 140</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C: Dependent variable: Difference of long-term credit scaled by total assets</th>
<th>Coefficient</th>
<th>Robust standard error</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matching Estimator (ATT)</td>
<td>0.11</td>
<td>0.07</td>
<td>0.11</td>
</tr>
<tr>
<td>Number of observations: 140</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

due to bank monitoring. Dhaliwal, Hogan, Trezevant, and Wilkins (2011) present empirical evidence in that regard. That said, improvements in disclosure and monitoring might substitute the need for private debt as a monitoring mechanism, inducing more public debt.

Panels A and B of Table 8 report the SOX effect estimation via matching procedure for public and private credit, respectively. Both types of credit present statistically significant changes, but in opposite directions. For the private credit–assets ratio, we found an increase between 0.12 and 0.20. For the public credit–assets ratio, however, we found a negative effect between 0.02 and 0.04. A similar result holds for the diff-in-diff panel regression presented in Table 9, pointing to a significant increase in private debt, but non-significant decrease in public debt.

The positive effect of SOX on private credit and its negative effect on public debt go against the conventional wisdom of

TABLE 8
Matching Difference-in-Differences Model: Amount of Public and Private Credit

This table presents the results of average change in total amount of public and private credit scaled by total assets comparing treated and control firms from 2001 (pre-SOX year) to three different post-SOX periods: 2003, 2003–2004, and 2003–2005. The matching estimation measures the difference-in-differences between the two groups of firms over the years. The treated firms are defined as those that are subject to SOX (firms that are cross-listed at levels 2 or 3). The control firms are the subset of non-treated firms selected as the closest match (three firms at most) to the treated firms based on the covariates: industry sector, total assets (in logs), and cash holdings, equity, fixed assets and accrued profit (scaled by total assets). The ATT is the Abadie and Imbens average treatment effect for the treated biased corrected matching estimator. Heteroskedasticity-consistent errors are used. See Appendix A for variable definitions.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Dependent variable: Difference of total public credit scaled by total assets</strong></td>
<td>Coefficient</td>
<td>P-Value</td>
</tr>
<tr>
<td>Matching estimator (ATT)</td>
<td>-0.041</td>
<td>0.080</td>
</tr>
<tr>
<td>Number of observations</td>
<td>135</td>
<td>290</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Panel B: Dependent variable: Difference of total private credit scaled by total assets</strong></th>
<th>Coefficient</th>
<th>P-Value</th>
<th>Coefficient</th>
<th>P-Value</th>
<th>Coefficient</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matching estimator (ATT)</td>
<td>0.200</td>
<td>0.004</td>
<td>0.121</td>
<td>0.013</td>
<td>0.170</td>
<td>0.000</td>
</tr>
<tr>
<td>Number of observations</td>
<td>135</td>
<td>290</td>
<td>435</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
bank loans as a substitute for monitoring and, therefore, better governance. In general, we expect firms with poor governance to take more private debt as banks have the monitoring technology (e.g., Diamond, 1991). In fact, it is in line with the coefficient of the monitoring interacted with diff-in-diff, showing that the improvements in governance had less effect on private loans for firms with better monitoring. However, it was natural to expect a substitution of private debt for public debt induced by SOX. Our results point in the other direction: a private debt increase after the shock on corporate governance introduced by SOX.

We believe that this result is strongly driven by the Brazilian institutional environment. In the period of analysis, Brazil had a bankruptcy law providing very low protection to creditors (see Araujo et al., 2012). According to Diamond (2004), in economic environments where lenders often fail to seek the bankruptcy courts to enforce their rights after a borrower defaults, short-term private debt can be an effective way to solve the lender passivity problem. In Brazil, before the New Bankruptcy Law – effective in June 2005 – lenders were not part of the reorganization procedure and, in case of liquidation, they recovered less than 1 percent of their credit. The consequence was that credit concentrated in short-term private credit (see Araujo et al., 2012). Other studies, including Berlin and Loeys (1988) and Myers (1977), focus on the relation between increased monitoring and increased leverage-related costs (agency cost of debt and bankruptcy costs). Since reorganization is costly, these authors argue that private debt may help firms to avoid attendant costs and formal default by providing more flexibility for rescheduling debt contracts. These results should be even more pronounced in developing countries where institutions are poorly designed and face legal enforcement problems.

Additionally, we find a heterogeneous effect of SOX on the treated firms concerning monitoring and cash holding levels. Firms with higher monitoring are less likely to engage in underinvestment compared to companies subject to poorer monitoring, because monitoring committees (compensation and/or nomination and/or audit committee and/or permanent oversight board) supervise management’s decisions. Therefore, such firms are more likely to have higher proportions of private debt and find a limited need for the benefits of governance improvement on private debt.

In line with such an argument, our results suggest that companies with poorer monitoring levels benefited more from private debt after SOX came into effect. Concerning cash holdings, we find that riskier companies (lower level of cash

### TABLE 9

<table>
<thead>
<tr>
<th>Dependent variable: Total public credit scaled by total assets</th>
<th>Coefficient</th>
<th>P-Value</th>
<th>Coefficient</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff-in-diff estimator</td>
<td>0.017</td>
<td>0.420</td>
<td>-0.095</td>
<td>0.300</td>
</tr>
<tr>
<td>Cash holdings * DID</td>
<td>-0.013</td>
<td>0.036</td>
<td>0.013</td>
<td>0.108</td>
</tr>
<tr>
<td>Cash holdings</td>
<td>0.025</td>
<td>0.252</td>
<td>0.013</td>
<td>0.426</td>
</tr>
<tr>
<td>Monitoring * DID</td>
<td>-0.014</td>
<td>0.022</td>
<td>0.000</td>
<td>0.677</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.001</td>
<td>0.458</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>252</td>
<td>174</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dependent variable: Total private credit scaled by total assets</th>
<th>Coefficient</th>
<th>P-Value</th>
<th>Coefficient</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff-in-diff estimator</td>
<td>0.163</td>
<td>0.072</td>
<td>0.651</td>
<td>0.020</td>
</tr>
<tr>
<td>Cash holdings * DID</td>
<td>-0.027</td>
<td>0.673</td>
<td>0.147</td>
<td>0.096</td>
</tr>
<tr>
<td>Cash holdings</td>
<td>-0.118</td>
<td>0.074</td>
<td>-0.061</td>
<td>0.211</td>
</tr>
<tr>
<td>Monitoring * DID</td>
<td>0.080</td>
<td>0.025</td>
<td>0.048</td>
<td>0.000</td>
</tr>
<tr>
<td>Firm size</td>
<td>-0.051</td>
<td>0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>252</td>
<td>174</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This table presents a comparison between the number of newly issued short-term and long-term private debt contracts from 2001 (pre-SOX year) to 2003 (post-SOX year). Our database concerning debt contracts is from Capital IQ – Standard and Poor’s. We dropped contracts if: the contract does not have information on interest rate spread; the information is duplicated; and the contract does not have information on principal. Finally, some of the publicly traded Brazilian companies took credit from the National Bank for Economic and Social Development (BNDES) at subsidized rates (TJLP, or long-term interest rate, plus a modest spread). This type of credit is closely related to political decisions, and because of such characteristics, we also dropped all companies that use this type of credit. In the end, we obtained 685 debt contracts considering the pre- and post-SOX years.

For the pre-SOX year, we have 34 all companies that use this type of credit. In the end, we obtained 685 debt contracts considering the pre- and post-SOX years.

Table 10 presents further analyses about the type of debt issued after SOX, by comparing the number of newly issued short-term and long-term contracts from 2001 (pre-SOX year) to 2003 (post-SOX year).

<table>
<thead>
<tr>
<th>Type of contract</th>
<th>Before SOX Treatment</th>
<th>Before SOX Non-treatment</th>
<th>After SOX Treatment</th>
<th>After SOX Non-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial paper</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Revolving credit</td>
<td>3</td>
<td>20</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Bonds and notes</td>
<td>13</td>
<td>32</td>
<td>23</td>
<td>31</td>
</tr>
<tr>
<td>Capital lease</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Term loans</td>
<td>39</td>
<td>155</td>
<td>93</td>
<td>191</td>
</tr>
<tr>
<td>Other borrowings</td>
<td>5</td>
<td>11</td>
<td>12</td>
<td>11</td>
</tr>
</tbody>
</table>

These results are potentially consistent with other findings in the paper, such as the shift away from short-term debt. Table 10 presents further analyses about the type of private debt issued after SOX, by comparing the number of newly issued short-term and long-term private debt contracts from 2001 (pre-SOX year) to 2003 (post-SOX year). The results show an increase in long-term private debt contracts, such as term loans, in the post-SOX year. The number of term loan contracts for the treated and non-treated firms increased 138 percent (from 39 to 93 contracts) and 23 percent (from 155 to 191) respectively, aligned with the findings that SOX leads to more private debt with longer maturity. Since borrowers’ financial health could change significantly over a long period, this result suggests that improved governance allowed private lenders to take on riskier debt contracts. With improvements in firms’ governance schemes, the risk of default declines (see Proposition 4), which explains both the shift in the supply curve of debt and the shift of debt from short term to long term.

CONCLUDING REMARKS

This paper studies the effect of changes in corporate governance level on firms’ debt financing policies in a relevant emerging economy. In particular, this study tests whether firms subject to a positive shock regarding corporate governance – brought about by the Sarbanes-Oxley Act – experienced a more pronounced increase in their debt and reduction in its cost than similar firms that were not subject to the new corporate governance level imposed by SOX.

Our empirical approach aims at replicating an experimental design using the Sarbanes-Oxley Act as an experiment in which we control for observed and unobserved firm heterogeneity via the difference-in-differences estimator. To implement this experiment, we use two sets of firms: one that was affected by SOX (treatment group) and another group that was not affected by SOX (control group). To reduce the concerns about selection bias, we match firms under SOX requirements (treatment), with control firms that were not subject to the new regulation.

Our main results show that the firms affected by the Sarbanes-Oxley Act increased their total credit-assets ratio by approximately 15 percent more than similar firms that were not affected by SOX. This increase was driven by long-term and private credit. Also, we found a significant reduction in the interest rate charged to firms. This improvement in terms of credit (increase in amount and reduction in price) is consistent with an increase in the supply of credit, which is consistent with an expected reduction in moral hazard costs due to the gains in corporate governance.

The results also show an increase in long-maturity loans in the post-SOX year, which corroborates other findings in the paper that indicate that SOX led to debt with longer maturity. Since borrowers’ financial health could change significantly over a long period, this result suggests that improved
governance allowed private lenders to take on riskier debt contracts. With improvements in firms’ governance schemes, the risk of default declined (see Proposition 4), which explains both the shift in the supply curve of debt and the shift of debt from short term to long term.

In addition to the main results for SOX, we tested the effect of cash holdings on firms’ debt and the heterogeneous effect of SOX for different levels of monitoring costs, as stated in the theoretical model. The only heterogeneity came from the source of credit. Companies with lower levels of cash holdings (our proxy for probability of solvency) and monitoring benefited more from public and private loans, respectively. Our results contribute to the literature in three ways. First, we study effects of governance on the relation between managers and creditors; second, we evidence benefits of improvements in corporate governance schemes on firms’ terms of credit in a relevant emerging economy; finally, our empirical strategy allows us to analyze the effect of changes in corporate governance levels on firms’ debt policies considering a more appropriate design to deal with endogeneity problems.

ACKNOWLEDGEMENTS

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REFERENCES


NOTES


2. See, for example, “After High-Profile Corporate Busts, Governance Consulting Booms” (*The Washington Post*, December 27, 2002).

3. According to JP Morgan (www.adr.com), in July 2008 Brazil was among the top three countries with firms cross-listed the US, just behind the UK and Japan.

4. Intuitively, better corporate governance schemes decrease information asymmetry, alleviating the moral hazard problem and improving the terms of credit. On the other hand, debt can work as a disciplinary mechanism, inducing managers to better allocate free cash flows, increase self-effort, etc. (see Jensen & Meckling, 1976; Zwiebel, 1995; Innes, 1990; Aghion and Bolton, 1992)

5. We chose a sample in which none of the cross-listed firms delisted in the post-SOX period. Brazilian firms have this feature.

6. According to the World Bank WDI database, Brazil has been one of the leading countries in interest rate spread during the last 10 years.

7. According to Durnev and Kim (2005), only Colombia ranks above Brazil in terms of legal enforcement.


9. The assumption of managers’ risk neutrality helps to derive a simple solution without loss of generality.

10. To check robustness we also did the matching with two matches per observation. The results remain the same.


12. The measure of disclosure and board composition and functioning are results of binary answers -- 0 for bad or 1 for good -- for 12 attributes. Both dimensions of governance, disclosure and board composition and functioning, have six attributes. The higher the score, the better is the company governance. The variable was constructed using public sources related to all Brazilian public companies. See Table 1 in Leal and Carvalhal-da-Silva (2007 for more details.

13. More than 90 percent of all contracts are indexed by CDI, Selic, TJLP, IGP-M, and Libor.

14. Ex-ante real interest rate is deflated by the expected inflation at the moment of debt issuance.

15. Information on Brazilian firms that are traded on NYSE and NASDAQ is obtained from www.adr.com.


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APPENDIX: VARIABLES DESCRIPTION

Panel A: Information about firms’ debt contracts
- **Principal**: Amount of loans, expressed in thousand Brazilian Reais.
- **Spread**: Spread paid above the referred index, expressed in percent.
- **Type of debt**: Type of loans: term loans, capital lease, bonds and notes, etc.
- **Real interest rate**: Firm’s debt interest rate expressed in percent. Brazil uses compounded interest rates, and because of this we compounded the interest rate index with the spread, deflating by the expected IGP-M for all contracts indexed by the Brazilian index. For contracts with foreign indexes, mainly Libor and CPI, we used the linear interest rates, deflating by the expected CPI.
- **Maturity**: Maturity of the bond, expressed in years.
- **Total credit**: Total amount of debt, scaled by total assets.
- **Cost of credit**: Cost of newly issued credit, expressed in percent and estimated as the weight-average interest rate, where the share of the principal of each debt contract to the total amount of debt issued by the firm in the specific year is used to define the weight of each contract in the firm average interest rate.

Panel B: Balance-sheet information
- **Firm size**: Total assets, expressed in thousand Brazilian Reais.
- **Cash holdings**: Cash and short term investment, scaled by total assets.
- **PPE**: Fixed assets, scaled by total assets.
- **Accrued profit**: Operating earnings, scaled by total assets.
- **Equity**: Book value, scaled by total assets.

Panel C: Index (expressed in percent)
- **IGP-M**: Brazilian inflation rate
- **CPI**: US inflation rate
- **TJLP**: Government subsidized rate
- **CDI**: Interbank deposit certificates
- **LIBOR**: London interbank offered rate
- **SELIC**: Brazilian Central Bank benchmark rate

Panel D: Information about monitoring index
- **Monitoring**: Average between two indicators that proxy for board composition and disclosure. The board dimension is based on a set of six questions that specify whether the chairman of the board and the CEO are the same person, if companies use committees, if the board is made up of a majority of outside directors and fit the IBGC’s (Brazilian Institute of Corporate Governance) recommended board size of five to nine members, if directors serve consecutive one-year terms, and if companies have a minority shareholder-mandated fiscal board. The disclosure dimension is based on a set of six questions that deals with company sanctions against governance, related party transactions, malpractice, auditors, compensation disclosure, and accounting practices.