The Real Costs of Washing Away Corruption:

Evidence from Brazil's Lava Jato Investigation*

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Abstract

Anti-corruption investigations aim at promoting allocative efficiency and growth, but, if too disruptive, they can generate adverse economic consequences. We examine the costs of one of the world's largest anti-corruption crackdowns, Operação Lava Jato in Brazil, using unique bank-firm-time data. We find investigated firms cut employment and wages and lose access to bank credit. Importantly, more exposed banks reduce credit also to non-investigated firms, and even more so for politically connected existing borrowers. We further document negative total real and financial effects for non-investigated firms more exposed through their banks. Economic policy makers should be waryof such costs.

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1. Introduction

Corruption is a pervasive issue in many countries, diverting resources from public goods provision, distorting resource allocation, and eroding trust in political institutions and democracy (Murphy, Shleifer, and Vishny, 1993; Bardhan, 1997; Svensson, 2005; Fisman and Svensson, 2007; Fisman and Golden, 2017). Consequently, anti-corruption measures are important for economic growth and development (Olken and Pande, 2012). But what happens when anti-corruption crackdowns target some of the largest firms in the economy? While curbing corruption facilitates the entry and growth of efficient and innovative firms, prosecuting major corrupt firms can disrupt economic activity, increase unemployment, hamper credit allocation, and diminish public support for anti-corruption initiatives. The existing literature predominantly highlights the benefits of anti-corruption measures, often overlooking their potential negative spillover effects.

This paper investigates the direct and indirect economic consequences of one of the world's largest anti-corruption operations: Brazil's Operação Lava Jato (Car Wash Operation). Initiated in 2014 as a local money laundering investigation, it exposed billions of dollars in bribes paid by Brazil's largest construction companies to public officials in exchange for contracts. Prominent among the implicated firms was Odebrecht, Latin America's largest construction conglomerate, involved in corrupt activities across several countries. Given these firms' extensive connections through input-output linkages and bank-lending relationships, the investigation's impact on the economy was potentially substantial (Gabaix, 2011; Acemoglu et al., 2012; Acemoglu, Akcigit, and Kerr, 2016).

To evaluate the investigation's direct effects on accused firms, we combine public data from MPF Brazil's employer-employee data and bank loan records. Utilizing a difference-in-differences approach, we compare employment, wage bills, and credit for the implicated construction companies against a control group of similar firms with over 250

employees before and after the crackdown. Our findings indicate that firms involved in the Lava-Jato scandal experienced significant declines in employment and wage bills, with wage bills decreasing by 63% and employment by 54% post-investigation. An event-study specification supports these results, showing no statistically significant differences between investigated and non-investigated firms before 2014, consistent with the parallel trends assumption.

The decline in firm size and revenue is a direct consequence of losing access to government contracts (Szerman 2023), but it might also be affected by the loss in access to credit. To test this, we use loan-level data from Brazil's Central Bank credit registry and compare access to credit for investigated and non-investigated firms before and after the anti-corruption crackdown. We find that investigated firms receive less credit, lower bank credit ratings and display higher bank loan loss provisions after the start of the investigations. The volume of new loans for investigated firms decreased by 50% after the investigations. We subject the results described above to a series of robustness tests, including choosing different control groups, a matched sample with firms with similar ex-ante characteristics, and a synthetic control estimation. All results provide qualitatively similar results across different specification and estimation methods.

Beyond the direct impacts on investigated firms, we examine the indirect effects on non-investigated large firms via the bank credit channel, following a substantial body of literature that highlights the bank credit channel's role in amplifying economic shocks (e.g., Khwaja and Mian, 2008; Bentolila, Jansen, and Jiménez, 2018; Amiti and Weinstein, 2018; Alfaro, García-Santana, and Moral-Benito, 2021).Besides, Brazil's large bank-based financial system makes bank credit a natural candidate for the transmission of the Lava Jato scandal to the corporate sector and Lava Jato firms represent a non-neglectable fraction of bank's credit

portfolios.[1] We test whether banks that were more exposed to investigated firms were differently affected by the anti-corruption investigations and changed their lending towards the rest of the economy. In order to do this, we first create a measure of bank exposure to the anti-corruption crackdown. For a given bank, we calculate the pre-determined outstanding credit of firms that subsequently become investigated with respect to the total stock of outstanding credit for that bank. We then create an indicator for banks with a large exposure to investigated firms. Our first analysis employs a difference-in-differences design and compares new loans given to non-investigated firms by banks that had a low versus a high exposure to investigated firms. We control for several key time-varying bank characteristics, and include different sets of fixed effects.

Highly exposed banks may grant more or less credit to other firms after the onset of the investigations due to different reasons related to the scandal. One the one hand, following the anti-corruption campaign, highly exposed banks might increase lending to "clean" non-investigated firms. Such positive indirect response would represent a reallocation of credit, resulting from the surplus generated by reduced or denied credit to corrupt firms. On the other hand, highly exposed banks may reduce credit to non-investigated firms as well because of higher expected losses on credit to Lava Jato firms and/or higher uncertainty about the scale and scope of the investigations. Furthermore, banks' reactions may also depend on concerns about other firms being caught in the scandal. They may cut credit to likely corrupt firms they suspect to become the next targets of investigations. More exposed banks may further suffer from higher risk aversion, increased pressure from market discipline or elevated concerns about their charter values. We do not differentiate between these reactions as they are not mutually exclusive. Instead, the goal of this paper is to provide an estimate of the net effect of Lava Jato on bank credit.

[1] Throughout the paper, we employ interchangeably the terms investigated firms and Lava Jato firms.

We find that banks with greater ex-ante exposure to investigated firms decrease lending to non-investigated firms significantly more than other banks after the onset of the investigations. The results are robust to different exposure measures and are not driven by a reallocation of credit from firms to households. We then perform a more granular analysis using data at the firm-bank-quarter level that allows us to distinguish between the intensive and extensive margins of credit. At the extensive margin we find that new borrowers are less likely to obtain loans from more exposed banks. At the intensive margin we find that the reduction in credit is magnified for firms that are perceived to have political connections as measured by campaign finance donations to politicians in the previous elections before the onset of the investigations. The total indirect effect - aggregated over all banks - on non-investigated firms corresponds to a reduction in new credit of 18% at the firm level.

Finally, we document the real effects related to the unexpected credit crunch for non-investigated firms due to the anti-corruption crackdown. Non-investigated firms more exposed to the scandal through their bank relationships reduce their wage bill by 12% and their number of employees by 10% after the onset of the investigations.

Our paper contributes to a growing literature that examines the costs and benefits of controlling corruption. Many governments worldwide have used audits and transparency initiatives to crack down on corrupt practices among politicians and bureaucrats. The existing literature has shown that information released from audits can reduce corruption by making voters more knowledgeable, politicians more accountable, and the judiciary more informed (Olken 2007; Ferraz and Finan 2008; Bobonis et al 2016; Querubin, Avis, Ferraz and Finan 2018, Arias et al 2022). Existing work has also shown that anti-corruption initiatives can positively affect the regional economy but hurt firms that are directly engaged in corrupt practices. Colonelli and Prem (2022) show that after an anti-corruption crackdown, audited municipalities experience higher economic activity levels and credit and the number of

incumbent firms in government-dependent sectors grow while politically connected firms shrink. In a related paper, Colonnelli et al. (2022) use firm-level data and show that firms caught in anti-corruption audits increase in size, as they invest and borrow more, when they have been victims of corrupt practices (passive corruption) but shrink when they have engaged in irregular dealings with the government (active corruption). The losses for corrupt firms are magnified by efforts to forbid investigated firms from contracting with the government (Szerman 2023). In the context of China's anti-corruption campaign initiated by Xi Jinping in 2012, Giannetti et al. (2021) found an improvement in the performance of firms operating in more corrupt environments and an increase in the proportion of young firms in the provinces and industries more prone to corruption, and one of the channels is a decrease in the cost of debt. The anti-corruption crackdown helped private, small firms with no political connections while hurting large and politically connected firms (Ding et al. 2020). [1]

In contrast to the papers mentioned above, Brazil's Lava-Jato anti-corruption crackdown targeted large firms in a sector with very strong links to the rest of the economy. We examine the direct effect on investigated firms and the indirect effect on non-investigated firms through the bank lending channel. As far as we know, Li, Wang and Zhou (2022) is the only other paper that also examines the link between anti-corruption crackdowns and credit. They document a credit reallocation away from government companies towards private companies, and specially strong at the extensive margin of credit. However, they restrict their analyses to the subset of listed firms, do not investigate the real effects on employment and firm size, and do not fully explore heterogeneity across banks. We are able to investigate these effects using rich micro data on labor and credit matched at the firm-bank level. Moreover, the anti-corruption investigations are directly observed at the firm level and not inferred from political connections or surveys, which eliminates possible measurement errors about the shock.

Our paper is also related to a large literature that examines how shocks to firms can propagate to the rest of the economy (Acemoglu et al 2012; Carvalho 2014). In particular, several papers show how large economic shocks to banks can diffuse to the rest of the economy (e.g., Khwaja and Mian, 2008; Amiti and Weinstein, 2018; Alfaro, García-Santana and Moral-Benito, 2021; Chodorow-Reich and Falato, 2022; Gutierrez, Jaume and Tobal, 2022; Iyer, Kokas, Michaelides and Peydró, 2022). We add to this literature showing how bank lending can amplify the negative employment effects of anti-corruption crackdowns. Another strength of our paper is that commercial banks in our main analysis are not state-owned, and they were not directly hit by the Lava Jato investigations, which helps to avoid confounding effects of banks seen as corrupt or under investigations.[2]

The remainder of this paper is organized as follows. Section 2 provides a brief overview of the institutional characteristics of the *Operação Lava Jato*. Section 3 describes the data and provides summary statistics. Section 4 presents our estimation strategy. Section 5 presents our results on the impact of anti-corruption investigations on investigated firms and the rest of the corporate sector. Section 6 concludes.

[1] For other references on the effects of China's anti-corruption policies, see Chen and Kung (2019), Griffin, Liu and Shu (2021).

[2] There are studies that investigate how corruption in bank lending and political connections influence the allocation of credit to firms (Beck, Demirgüç-Kunt and Levine, 2006; Charumilind, Kali and Wiwattanakantang, 2006; Barth, Lin, Lin, and Song, 2009; Weill, 2011; Qi and Ongena, 2019).

2. Institutional background of the Operação Lava Jato

The *Operação Lava Jato*[2] started in March 2014 and was headed by the Federal Police and the *Ministério Público Federal* (Netto, 2016). This investigations focused initially on money laundry and bribery by a small group of black-market foreign currency dealers who were involved in money laundry, then expanded within a few months to the state-owned oil company Petrobras[3] and the largest Brazilian construction companies that served as contractors. The operation eventually reached politicians, political parties, state governors, the congress (presidents of both chambers), the federal government of Brazil and even governments of other countries. Essentially, it investigates crimes of active and passive corruption, fraudulent foreign currency exchange, large-scale bribery, kickbacks and an illegal campaign financing scheme of government parties. *Operação Lava Jato* was the largest anti-corruption and anti-money laundry investigation in Brazil and the largest and most complex detected corruption scandal in the history of Latin America: it issued more than 900 warrants for search and seizure, temporary arrests, preventive detentions and coercive measures, aiming at investigating a money laundry and corruption scheme that moved billions of *Brazilian Reais* in bribes (e.g. Netto, 2016; Campos et al., 2021) .

Initially, the operation targeted black-market foreign currency dealers who employed small businesses such as gas stations and car washes to launder money. During the investigations, prosecutors argued that the same criminals laundered money for key

[2] The name *Operação Lava Jato* (Car Wash Operation) is due to a gas station that was used to move illegal values and that was investigated in the first phase of the operation, in which a black-market foreign currency dealer was arrested. Subsequently, the investigations uncovered a direct connection with the former procurement director of Petrobras, who was arrested preventively in the second phase.

[3] Intriguingly, Petrobras was previously seen as "the most autonomous and corporately coherent organization within the Brazilian state enterprise system" (Evans, 1989), an exception if compared to typical glitches of public or state-owned enterprises.

executives of Petrobras[4] who were supposedly linked to politicians and government parties in an intricate web of corruption.[5] In November 2014, the operation hit a core set of large Brazilian construction companies, including Construtora OAS, Camargo Corrêa and Queiroz Galvão. Shortly afterwards, two further construction companies were added to the list: Andrade Gutierrez and Odebrecht, Latin America's largest construction conglomerate (see, for details, Campos et al., 2021).

Essentially, overbilling[6] of contracts for oil refineries, oil rigs, off-shore exploration vessels and office buildings were diverted to secret accounts that supposedly shifted pre-defined percentages of the surplus to politicians, political parties and the corporate conglomerates that were part of the scheme. Billions of U.S. dollars were paid through a web of corruption, in which private interests could acquire political concessions, leading participants to bribe officials in several countries in Latin America and Africa[7], concealing illicit funds in Europe and the United States (Campos et al., 2021).

The operation had a successful start and worked efficiently until 2016. At that time, its investigations gradually slowed down as it came closer and closer to politics. In 2019, the *Intercept Brazil Portal* disclosed conversations between the former head judge Sergio Moro and prosecutors and questioned the impartiality of the investigations. Afterwards, Lava Jato lost its luster and the *Procuradoria-Geral da República* (Attorney General's Office), under a new leadership, announced the dissolution of the task force at the beginning of 2021. Since

[4] According to the investigations, witnesses testified that the construction companies formed a multi-year cartel to share out contracts, extending beyond petroleum to highway and hydropower contracts. This cartel of the contractors for Petrobras had possibly existed for at least 15 years. Considering only the decade between 2004 and 2014, the companies maintained contracts with Petrobras which totaled 59 billion Brazilian *Reais* (see Campos et al., 2021).

[5] The former director of Petrobras, Paulo Roberto Costa, confessed that several construction firms participated in a huge scheme using corrupt money for campaign financing of political parties.

[6] The construction firms and the public counterparts had formed an agreement that ensured guaranteed business on excessively lucrative terms if they agreed to channel a share of between 1% and 5% of every deal to secret funds (see Campos et al., 2021 and Netto, 2016).

[7] 14 countries and some of their heads of state were involved including Angola, Argentina, Brazil, Chile, Colombia, the Dominican Republic, Ecuador, Guatemala, Mexico, Mozambique, Panama, Peru, and Venezuela (BBC-Brasil, 2017; Campos et al., 2021).

then, investigations are conducted by GAECO (*Grupo de Atuação Especial de Combate ao Crime Organizado*), which is a group part of the *Ministério Público Federal*.

Among the 21 investigated construction firms that we analyze in this paper, two went bankrupt (GDK and Schahin) and twelve entered a judicial reorganization process (either during our sample period or afterwards).[8] Furthermore, there are only seven companies whose CEOs or other key executives were not arrested or wanted by the Federal Police (Campos et al., 2021; Netto, 2016). Plea bargain agreements were conducted and large involved construction companies were excluded from any business with the government (Szerman, 2023). This happened in tandem with a major bust in construction activity and the 2015-2016 recession in Brazil.

3. Data

3.1. Data sources and sample

Our empirical analyses are based mainly on four different data sources. We collect and match unique micro data on firms, banks and campaign contributions to study the direct effects of Lava Jato on the investigated firms and the indirect effects – through bank credit – on non-investigated firms.

The main source of information comes from the Brazilian credit registry (SCR - Credit Information System), a confidential loan level database owned and managed by the Central Bank of Brazil. It contains detailed information on almost all loans in the economy at a monthly level. We study regular (free-market) lending and exclude earmarked loans from our

[8] There are 23 construction firms under investigation but only 21 are recorded in the credit registry of the Central Bank of Brazil The firms that entered in judicial reorganization are: Odebrecht, OAS, Queiroz Galvão, UTC Engenharia, Engevix, IESA, Mendes Junior, Galvão Engenharia, GDK, Schahin, Alumini, and Tomé Engenharia. (https://pt.wikipedia.org/wiki/Lista_de_empresas_envolvidas_na_Operação_Lava_Jato). (reference is wikipedia or campos, neto ?)

sample.[9] Our analysis focuses on new loans, rather than outstanding loans, because we found the former to respond quicker and sharper to the onset of the investigations. On the other hand, since their dynamics are more volatile, we aggregate new loans at the quarterly frequency. We also aggregate new loans across credit types for most standard types and work on that consolidated level. SCR contains information on loan amounts, interest rates, loan loss provisions, maturities, regulatory borrower ratings and others.[10] However, borrower-level characteristics are relatively scarce.[11] Therefore, to account for time-invariant or time-varying heterogeneity in firm characteristics, we generally use firm fixed effects or a full set of interacted firm and time fixed effects. We restrict our analysis to privately owned non-financial borrowing firms.[12]

Our second dataset is *Relação Anual de Informações Sociais* (RAIS), an administrative data set collected on an annual basis by the Brazilian Ministry of Economics and Labor, which covers all formal workers in Brazil. We restrict our sample to large firms that have more than 250 employees in 2012.[13] From RAIS we obtain information on the number of employees and wage bill for every firm-year.

Our third dataset refers to the accounting database of Brazilian financial institutions (COSIF), managed by the Central Bank of Brazil. It provides banks' balance sheet data that

[9] Free market lending, in contrast to earmarked lending, refers to the type of credit that is not subject to any public sector directions and has not subsidized loan interest rates.

[10] Loan amount is the loan characteristic that is more meaningful to be aggregated (through a simple sum), so that we focus more on loan amounts than other on other loan characteristics. It is also the dependent variable where we find the strongest results. All other loan characteristics are in fact weighted averages, with weights given by new loan amounts.

[11] Borrower-level information recorded at the SCR (but sourced originally from tax records) includes, among others, firm's location, age, industry and ownership type. We additionally collect from the BMF Brazilian exchange site the information on whether firms are publicly listed or not and we investigate the composition of some economic groups with the help of the Valor Pró commercial data source.

[12] The state-controlled oil company Petrobras is therefore excluded. Borrowing in the sense of firms with credit outstanding in some month during the sample period before the investigations, as shown in the credit registry.

[13] We apply the widely used European Union definition of large versus small- and medium-sized enterprises, using the threshold of 250 employees (https://eur-lex.europa.eu/EN/legal-content/glossary/small-and-medium-sized-enterprises.html). The investigated Lava Jato firms are all large firms according to this definition.

serves to build several standard (time-varying) bank controls. We describe them in the next subsection. We initially select the 50 largest Brazilian banks in terms of (free-market) outstanding credit to large firms in 2012. They account for approximately 98% of that credit universe. Subsequently, we exclude state-owned banks from the main analysis because of their focus on earmarked lending and their countercyclical behavior (Capeleti, Garcia, Miessi, 2022). We are left with 44 banks in our main sample.

Our fourth dataset comes from the *Tribunal Superior Eleitoral* (TSE) and contains campaign contributions in the federal elections of 2010, with detailed information about donors' contributions and recipients. In subsequent summary statistics we show the donation size normalized by the number of employees of the donating firm.

In sum, our sample comprises free-market new loans granted to large privately owned non-financial firms by 44 relevant privately-owned banks. At its most granular version, the data are disaggregated at the firm-bank-quarter level during the period from 2011Q1 to 2016Q2, covering 503,620 firm-bank-quarter observations with positive outstanding credit and 12,718 firms (see Table 1)[14]

3.2. Main variables and summary statistics

To investigate the effects of Lava Jato, we analyze real and financial firm outcomes. As real outcomes we analyze firms' wage bill (*wage bill*) and number of employees *(employees*). As financial outcomes, we analyze firms' amount of new loans (*new loans*), average borrower regulatory rating (*regulatory rating*), average loan loss provision (*loan loss provision*), average new loan maturity (maturity) and average pre-fixed new loan interest rate (*interest rate*). When appropriate, we control for bank variables in our analyses. They include capital to assets ratio (*Capital*), logarithm of total assets (*Log(assets)*), holdings of cash and

[14] Our sample period ends in the middle of 2016, which was right before the impeachment of the president Dilma Rousseff, which created substantial economic and political uncertainty in the country.

marketable securities over total assets (*Liquidity*), non-performing loans (*Npl*) and return on assets (*Roa*), credit portfolio size (*Credit/Assets)*

We employ three important variables to moderate the indirect effects of Lava Jato in our methodology. First, we build the bank indicator variable *Lava Jato bank exposure*$_b$ to work as the main treatment variable in the analysis of indirect effects on non-investigated. It equals one if bank *b* has a high share (upper tercile) of outstanding credit to firms in 2012 that become subsequently investigated in the *Operação Lava Jato*, as in equation (1).

$$\textit{Lava Jato bank exposure}_b = T_3 \left(\frac{\sum_{i \in LJ} Outstanding\ loans_{i,b,2012}}{\sum_{all\ i\ but\ LJ} Outstanding\ loans_{i,b,2012}} \right) \quad (1)$$

where LJ denotes the set of investigated (Lava Jato) firms and T_3 denotes the third tercile operator applied to the distribution of banks.

We also aggregate the bank exposure above at the firm level to allow for the analyses of total firm effects, building a firm dummy variable *Lava Jato firm exposure*$_i$. It captures whether firm *i* has a high exposure (upper tercile) to Lava Jato firms through its bank relationships in 2012. It is based on the weighted average of Lava Jato bank exposures of every bank b that firm i has outstanding credit with in 2012, as in equation (2), where T_3 denotes the third tercile operator applied to the distribution of firms.

$$\textit{Lava Jato firm exposure}_i = T_3 \left(\frac{\sum_{all\ b} Outstanding\ loans_{i,b,2012} \times Lava\ Jato\ bank\ exposureb}{\sum_{all\ b} Outstanding\ loans_{i,b,2012}} \right) \quad (2)$$

Finally, we measure in the firm dummy variable *Donations*$_i$ whether a firm donated in the federal election campaign of 2010. This variable helps us to investigate whether the indirect effects of Lava Jato might have been amplified for donating firms. Campaign

donations may serve as proxies for government connections and potentially for undetected corruption. In our sample period, when the public in Brazil was curious to learn which firm was going to be caught next in the Lava Jato scandal, suspicion could have arisen about firms that had made large financial contributions to the election campaigns of likely future government representatives.

Table 1 reports summary statistics of the main variables used in this paper. In the table, variable subscripts i, b, t denote firm, bank and quarter or year. The *Lava Jato exposure* variables and *Donations* are summarized in the table according to their underlying continuous versions.

(Insert Table 1 here)

New Loans$_{it}$ indicates that, on average, firms borrow R$20,541,316 per quarter in new loans from private banks. On the other hand, *New Loans*$_{ibt}$ indicates that existing borrowers (before 2014) borrow, on average, R$1,734,128 per bank-quarter in new loans. The median value for the latter variable is zero, since we include zeros for absent new loans if there is positive outstanding credit for that firm-bank-quarter triple in the case of the intensive margin, or include zeros for all missing new loans in the case of the extensive margin.

Additionally, the loans are on average fully repaid in 11 months (median: 5), regulatory rating has a moderate grade of 2 (in a scale from 1 to 4, where lower grades mean higher quality)[15] and the pre-fixed interest rate are quite high (mean: 47.05%, median: 19.64%). Banks experience, during the sample period, return of assets of 0.77% (median: 1.01%), and

[15] Grades 1 to 4 stand for regulatory ratings AA, A, B and C defined at Resolução 2682/1999 of Banco Central do Brasil. We exclude new loans with worse ratings as they usually refer to renegotiations or restructurings.

usually set aside 0.89% of their portfolio as provisions to account for future and incurred losses (median: 0.49%).

Given our selection of firms with over 250 employees, firms in our sample are large (mean: 1,035 employees; median: 485 employees) and with relatively skilled workers with wages well above the minimum wage in the country (mean: R$ 2,098.84/month).[16] The firms donated an average of R$62.67 (median: R$0) per employee in the federal elections of 2010 and are well connected in the banking system (mean: 3.52 bank relationships in 2012).

The Lava Jato bank exposure indicate that around 2% of all privately owned banks' outstanding credit in 2012 was granted then to the later investigated firms, although only about 1/10 of this exposure is on average indirectly linked to non-investigated firms (through the Lava Jato firm exposure).

Finally, Figure 1 shows the *Lava Jato bank exposure* (blue bars) of privately owned banks, with the banks being ranked in descending order based on the magnitude of their exposures. The figure also shows the number of firm-quarter observations of each bank (red line) in the year 2012 of our sample.

(Insert Figure 1 here)

There is substantial heterogeneity across banks in that measure. The three banks with the largest exposures display values between 8% and 15% of their portfolios. Moreover, the biggest banks in Brazil, as measured by the peaks in the number of firm-quarter observations, have moderate or low levels of Lava Jato exposures. The upper tercile of the *Lava Jato bank exposure* distribution contains the banks to the left of the dotted vertical line. There is one large bank and several medium-sized banks in that group.

[16] The minimum wage in Brazil during our sample period was R$724 in January 2014 and R$880 in July 2016.

4. Estimation Strategy

In the first part of the paper, we conduct a difference-in-difference (DID) analysis to study the *direct* effects of the anti-corruption investigations. We employ data aggregated at the firm-time level.

The treatment group are the firms investigated in the *Operação Lava Jato* (as indicated by the variable *Lava Jato*). The main control group are all other large (non-financial and privately owned) firms in the credit registry of the Central Bank of Brazil that do not belong to the construction sector, although we relax the latter constraint in further analyses.[17] We split the sample into the period before the start of the investigations in 2014Q1 and the period afterwards. To test the effects of Lava Jato on the investigated firms, we estimate the DID model shown in equation (3):

$$Firm\ outcome_{i,t} = \beta\,(Lava\ Jato_i \times Post_t) + \upsilon_i + \theta_t + \varepsilon_{i,t} \qquad (3)$$

$Firm\ outcome_{i,t}$ stands for (log of) real outcomes (wage bill or number of employees) or financial outcomes (amount of new loans, average borrower rating, average loan loss provision, average new loan maturity and average new loan interest rate) of firm *i* at time *t*. The amount of new loans is the sum over all banks in the sample in relation to firm i.[18] All other firm financial outcomes are weighted averages, with weights given by new loan amounts. The data frequency is yearly for real outcomes and quarterly for financial outcomes.

[17] More precisely, firms with credit outstanding in some month during the sample period before the onset of investigations, as shown in the credit registry.

[18] When explaining new loan amounts with zero mass, we use the Poisson Pseudo Maximum Likelihood (PPML) estimator, instead of OLS to explain log(1+New Loans). Hence, more precisely PPML estimates the equation: New Loans = exp (β.X)×ε with ε ~ Poisson(1), which implies E(New Loans) = exp (β.X).

The dummy variable *Lava Jato*$_i$ is the treatment variable and indicates each of the 21 investigated construction firms in the Lava Jato corruption scandal. *Post*$_t$ is a dummy variable that indicates the period after the start of the anti-corruption investigations, that is equal to 2024 or afterwards in the yearly data or to one from 2014Q2 onwards in the quarterly data.[19] In particular, the latter definition takes into account natural anticipation effects regarding the unfolding of the investigations and go against finding strong results if anticipation considerations are not relevant. In the quarterly data, we exclude the first quarter of 2014 from the regression sample because the anti-corruption investigations started in the middle of March 2014. We control for time-invariant firm characteristics by including firm fixed effects υ_i and also control for common macroeconomic shocks to firms that may change over time using time fixed effects θ_t. The standard errors are clustered at the firm level. The DID estimator corresponds to the coefficient β of the interaction term *Lava Jato* x *Post*.

In the second part of the paper, we investigate the *indirect* (spillover) effects of Lava Jato on the rest of the economy through bank credit. Banks with a high ex ante credit exposure to investigated firms may grant more or less credit to non-investigated firms after the start of the investigations for reasons discussed in the introduction.

We first estimate the indirect effect of the anti-corruption investigations on non-investigated firms at the bank-quarter level, as shown in equation (4).

$$New\ loans_{b,t} = \beta(Lava\ Jato\ bank\ exposure_b \times Post_t) + X_{b,t-1} + \varphi_b + \theta_t + \varepsilon_{b,t} \quad (4)$$

where *New loans*$_{b,t}$ is the (log of) the sum of new loan amounts from bank *b* to non-investigated firms in quarter *t*.

[19] Given the clustering of the investigations and denouncements in specific quarters of 2014, there is almost no observable staggered starting time across firms. Many of the investigated firms were even hit harder in November 2014, when their CEOs and various top executives were arrested (Netto 2016).

A key element of our identification strategy is that we consider data on investigated firms to define the bank exposure measure and then estimate the regressions with data from non-investigated firms as well as the fact that the computation of the *Lava Jato bank exposure* is based on data from 2012, while the estimation period for the regressions ranges from 2013 to mid-2016.[20] $Post_t$ again refers to the period after the start of the investigations and we drop 2014Q1. The variable *Lava Jato bank exposure*$_b$ is a dummy that equals one if bank *b* has a high share (upper tercile) of outstanding credit to firms in 2012 that become subsequently investigated in the *Operação Lava Jato*, according to equation (1). The coefficient β on the interaction term *Lava Jato bank exposure* × *Post* indicates the DID estimator. Bank characteristics $X_{b,t-1}$ previously described in Table 1 and lagged by one quarter are employed as control variables. In equation (4) we employ bank fixed effect to control for any time-invariant bank non-observables, as well as time fixed effects. We cluster standard errors at the bank level.

We then perform a more granular analysis of the indirect effects on non-investigated firms at the firm-bank-quarter level, as shown in equation (5). In this analysis, the estimation sample is restricted to financial and real outcomes of non-investigated firms.

$$New\ loan\ variable_{i,b,t} = \beta(Lava\ Jato\ bank\ exposure_b \times Post_t) + X_{b,t-1} + c_{i,t} + \varphi_b + \varepsilon_{i,b,t} \quad (5)$$

[20] We also perform robustness tests with *Lava Jato bank exposure* based on 2011 and the estimation sample starting in 2012. Most of the results are qualitatively similar. Note that although computing Lava Jato exposures based on a earlier year allows the use of a longer estimation period, the resulting measure may capturet a less tinely bank exposure at the onset of the investigations.

where *New loan variable* $_{i,b,t}$ is either the new loan amount[21] granted to firm i by bank b at quarter t at the intensive margin or an indicator whether firm i received a new loan with bank b in quarter t at the extensive margin.

Equation (5) is estimated separately for the intensive and extensive margins (e.g. Aretz, Campello and Marchica, 2020). For the intensive margin analysis, we analyze firm-bank pairs where the firm has borrowed from the bank before 2014Q1; for the extensive margin we analyze the remaining pairs. The coefficient β on the interaction term *Lava Jato bank exposure* × *Post* indicates whether *ex-ante* more exposed banks grant relatively more or less credit to non-investigated firms after the onset of the investigations. We employ firm-time and bank fixed effects. Firm-time fixed effects purge all time variation in the data at the firm-level and captures determinants of credit demand, allowing us to better isolate credit supply-side effects. In an additional specification, we also add firm-bank fixed effects as they control for unobserved bank-firm relationship characteristics. In the estimation of Equation (5), we cluster the standard errors two way at the firm and bank level.

We then investigate a potential amplification effect due to firms' political connections by interacting the main independent variables (*Lava Jato bank exposure*$_b$ *and Post*$_t$) with the indicator *Donations*$_i$, as shown in equation (6).

$$New\ loan\ variable_{i,b,t} = \beta_1\ LJ\ bank\ exposure_b \times Post_t + \beta_2\ LJ\ bank\ exposure_b \times Donations_i + \beta_3 (LJ\ bank\ exposure_b \times Post_t \times Donations_i) + X_{b,t-1} + c_{i,t} + \varphi_b + \varepsilon_{i,b,t} \quad (6)$$

All variables are the same as in the previous model, except *Donations*$_i$. The latter is an indicator whether the firm donated in the federal election campaign of 2010, as shown in equation (5). Campaign donations serve as proxies for government connections and

[21] When explaining new loan amounts with zero mass, we use the Poisson Pseudo Maximum Likelihood (PPML) estimator.

potentially for undetected corruption.[22] The key coefficient β_3 on the triple interaction term indicates whether *ex-ante* more exposed banks grant relatively more or less credit after the onset of the investigations to non-investigated donating firms in comparison to non-donating firms. As before, we employ firm-time and bank fixed effects and bank controls. Besides, we are able to add in additional specifications not only firm-bank fixed effects but also bank-time fixed effects.[23] The latter strengthens our identification as they control for any time-varying bank characteristics that move in response to the Lava Jato scandal. We again cluster the standard errors two way at the firm and bank level. In additional unreported analyses, we examine the effect of other firm-level moderators following equation (6).[24]

Finally, non-investigated firms may receive lower new credit from one type of bank (e.g. bank with high Lava Jato exposure) and higher new credit from another. In order to gauge the total firm-level effect, we next perform a consolidated firm-time analysis on non-investigated firms. We examine whether non-investigated firms that are *ex-ante* indirectly more exposed to Lava Jato through their bank relationships suffer any adverse effects. We estimate the model shown in equation (7):

$$Firm\ outcome_{i,t} = \beta\, Lava\ Jato\ firm\ exposure_i \times Post_t + \upsilon_i + \theta_t + \varepsilon_{i,t} \qquad (7)$$

where $Firm\ outcome_{i,t}$ is a real or financial outcome according to the same definitions of equation (3) but for the sample of non-investigated firms.

The variable $Lava\ Jato\ firm\ exposure_i$ is now the key transmission channel. It indicates whether borrower *i* has a high exposure to Lava Jato firms through its bank relationships in

[22] In our setting, when the public in Brazil was curious to learn which firm was going to be caught next in the Lava Jato scandal, suspicion could have arisen about firms that had made large financial contributions to the election campaigns of likely future government representatives

[23] We lose identification of β_2 *and* β_1 respectively in those cases.

[24] In these additional analyses, we employ number of employees, mean wage, firm age, firm growth number of bank relationships, among others, as alternative moderators. We hardly find significant results.

2012, according to equation (2). Similarly to the Lava Jato bank exposure, it is measured prior to the start of the regression sample to ensure its exogeneity. In equation (7) standard errors are clustered at the firm level.

5. Results

5.1. Impact of Lava Jato on investigated firms

We start our analysis by examining the direct effects of Lava Jato on the investigated firms. Table 2 presents the results for the real effects. Columns (1) and (3) show our baseline DiD results with firm and time fixed effects and based on a sample without construction non-investigated firms. columns (2) and (4) includes additionally sector-time fixed effects and are based on a sample including the former firms, to control, in particular, for the business cycle of the construction sector.[25] .

(Insert Table 2 here)

Overall, we find significantly negative real effects of the anti-corruption investigations on the wage bill and employment. Because the coefficients of interest are large and the related independent variables are discrete, the semi-elasticity is better approximated by the exponentiation of the coefficient and subtracting by one. The wage bill decreases by 63% and number of employees decreases by 54% for investigated firms after the onset of the investigations, considering the baseline estimates in columns (1) and (3). The latter effect is consistent with Szerman (2023), who finds a 47% decline in employment. Even after

[25] On the one hand, construction non-investigated firms could also be affected by Lava Jato though competition or contagion channels and therefore not part of an ideal control groups; on the other hand, they belong to the same sector of investigated firms and thefore supposedly more similar to the latter among other firms from that point of view.

controlling for the bust of construction activity at the last years of our sample period, columns (2) and (4) show the direct real effects of Lava Jato on investigated firms remain quite large.

Moreover, the adverse effects increase monotonically over time, as shown in Figure 2. For the estimations underlying that figure, we define 2011 as the baseline year and employ different interactions with year dummies for each year afterwards. Figure 2 also shows that before 2014 there is no statistically significant difference between investigated and non-investigated firms, consistent with the underlying DID assumption of parallel trends.

(Insert Figure 2 here)

Next, we study the financial effects of Lava Jato on the investigated firms. Table 3 Panel A shows the effects on the amount of new loans. Since the variable *New Loans* has many zeros, we estimate these regressions using Pseudo Poisson Maximum Likelihood (PPML) instead of the classic log linear OLS estimation. Although derived under Poisson distribution, this technique is fully robust to other positive distributions with even some efficiency properties. It reduces biases, provides undistorted estimate of elasticities and has been widely used in the gravity models literature on international trade (Santos Silva and Tenreyro, 2006) and more recently in analyses of new loans in absence of loan application data as in ours (e.g., Jiménez, Laeven, Martinez-Miera and Peydró, 2022).[26] We will generally apply PPML estimation in the next models as well, when explaining other versions of *New Loans* (and other variables) with zero mass.

Column (1) of Table 3 shows the main result whereas columns (2), (3) and (4) show the results based on various alternative control groups and samples. Column (2) excludes unlisted

[26] The absence of loan application data implies the need to input many zeros for fully explainig new loans as we cannot distinguish between cases where the firm did not apply for a new loan from cases where the firm did apply but was rejected by the bank.

firms from the control group because all investigated firms are non-listed.[27] Column (3) makes use of propensity score matching to match each investigated firm to four other non-investigated firms. [28] In column (4), as a robustness test, we start the sample in 2012 instead of 2011.

(Insert Table 3 here)

The coefficients of the interaction terms are statistically and economically significant and similar in magnitude across all four models. Calculating the size of the effects by the exponentiation of coefficients and subtracting by one indicate that new loans decrease by around 50% for Lava Jato firms. Panels B and A of Figure 3 Panel A show the coefficients of a dynamic model that decompose the interaction effects by quarter, using the 2012Q1 as the reference period and according to the PPML estimation and a OLS one, respectively.

(Insert Figure 3 here)

Figure 3 shows no differences in trends between the two groups before the start of the investigations. And although the interaction coefficients start a decreasing pattern after that, they only become significant a year later in 2015 and intensify overtime until 2016Q1, consistent with the fact that investigated firms were even more hit by the end of 2014. Both PPML and OLS estimates show similar dynamics.

Furthermore, as a robustness test, we perform a synthetic control estimation first aggregating new loans by industry and then proceeding to create a synthetic control based on other industries apart from construction. We provide details on the donor industries weights

[27] In fact, we also exclude any firm whose controlling firm in the economic group is listed.

[28] Table A1 in the appendix reports the results of the underlying propensity score matching regression.

in the synthetic control group approach in the Appendix, Table A2. Figure 3 Panel C shows that investigated firms and the synthetic control show similar dynamics before Lava Jato, but there is a sizable contraction of new loans to investigated firms after 2014, reaching almost a full depletion of new credit in the first quarter of 2016.

In Table 3, Panel B, we consider further loan characteristics as the dependent variables. We find that regulatory credit ratings that banks assign to investigated firms deteriorate by almost one full notch (higher numbers indicate worse ratings), and similarly loan loss provisions increase 0.6%, which is substantial compared to its mean of 0.9% in the sample. Loan maturities tend to decrease and interest rates to increase but these effects are not statistically significant. Overall, those results suggest worse loans terms and creditworthiness evaluations of investigated firms.

Overall, the results of Table 2 and 3 indicate large negative real and financial effects of Lava Jato on the investigated firms.

5.2. The effects of Lava Jato on non-investigated firms at the bank level

In the next step, we investigate the potential indirect effects of Lava Jato on non-investigated firms, using data at the bank-quarter level. Our identification strategy of the treatment effect is based on banks' ex ante credit exposure to those firms that later become targets of the Lava Jato investigations. We employ not only the previously defined dummy *Lava Jato bank exposure* (equation 1), but also a categorical variable that equals one for the upper or, alternatively, the middle tercile (highest and moderate exposures) and the continuous exposure measure itself (equation (1) before the application of the tercile operator).

(Insert Table 4 here)

Table 4 shows that banks with greater ex-ante exposure to Lava Jato firms decrease lending to non-investigated firms significantly more than other banks after the onset of the investigations. The results are robust regardless of what exposure measure we consider, discrete or continuous. As the effects are concentrated in the upper tercile (see column 2), we employ the corresponding dummy variable for the upper tercile in the remainder of the paper.[29]

Considering this decrease of new loans to the corporate sector, it is possible that banks reallocate credit to the household sector. Using another dataset that aggregates lending by borrower type, we show in the Appendix, Table A3 that this is not the case. The only statistically significant interactions show up when the dependent variable is (log of) new loans granted to the corporate sector, as shown in columns (4) to (6).[30] Hence, the decrease of lending by ex-ante highly exposed banks occurs vis-à-vis the corporate sector.

5.3 The effects of Lava Jato on non-investigated firms at the firm-bank level

We now perform a more granular analysis of the effects of Lava Jato on non-investigated firms, using data at the firm-bank-quarter level and still employing the *Lava Jato bank exposure*.

As explained beforehand, we distinguish in this analysis between the effects at the extensive and intensive margin. For the extensive margin, the dependent variable is a dummy equal to one if there is a new loan for the firm-bank-quarter, whereas for the intensive margin

[29] When applying this measure, banks with high versus low Lava Jato bank exposure do not differ significantly in the period before the investigation in terms of their amount of new loans, total assets, and credit-to-assets ratio.

[30] The aggregate dataset underlying Appendix, Table A3 comes from a different source in comparison to all other tables in our paper. This explains the somewhat different estimation results compared to Table 4.

the dependent variable is the amount of new loans for the firm-bank-quarter (which can be zero).

Table 5 confirms our earlier finding that highly exposed banks reduce new credit to non-investigated firms. The results for the extensive margin indicate that potentially new borrowers exhibit a lower likelihood of obtaining loans from more exposed banks, regardless of the fixed effects added to the model (firm-time and bank; or firm-bank and time). The decrease in the likelihood of obtaining a new loan appears to be small but it is not, since this finding refers to all potentially new borrowers in our sample, not necessarily to those who have applied for new loan (we do not have information on loan applications).

Existing borrowers also receive less new credit from more exposed banks after the onset of the investigations (intensive margin) but those results are not significant, so that findings of the previous section appear to be mainly driven by the extensive margin. In additional unreported analyses, we examine whether the latter results are not an artifact of the PPML estimation method employed for the intensive margin. We estimate OLS results of the DID model and still find no significant results at the intensive margin. Nevertheless, for subset of non-investigated firms at the intensive margins it is possible that Lava Jato investigations have had important effects.

(Insert Table 5 here)

To shed light on potential heterogenous effects across firms, we interact the effects of the Lava Jato bank exposure on non-investigated firms in the post period with firm characteristics that might moderate those effects. We again distinguish between effects at the extensive and intensive margin. One obvious candidate for a moderator in our setting is information about firms' political connections. Following the related studies, we consider

firms' electoral campaign donations as proxies for government connections and potentially for undetected corruption at the firm level. In our sample period, when the public in Brazil was curious to learn which firm was going to be caught next in the Lava Jato scandal, suspicion could have arisen about firms that had made large financial contributions to the election campaigns of likely future government representatives. Table 6 presents the results.

Considering interactions with a dummy indicating whether the firm donated in the federal election campaign of 2010, Table 5 shows significant moderating effects at the intensive margin. Highly ex ante exposed banks grant more new credit to existing borrowers that have donated in the 2010 elections before the onset of the investigations (positive coefficient on *LJ bank exposure* x *Donations*) but, importantly, they decrease new loans to those same donating existing borrowers afterwards (negative triple interaction). Indeed, we find a strong negative effect for the tripe interaction at the intensive margin. This effect only becomes insignificant when we saturate the model with all possible combinations of fixed effects in column (8).[31]

(Insert Table 6 here)

In additional unreported analyses, we again examine whether the latter results are not an artifact of the PPML estimation method employed for the intensive margin. We estimate OLS results of the DID model and find similar results at the intensive margin.

We found earlier that non-investigated firms experienced a contraction of new credit from *ex ante* more exposed banks. However, it is also possible that less exposed banks substitute away from this effect, so that the total impact at the firm level would be muted. Therefore, next we investigate indirect effects of Lava Jato on non-investigated firms at the

[31] We also do not find significant moderating effects of donations at the extensive margin.

firm level, considering total new credit received from the privately owned banks in our sample. We assume that the previously defined *Lava Jato firm exposure* contains the key transmission channel for such analysis.

(Insert Table 7 here)

Table 7, column (1), shows a sizable decline in new credit from private banks at the firm level, for firms with high Lava Jato firm exposure. This indirect effect on non-investigated firms, a reduction of 18%, is - as expected - smaller than the direct effect of Table 3, but still economically meaningful. Other effects in Table 7 are also significant but less economically relevant. Columns (2) and (3) show that firm average regulatory rating slightly worsens and average loan loss provisions slightly increase for more indirectly exposed firms, with estimated coefficients much smaller than the direct effects of Table 3. Columns (4) and (5) show small significant increases in interest rates and maturity.

(Insert Table 8 here)

In the final step, we examine the real effects related to the unexpected credit crunch for non-investigated firms due to the Lava Jato scandal. Table 8 reports the results. These effects are well-identified through the Lava Jato firm exposure measure and derived controlling for firm and time fixed effects (columns (1) and (3)) or firm and sector-time and state-time fixed effects (columns (2) and (4)). Therefore, we can rule out that these effects are due to the general deterioration in the Brazilian macro-economy or to sectoral or regional declines in economic activity during 2015-2016. Firms more indirectly exposed to the scandal through their bank relationships reduce their wage bill by 11.9% and their number of employees by

9.8% after the onset of the investigations in the most saturated specifications. Although such figures represent effects smaller in magnitude from the direct effects of Table 2 (around 70% smaller), they are still economically meaningful and, as the former, they also increase over time, as shown in Figure 4.

(Insert Figure 4 here)

5.4. Further analyses

Our main analysis is based on loan data from privately owned banks in Brazil. We now expand the sample and include state-owned banks. These banks are important in Brazil as they exhibit a market share of about 40%. They implement countercyclical state-led lending programs, are subject to government influence and exhibit a weaker governance.

The Appendix, Table A4, shows the results. On the one hand, we find for the extensive margin that state-owned banks do not differ from private banks in their response to the Lava Jato shock, irrespectively on whether the latter is moderated by Lava Jato bank exposures. On the other hand, for the intensive margin (low exposed) state-owned banks reduce credit more strongly to existing borrowers than (low-exposed) privately owned banks after the onset of the investigations, while highly exposed state-owned banks grant relatively more credit to existing borrowers than highly exposed privately owned banks after the onset of the investigations. The findings show that state-owned banks' response to the anti-corruption investigations is distinct from the one of privately owned banks.

6. Conclusions

In this paper, we investigate the effects of one of the world's largest anti-corruption investigations: the *Operação Lava Jato* in Brazil. We conduct a difference-in-differences analysis of the direct and indirect effects on investigated and non-investigated firms, considering the bank credit channel as transmission mechanism.

We find that anti-corruption investigations "work" from an economic point of view, i.e., they have the expected negative effects on the investigated firms.[32] However, we also find significant negative spillovers on the rest of the corporate sector. More exposed (privately owned) banks reduce credit to non-investigated firms and this negative effect is stronger at the intensive margin for lending to politically connected firms. We further show (total) negative real and financial effects for non-investigated firms more exposed to the Lava Jato shock through their bank relationships. These findings suggest that the economic impact of anti-corruption investigations is neither as straightforward nor as much positive as suggested by the evidence from some prior studies. This conclusion might be a particular consequence of the unprecedented scale and scope of the investigations and the economic importance of the investigated firms in the Lava Jato scandal.

Our paper has an important implication: economic policy makers should *ex ante* be wary of not only the direct but also the indirect effects of anti-corruption investigations, specially so when the scale and scope of these investigations are large. We also acknowledge that our results on bank credit reallocation capture a partial equilibrium effect and likely underestimate the full effect. There might be further negative effects through trade credit chains, debarments from public procurement and credit risk contagion.

[32] Although theoretically there could be better alternatives under which the affected firms do not suffer negative consequences and only the corrupt managers are removed, it is beyond the scope of our paper to discuss whether and how those alternatives are feasible in practice.

Appendix

Table A1: Propensity score matching of Lava Jato and non-Lava Jato-firms

This table shows the results of 4-nearest neighbor propensity score matching at the firm level underlying the regression results reported in Column (3) of Table 3, Panel A. In the matching cross-sectional regression, the dependent variable *Lava Jato*$_i$ is a dummy dependent variable that equals one for the 21 construction firms that are subject to anti-corruption investigations and zero otherwise. Variables with subscript [2012-2013] represent percentage variations between annual averages of 2012 and 2013. Variables with subscript [2012] represent annual averages of that year. Standard errors are in parentheses. ***, **, * denote statistical significance at the 1%, 5% or 10% level.

Dep. Var.:	*Lava Jato*
Δ*New Loans*$_{[2012-2013]}$	-0.007
	(0.021)
Δ*Outstanding Loans*$_{[2012-2013]}$	-0.067
	(0.082)
Rating$_{[2012]}$	0.283
	(0.189)
Loan Loss Provision$_{[2012]}$	-96.949**
	(42.975)
Maturity$_{[2012]}$	-0.018*
	(0.009)
Employees$_{[2012]}$	0.000***
	(0.000)
Age	0.007
	(0.006)
State	0.021
	(0.024)
Constant	-3.218***
	(0.567)
Estimation	Probit
Number of observations	5,006
Pseudo-R^2	0.136

Table A2: Donor industries weights in Synthetic Lava Jato Control Group

Industry code (CNAE)	Industry	Weight
12	Manufacture of tobacco products	.515
20	Manufacture of chemical products	.206
39	Decontamination and other waste management services	.141
91	Activities related to cultural and environmental heritage	.137
Sum		1.000

Table A3: Effects on credit by borrower sector at the bank level

This table shows the regression results of the model $\text{Log}(\textit{New loans})_{b,t} = \beta_1 \textit{Lava Jato bank exposure}_b + \beta_2 \textit{Post}_t + \beta_3(\textit{Lava Jato bank exposure}_b \times \textit{Post}_t) + \text{fixed effects} + \varepsilon_{b,t}$ where $\textit{New loans}_{b,t}$ is the sum of new loan amounts granted by bank b to the household sector (columns 1, 2 and 3) or to the corporate sector (columns 4, 5 and 6). The sample period is 2013Q1-2016Q2, excluding 2014Q1. Lava Jato bank exposure is an indicator of the third tercile of the banking distribution of bank shares of outstanding loans, as of 2012, to firms that were subsequently investigated by *Operação Lava Jato (*see equation 1). Post is a dummy variable that switches to one in the period after 2014Q1. Bank controls are *Credit/Assets*, *Log(Total Assets)*, *Capital*, *Non-performing loans*, *Liquidity* and *Return on Assets* lagged by one period and as defined in section 3.2. Standard errors (in parentheses) are clustered at the bank level. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

	(1)	(2)	(3)	(4)	(5)	(6)
	Household sector			Corporate sector		
Dep. Var.:	*Log(New Loans)$_{households}$*			*Log(New Loans)$_{firms}$*		
Lava Jato bank exposure × Post	-0.017	0.100	-0.008	-0.338*	-0.346*	-0.312*
	(0.168)	(0.284)	(0.167)	(0.171)	(0.187)	(0.165)
Lava Jato bank exposure	-	-0.641	-	-	0.305	-
		(0.469)			(0.287)	
Post	0.065	-	-	0.129	-	-
	(0.102)			(0.092)		
Bank controls$_{t-1}$	Yes	Yes	Yes	Yes	Yes	Yes
Bank-FE	Yes	-	Yes	Yes	-	Yes
Time-FE	-	Yes	Yes	-	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	OLS	OLS
Number of observations	427	428	427	536	536	536
Adj.-R^2	0.965	0.756	0.966	0.902	0.729	0.908

Table A4: Effects on credit to investigated firms including state-owned banks

Regression results of the model *New loan variable*$_{i,b,t}$ = β_1 *LJ bank exposure*$_b$ × *Post*$_t$ + β_2 *Post*$_t$ × *State owned bank* $_b$ + β_3 (*LJ bank exposure*$_b$ × *Post*$_t$ × *State owned bank*$_b$) + $X_{b,t-1}$ + *fixed effects* + $\varepsilon_{i,b,t}$, *where New loan variable*$_{i,b,t}$ denotes either the new loan amount granted to firm i by bank b at quarter t at the intensive margin (columns 5-8) or an indicator whether firm i received a new loan from bank b in quarter t at the extensive margin (columns 1-4). Extensive margin comprises firm-bank pairs where the firm did not borrow from the bank before 2014Q1, while the intensive margin comprises the remaining pairs where it did. In both margins we exclude investigated Lava Jato firms from the sample. The sample period is 2013Q1-2016Q2, excluding 2014Q1. Lava Jato bank exposure is an indicator of the third tercile of the banking distribution of bank shares of outstanding loans, as of 2012, to firms that were subsequently investigated by *Operação Lava Jato (*see equation 1). Post is a dummy variable that switches to one in the period after 2014Q1. *State owned bank* is a dummy indicating whether the bank is owned by some level of the Brazilian government. Bank controls are *Credit/Assets, Log(Total Assets), Capital, Non-performing loans, Liquidity* and *Return on Assets* lagged by one period and as defined in section 3.2. Sample excludes Lava Jato investigated firms. Standard errors (in parentheses) are clustered two-way at the firm and bank levels. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

	(1)	(2)	(3)	(4)
	Extensive margin		Intensive margin	
Dep. Var.:	*New Loans [dummy]*	*New Loans [dummy]*	*New Loans*	*New Loans*
LJ bank exposure × Post	-0.010**	-0.009**	-0.006	-0.075
	(0.004)	(0.004)	(0.062)	(0.075)
Post x State owned bankbank	0.001	0.003	-0.154***	-0.173***
	(0.005)	(0.004)	(0.040)	(0.037)
LJ bank exposure × Post × State owned bank	0.009	0.008	0.231***	0.353***
	(0.010)	(0.010)	(0.080)	(0.091)
Bank controls $_{t-1}$	Yes	Yes	Yes	Yes
Bank FE	Yes	-	Yes	-
Firm-Time-FE	Yes	Yes	Yes	Yes
Firm-Bank-FE	-	Yes	-	Yes
Number of observations	209,256	209,233	188,869	162,425
Estimation	OLS	OLS	PPML	PPML
Adj-R^2 or Pseudo-R^2	0.077	0.147	0.442	0.642

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Figure 1: Bank exposure to Lava Jato firms

Blue bars (with left hand side scale) display the Lava Jato bank exposures in descending order. They equal the percentage of outstanding credit exposure to Lava Jato firms as of 2012, for each of the 44 privately owned banks in our sample, calculated as shown in equation (1) before applying the tercile operator. Red line (with righ hand side scale) displays the number of firm-quarter observations of each bank in our sample in the year 2012. The vertical dashed line indicates the upper tercile split of the bank distribution of Lava Jato bank exposures, as applied in equation (1).

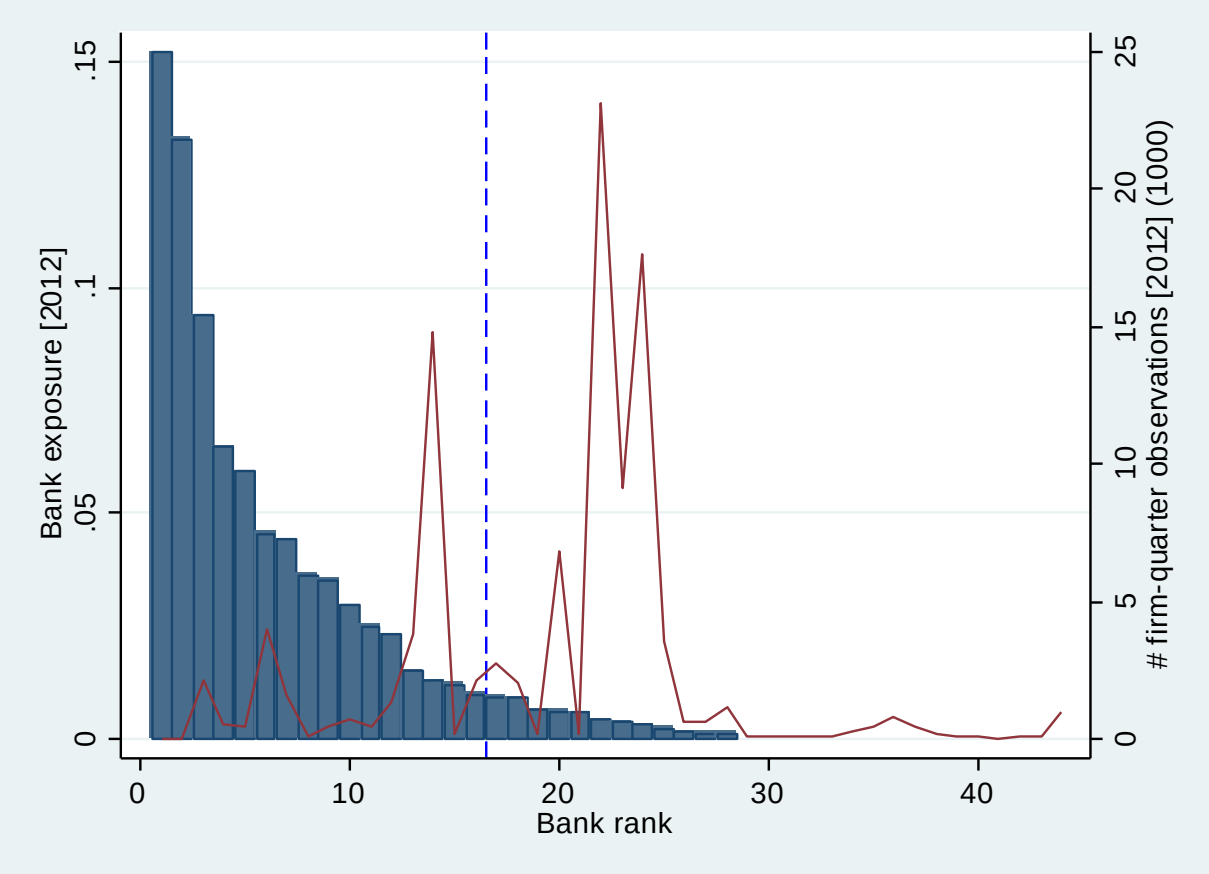
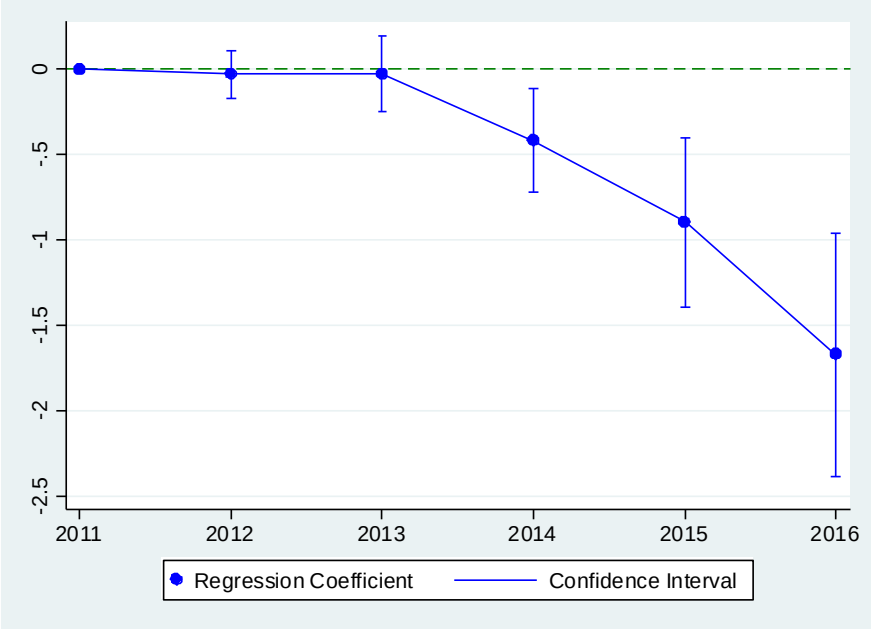


Figure 2: Real effects on Lava Jato firms

Figure depicts regression coefficients β_j's and their 95% confidence intervals of the model $Firm\ outcome_{i,t} = \sum\beta_j\ (Lava\ Jato_i \times Year[j]_t) + fixed\ effects + \varepsilon_{i,t}$, where $Firm\ outcome_{i,t}$ indicates the (log of) either *Wage bill* (panel A) *or Number of employees* (panel B), for firm i at year t, and j denotes one of the years 2012, 2013, 2014, 2015 or 2016. *Year*[j] is a dummy variable equal to one in the year j and zero otherwise. The sample period is 2011 to 2016 (year 2011 is the reference year). *Lava Jato* is a dummy variable that equals one for the 21 construction firms that are subject to anti-corruption investigations and zero otherwise. Standard errors are clustered at the firm-level.

Panel A: Dynamic effects on the wage bill of Lava Jato firms



Panel B: Dynamic effects on the number of employees of Lava Jato firms

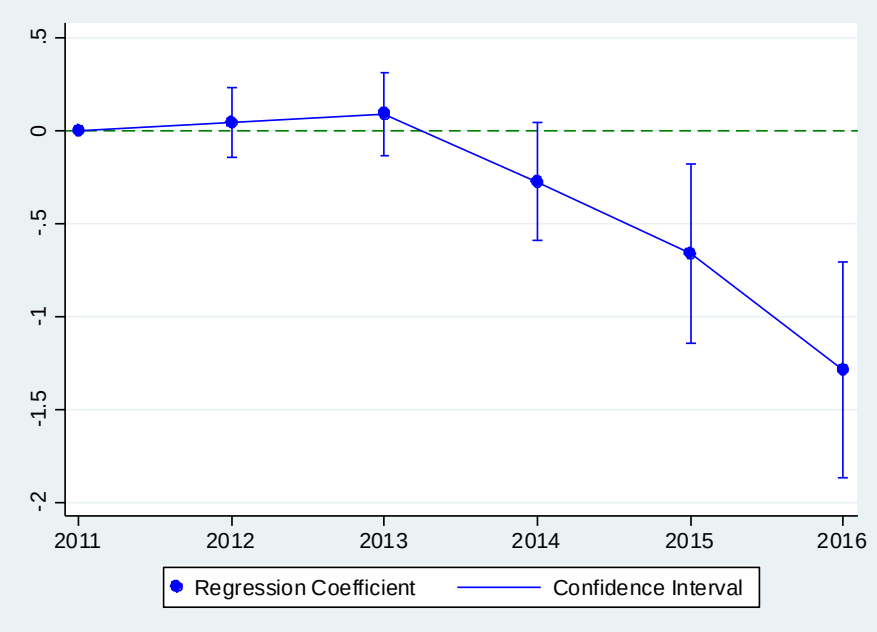
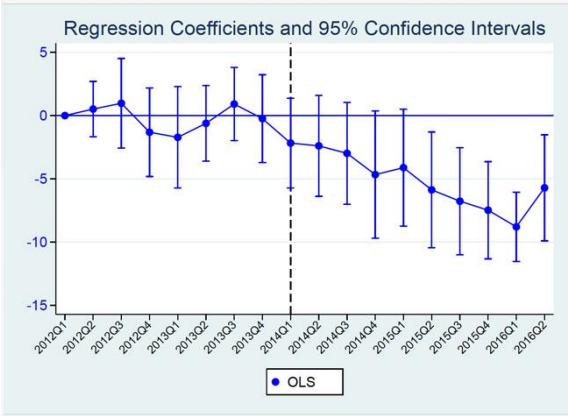


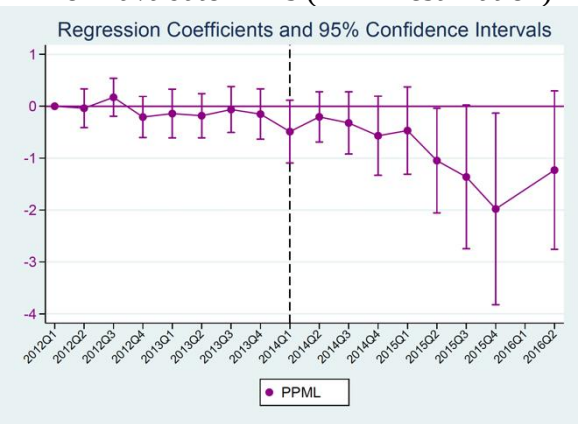
Figure 3: Effects on new credit to Lava Jato firms

Figure depicts regression coefficients β_j's and their 95% confidence intervals of the model *Firm outcome*$_{i,t}$ = $\sum\beta_j$ (*Lava Jato*$_i$ × *Quarter*[j]$_t$) + *fixed effects* + $\varepsilon_{i,t}$, where *Firm outcome*$_{i,t}$ indicates either Log(1+*New Loans*$_{it}$) in the OLS estimation of Panel A or *New Loans*$_{it}$ in the PPML estimation of Panel B. *New Loans*$_{it}$ is the sum over all 44 relevant privately owned banks of new loans granted to firm i at quarter t, and j denotes one of the quarters from 2012Q2 to 2016Q2. *Quarter*[j] is a dummy variable equal to one in the quarter j and zero otherwise. Sample period is 2012Q1 to 2016Q2 (quarter 2012Q1 is the reference quarter). *Lava Jato* is a dummy variable that equals one for the 21 construction firms that are subject to anti-corruption investigations and zero otherwise. Standard errors are clustered at the firm-level. Panel C shows the results of a synthetic control group analysis at the industry-quarter level. The outcome variable is Log(1+*New Loans*$_{st}$), where *New Loans*$_{st}$ is total amount of new loans granted to economic sector s at quarter t from the banks in the sample. and the vector of predictor variables includes the sectoral averages both in 2012 and in 2013 of the variables Δ(%)*New Loans*, Δ(%)*Outstanding Loans*, *regulatory rating*, *loan loss provisions*, *maturity* and the sectoral averages of *firms' wage bill*, *age* and *state*, where Δ(%) denotes the percentage growth. See the summary of Table 1 for the defintion of those variables at the disagregate level.

Panel A: Dynamic effects on new loans of of Lava Jato firms (OLS estimation)



Panel B: Dynamic effects on new loans of of Lava Jato firms (PPML estimation)



Panel C: Log(*1+New loans*) of Lava Jato firms and of the synthetic control group

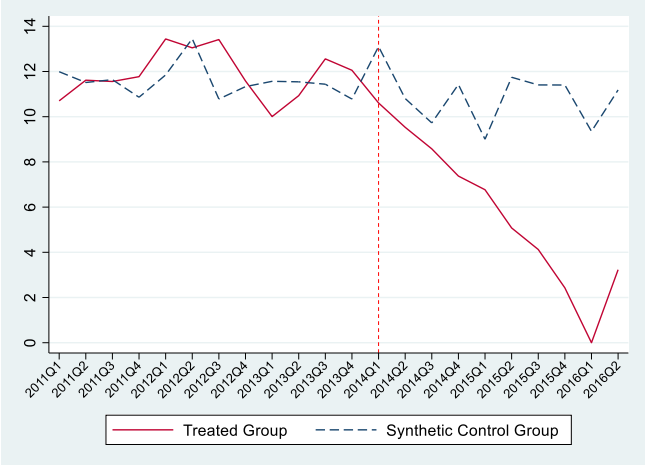
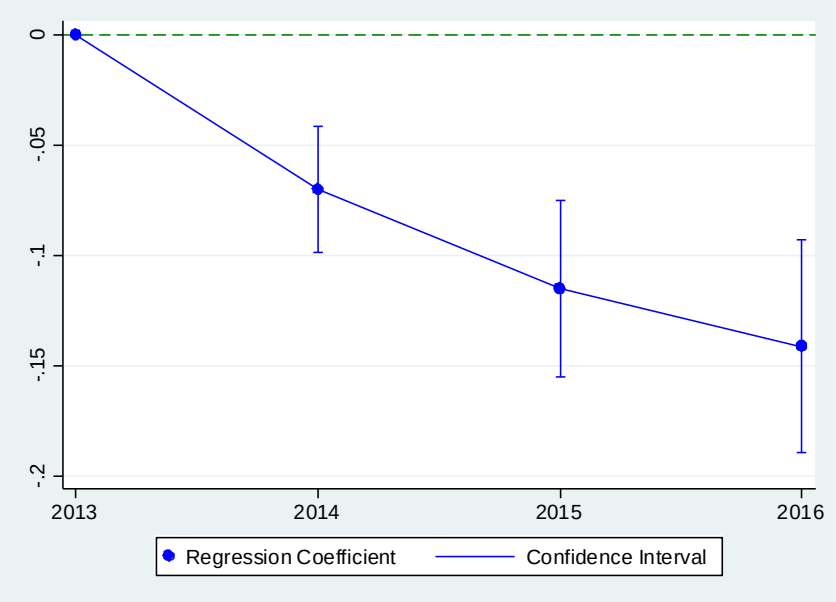


Figure 4: Real effects on non-investigated firms

Figure depicts regression coefficients β_j's and their 95% confidence intervals of the model *Firm outcome*$_{i,t}$ = $\sum\beta_j$ (*Lava Jato firm exposure*$_i$ × *Year*[j]$_t$) + *fixed effects* + $\varepsilon_{i,t}$, where *Firm outcome*$_{i,t}$ indicates the (log of) either *Wage bill* (panel A) *or Number of employees* (panel B), for firm i at year t, and j denotes one of the years 2014, 2015 or 2016. *Year*[j] is a dummy variable equal to one in the year j and zero otherwise. The sample period is 2013 to 2016 (year 2013 is the reference year). *Lava Jato firm exposure* is a dummy that equals one if the firm is in the upper tercile of the firm distribution of the weighted averages of Lava Jato bank exposures of every bank b that each firm i has outstanding credit with in 2012, as in equation (2). Sample excludes Lava Jato investigated firms. Standard errors are clustered at the firm-level.

Panel A: Effect on wage bill of non-investigated firms



Panel B: Effect on number of employees of non-investigated firms

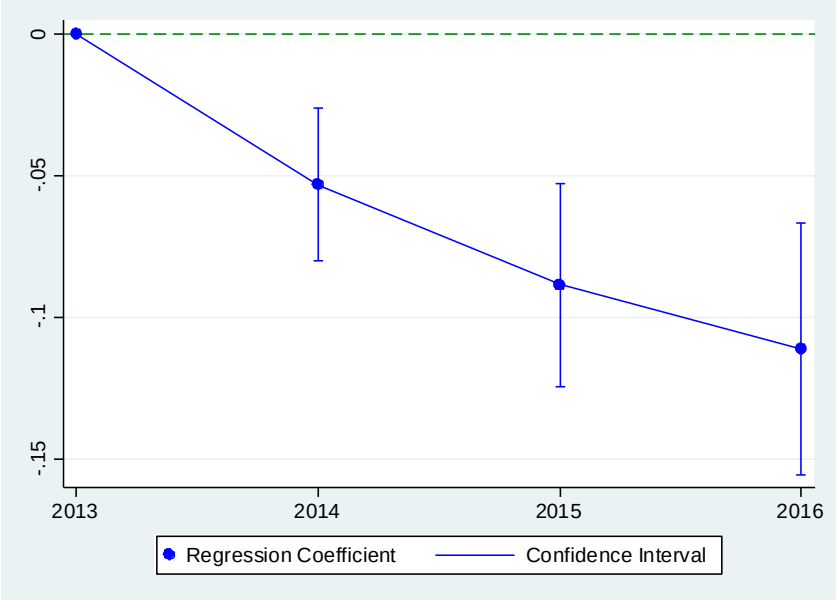


Table 1: Summary statistics

Summary statistics for the main variables used in the paper. Underlying sample comprises free-market new loans granted to 12,718 large (over 250 employees) privately owned non-financial firms from 44 relevantprivately owned banks. Summary statistics are computed based on the full time period 2011Q1-2016Q2. Loan characteristics are sourced from the SCR database and are described in the sequence. *New Loans$_{it}$* is the amount of new loans granted to firm i in quarter t by all private banks in the sample, as employed in equations (3) and (7). *New Loans$_{ibt}$* is the amount of new loans granted to firm i by bank b in quarter t, as employed in equations (5) and (6). *New Loans$_{it}$* and *New Loans$_{ibt}$* include zeros for absent new loans if there is positive outstanding credit for the firm-quarter pair or for the firm-bank-quarter triple and are winsorized at the 97.5% and 95% upper tail percentiles, respectively. *Maturity* (measured in months), *interest rate* (measured in p.p. a.a.), *regulatory rating* (in a scale from 1 to 4, where lower grades mean higher quality) and *loan loss provisions* (measured as a ratio over total loans) denote weighted averages over new loans granted to firm i by bank b at quarter t, with weights given by individual new loan amounts. *Interest rate* is winsorized at the 90% upper tail percentile. Firm characteristics include its *number of employees* and its *wage bill* (measured in R$/month), which are both sourced from RAIS, have an annual frequency and are winsorized at the 97.5% upper tail, and the total amount of campaign contributions of the firm in the federal elections of 2010 is normalized by the number of employees in 2012 (*Election campaign donations (continuous)).* Still, *Age* is the number of years of the firm and *Number of bank-relationships*, which is the number of banks the firm has outstanding credit with in each year. Bank characteristics are sourced from the COSIF database and are described in the sequence. *Capital* is capital to assets ratio, *Log(assets)* is the logarithm of total assets, *Liquidity* is holdings of cash and marketable securities over total assets, *NPL* is the ratio of non-performing loans, *Roa* is return on assets, *Credit/Assets* is the credit portfolio size over total assets. *Lava Jato bank exposure (cont.)* is the percentage of outstanding credit exposure of the bank to investigated Lava Jato firms as of 2012, according to equation (1) before the application of the tercile operator. *Lava Jato firm exposure* (*cont.)* is the weighted average of Lava Jato bank exposures of every bank b that the firm has outstanding credit with in 2012, as in equation (2) before the application of the tercile operator.

Variable	Number of obs.	Mean	Median	Std. Dev.
Loan characteristics				
New Loans$_{it}$	198,663	2,515,873	8,230	6,396,765
New Loans$_{ibt}$	503,620	664,500	0	6,045,580
Maturity $_{ibt}$	168,632	11.38	5.02	13.79
Interest rate $_{ibt}$	122,275	29.98	19.00	28,43
Regulatory Rating $_{ibt}$	168,646	2.20	2.00	1.08
Loan loss provision $_{ibt}$	168,646	0.0079	0.0050	0.0101
Firm characteristics				
Number of employees$_{it}$	73,695	854	470	1046
Wage bill$_{it}$	73,270	1,973,630	918,286	2,892,132
Age$_{it}$	43,155	25,67	23.14	14.39
Election campaign donations$_{i}$ (cont) [2010]	12,718	67.01	0	462,90
Number of bank-relationships$_{it}$	73,873	2.27	2	2.18
Bank characteristics				
Liquidity$_{bt}$	882	0.23	0.20	0.17
Credit/Assets$_{bt}$	882	0.54	0.53	0.22
Log(Assets$_{bt}$)	882	23,27	23,04	1,57
Capital$_{bt}$	881	0.19	0.16	0.10
NPL$_{bt}$	882	0.041	0.036	0.036
ROA$_{bt}$	843	0.010	0.011	0.021
Lava Jato exposures [2012]				

Lava Jato bank exposure$_b$ (cont.)	44	0.0194	0.0042	0.0343
Lava Jato firm exposure$_i$ (cont.)	12,697	0.0021	0.0013	0.0027

Table 2: Real effects on Lava Jato firms

Regression results of the model *Firm outcome*$_{i,t}$ = β(*Lava Jato*$_i$ × *Post*$_t$) + *fixed effects* + $\varepsilon_{i,t}$ where *Firm outcome* $_{i,t}$ indicates the log of either *Wage bill or Number of employee.* for firm i at year t. *Lava Jato* is a dummy variable that equals one for the 21 construction firms that are subject to anti-corruption investigations and zero otherwise. *Post* is a dummy variable that switches to one in the period after 2014Q1. The sample period is 2011 to 2016. Sample excludes non-investigated construction firms in columns (1) and (3) but not in columns (2) and (4). Standard errors (in parentheses) are clustered at the firm-level. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

Dep. Var.	*Log(wage bill)* (1)	*Log(wage bill)* (2)	*Log(employees)* (3)	*Log(employees)* (4)
Lava Jato x Post	-0.975***	-0.513***	-0.785***	-0.347**
	(0.213)	(0.119)	(0.196)	(0.133)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	-	Yes	-
Sector-Time FE	-	Yes	-	Yes
State-Time FE	-	Yes	-	Yes
Includes construction non-LJ firms	-	Yes	-	Yes
Estimation	OLS	OLS	OLS	OLS
Number of observations	63,996	73,235	64,301	73,664
Adj.-R^2	0.775	0.758	0.718	0.707

Table 3: Effects on credit to Lava Jato firms

Regression results of the model *Firm outcome* $_{i,t}$ = β(*Lava Jato*$_i$ × *Post*$_t$) + *fixed effects* + $\varepsilon_{i,t}$ where *Firm outcome* $_{i,t}$ indicates the volume of new loans *(New Loans)* (Panel A) or other loan characteristics (*Rating, Loan loss provision, Maturity* and *Interest rate*) (Panel B) for firm i at quarter t. Apart from *New loans*, which are the sum over all banks, all other variables are weighted averages. The sample period is 2011Q1-2016Q2 (Panel A) or 2012Q1-2016Q2 (Panel B). In both cases, the quarter 2014Q1 is excluded. Sample excludes construction non-investigated firms. *Lava Jato* is a dummy variable that equals one for the 21 construction firms that are subject to anti-corruption investigations and zero otherwise. *Post* is a dummy variable that switches to one in the period after 2014Q1. In Panel A, Column (2) excludes publicly listed firms from the control group; Column (3) shows the results of a propensity score matching strategy; and Column (4) is based on data starting in 2012 instead of 2011. Standard errors (in parentheses) are clustered at the firm level. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

Panel A: Volume of new loans

Dep. Var.:	*New Loans* (1)	*New Loans* (2)	*New Loans* (3)	*New Loans* (4)
Lava Jato × Post	-0.660***	-0.634**	-0.749**	-0.687***
	(0.254)	(0.253)	(0.299)	(0.241)
Firm-FE	Yes	Yes	Yes	Yes
Time-FE	Yes	Yes	Yes	Yes
Unlisted firms only	-	Yes	-	-
Matching control group	-	-	Yes	-
Sample starting in 2012	-	-	-	Yes
Estimation	PPML	PPML	PPML	PPML
Number of observations	159,955	155,958	1,436	124,769
Pseudo-R^2	0.647	0.642	0.549	0.655

Panel B: Characteristics of new loans

Dep. Var.:	*Rating* (1)	*Loan loss provision* (2)	*Maturity* (3)	*Interest rate* (4)
Lava Jato × Post	0.799***	0.006***	-0.256	4.598
	(0.197)	(0.002)	(0.340)	(8.559)
Firm-FE	Yes	Yes	Yes	Yes
Time-FE	Yes	Yes	Yes	Yes
Estimation	OLS	OLS	PPML	OLS
Number of observations	63,706	63,706	63,397	53,077
Adj.-R^2 or Pseudo-R^2	0.369	0.339	0.352	0.323

Table 4: Effects on credit to non-investigated firms at the bank level

Regression results of the model $Log(New\ loans)_{b,t} = \beta(Lava\ Jato\ Exposure_b \times Post_t) + X_{b,t-1} + fixed\ effects + \varepsilon_{b,t}$ where $New\ loans_{b,t}$ is the sum of new loan amounts granted by bank b to (only) non-investigated firms at quarter t. The sample period is 2013Q1-2016Q2, excluding 2014Q1. Lava Jato bank exposure is measured by tercile dummies (T_3 = upper tercile, T_2 = mid tercile) or the continuous measure of the bank share of outstanding loans, as of 2012, to firms that were subsequently investigated by *Operação Lava Jato (*see equation 1). Post is a dummy variable that switches to one in the period after 2014Q1. Bank controls are *Credit/Assets, Log(Total Assets), Capital, Non-performing loans, Liquidity* and *Return on Assets* lagged by one period and as defined in section 3.2. Standard errors (in parentheses) are clustered at the bank level. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

Dep. Var.:	*Log(New Loans)* (1)	*Log(New Loans)* (2)	*Log(New Loans)* (3)
Lava Jato bank exposure (T_3) × Post	-0.594***	-0.649***	
	(0.163)	(0.175)	
Lava Jato bank exposure (T_2) × Post		-0.284*	
		(0.161)	
Lava Jato bank exposure (cont.) × Post			-7.694*
			(3.377)
Bank controls$_{t-1}$	Yes	Yes	Yes
Bank-FE	Yes	Yes	Yes
Time-FE	Yes	Yes	Yes
Estimation	OLS	OLS	OLS
Number of observations	505	505	505
Adj.-R^2	0.847	0.847	0.846

Table 5: Effects on credit to non-investigated firms

Regression results of the model *New loan variable*$_{i,b,t}$ = β(*Lava Jato Exposure*$_j$ × *Post*$_t$) + $X_{b,t-1}$ + *fixed effects* + $\varepsilon_{i,b,t}$ where *New loan variable*$_{i,b,t}$ denotes either the new loan amount granted to firm i by bank b at quarter t at the intensive margin (columns 3 and 4) or an indicator whether firm i received a new loan from bank b in quarter t at the extensive margin (columns 1 and 2). Extensive margin comprises firm-bank pairs where the firm did not borrow from the bank before 2014Q1, while the intensive margin comprises the remaining pairs where it did. In both margins we exclude investigated Lava Jato firms from the sample. The sample period is 2013Q1-2016Q2, excluding 2014Q1. Lava Jato bank exposure is an indicator of the third tercile of the banking distribution of bank shares of outstanding loans, as of 2012, to firms that were subsequently investigated by *Operação Lava Jato (*see equation 1). Post is a dummy variable that switches to one in the period after 2014Q1. Bank controls are *Credit/Assets, Log(Total Assets), Capital, Non-performing loans, Liquidity* and *Return on Assets* lagged by one period and as defined in section 3.2. Sample excludes Lava Jato investigated firms. Standard errors (in parentheses) are clustered two-way at the firm and bank levels. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

	(1)	(2)	(3)	(4)
	Extensive margin		Intensive margin	
Dep. Var.:	*Dummy [New Loans>0]*	*Dummy [New Loans>0]*	*New Loans*	*New Loans*
LJ bank exposure × Post	-0.010**	-0.009**	-0.048	-0.123
	(0.004)	(0.004)	(0.076)	(0.093)
Bank controls $_{t-1}$	Yes	Yes	Yes	Yes
Bank-FE	Yes	-	Yes	-
Firm-Time-FE	Yes	Yes	Yes	Yes
Firm-Bank-FE	-	Yes	-	Yes
Observations	154,109	154,090	130,054	110,209
Estimation	OLS	OLS	PPML	PPML
Adj-R^2 or Pseudo-R^2	0.076	0.148	0.442	0.642

Table 6: Effects on credit to non-investigated firms and election campaign donations

Regression results of the model *New loan variable*$_{i,b,t}$ = β_1 *LJ bank exposure*$_b$ × *Post*$_t$ + β_2 *LJ bank exposure*$_b$ × *Donations*$_i$ + β_3 *(LJ bank exposure*$_b$ × *Post*$_t$ × *Donations*$_i$ *)* + $X_{b,t-1}$ + *fixed effects* + $\varepsilon_{i,b,t}$, *where New loan variable*$_{i,b,t}$ denotes either the new loan amount granted to firm i by bank b at quarter t at the intensive margin (columns 5-8) or an indicator whether firm i received a new loan from bank b in quarter t at the extensive margin (columns 1-4). Extensive margin comprises firm-bank pairs where the firm did not borrow from the bank before 2014Q1, while the intensive margin comprises the remaining pairs where it did. In both margins we exclude investigated Lava Jato firms from the sample. The sample period is 2013Q1-2016Q2, excluding 2014Q1. Lava Jato bank exposure is an indicator of the third tercile of the banking distribution of bank shares of outstanding loans, as of 2012, to firms that were subsequently investigated by *Operação Lava Jato (*see equation 1). Post is a dummy variable that switches to one in the period after 2014Q1. *Donations* is a dummy indicating whether the firm donated in the Brazilian federal election campaign of 2010.Bank controls are *Credit/Assets*, *Log(Total Assets)*, *Capital*, *Non-performing loans*, *Liquidity* and *Return on Assets* lagged by one period and as defined in section 3.2. Sample excludes Lava Jato investigated firms. Standard errors (in parentheses) are clustered two-way at the firm and bank levels. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Extensive margin				Intensive margin			
Dep. Var.:	*Dummy [New Loans > 0]*				*New Loans*			
Lava Jato bank exposure × Post	-0.011**	-0.010**	-	-	-0.006	-0.074	-	-
	(0.005)	(0.005)			(0.081)	(0.093)		
Lava Jato bank exposure × Post × Donations	0.005	0.005	0.004	0.004	-0.118**	-0.125**	-0.102*	-0.084
	(0.005)	(0.005)	(0.005)	(0.005)	(0.049)	(0.062)	(0.053)	(0.062)
Lava Jato bank exposure × Donations	-	-	-	-	0.137**	-	0.131**	-
					(0.010)		(0.024)	
Other interactions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls $_{t-1}$	Yes	Yes	-	-	Yes	Yes	-	-
Bank FE	Yes	-	-	-	Yes	-	-	-
Firm-Time-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Bank-FE	-	Yes	-	Yes	-	Yes	-	Yes
Bank-Time-FE	-	-	Yes	Yes	-	-	Yes	Yes
Estimation	OLS	OLS	OLS	OLS	PPML	PPML	PPML	PPML
Number of observations	154,105	154,086	154,105	154,086	130,054	110,209	129,978	110,132
Adj.-R^2 or Pseudo-R^2	0.076	0.148	0.079	0.151	0.442	0.642	0.451	0.651

Table 7: Effects on credit and credit characteristics to non-investigated firms

Regression results of the model *Firm outcome* $_{i,t} = \beta(Lava\ Jato\ firm\ exposure_i \times Post_t) + fixed\ effects + \varepsilon_{i,t}$ where *Firm outcome* $_{i,t}$ indicates the volume of new loans *(New Loans)* (column 1) or other loan characteristics (*Rating*, *Loan loss provision*, *Maturity* and *Interest rate*) (columns 2-5) for firm i at quarter t. Apart from *New loans*, which are the sum over all banks, all other variables are weighted averages. The sample period is 2013Q1-2016Q2, excluding 2014Q1. *Lava Jato firm exposure* is a dummy that equals one if the firm is in the upper tercile of the firm distribution of the weighted averages of Lava Jato bank exposures of every bank b that each firm i has outstanding credit with in 2012, as in equation (2). *Post* is a dummy variable that switches to one in the period after 2014Q1. Sample excludes Lava Jato investigated firms. Standard errors (in parentheses) are clustered at the firm level. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

Dep. Var.:	*New Loans*	*Rating*	*Loan Loss Provision*	*Maturity*	*Interest Rate*
	(1)	(2)	(3)	(4)	(5)
Lava Jato firm exposure × Post	-0.185***	0.085***	0.001***	0.048**	1.309**
	(0.031)	(0.020)	(0.000)	(0.022)	(0.587)
Firm-FE	Yes	Yes	Yes	Yes	Yes
Time-FE	Yes	Yes	Yes	Yes	Yes
Estimation	PPML	OLS	OLS	PPML	OLS
Number of observations	102,430	50,056	50,056	49,786	41,430
Adj.-R^2	0.659	0.404	0.377	0.368	0.333

Table 8: Real effects on non-investigated firms through firm indirect exposure to Lava Jato

Regression results of the model *Firm outcome*$_{i,t}$ = β(*Lava Jato*$_i$ × *Post*$_t$) + *fixed effects* + $\varepsilon_{i,t}$ where *Firm outcome* $_{i,t}$ indicates the (log of) either *Wage bill or Number of employee*. for firm i at year t. The sample period is 2013-2016. *Post* is a dummy variable that switches to one in the period after 2014Q1. *Lava Jato firm exposure* is a dummy that equals one if the firm is in the upper tercile of the firm distribution of the weighted averages of Lava Jato bank exposures of every bank b that each firm i has outstanding credit with in 2012, as in equation (2). Sample excludes Lava Jato investigated firms. Standard errors (in parentheses) are clustered at the firm-level. ***, **, * denote statistical significance at the 1%, 5% or 10% levels.

Dep. Var.:	*Log(Wage bill)* (1)	*Log(Wage bill)* (2)	*Log(Employees)* (3)	*Log(Employees)* (4)
Lava Jato firm exposure × Post	-0.108***	-0.119***	-0.084***	-0.098***
	(0.017)	(0.030)	(0.016)	(0.027)
Firm-FE	Yes	Yes	Yes	Yes
Time-FE	Yes	-	Yes	-
Sector-time FE	-	Yes	-	Yes
State-time FE	-	Yes	-	Yes
Estimation	OLS	OLS	OLS	OLS
Number of observations	47,595	47,576	48,069	48,050
Adj.-R^2	0.813	0.822	0.788	0.800