

CORRUPTION AND MARKET VALUE: EFFECTS OF THE LAVA JATO OPERATION ON THE BRAZILIAN STOCK MARKET

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ABSTRACT

This paper aims to identify the effects of the disclosure of corruption events on the market values of companies listed on the Brazilian Stock Exchange. For this purpose, we applied the event studies methodology to evaluate the influence of exposing the phases of one of the most extensive Brazilian anti-corruption operations - the Lava Jato Operation - on the cumulative abnormal return of shares, both of the companies cited in the investigations (direct involvement) and of those listed in the same segments as the cited companies. Results indicate that the Lava Jato Operation reduced the market values of the companies directly involved in the corruption scandals above market variations. For the other companies in the concerned segments, there was a positive effect on the cumulative abnormal returns. Such results suggest that the onset of anti-corruption operations such as the Lava Jato Operation has the potential to reduce pricing differences that exist between companies that directly participate in fraudulent contracts and other companies in the same segments. This pricing adjustment may be associated with the correction made by the market due to losses in competitiveness caused by unfair competition.

Keywords: Corruption. Market value. Lava Jato Operation.

1 INTRODUCTION

Brazilian newscasts have often shown corruption events in various spheres and hierarchy levels of public power, as well as in contracts that involve the public and private sectors. Such news reports are aligned with the increase in the perception of corruption by Brazilians, to Brazil's decline in the Corruption Perception Index (CPI), as well as the outbreak of anti-corruption operations such as the Lava Jato Operation. This is one of the most extensive

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Brazilian anti-corruption operations and has enabled the discovery and dismemberment of various corruption schemes throughout the country, which count on the participation of leading politicians and prominent businesspeople and involve billions of Reais (Polícia Federal, 2016).

In the literature on the subject, researchers investigate the effects of corruption on economic growth by analyzing factors such as investments (Mo, 2001), transactional costs and market efficiency (Méon & Weill, 2010), and governmental policies (Mauro, 1996; 1997). The conclusions are still divergent: some results suggest that corruption reduces the investment level and economic growth due to the increase in market inefficiency and uncertainty (Mauro, 1996; Ionescu, 2014), while other studies suggest that the corruption effects may be adverse in different economies depending on specific institutional/socioeconomic conditions and factors (Blackburn, Bose, & Haque, 2011; Wang & You, 2012).

The study by Méon and Sekkat (2005), for example, shows that corruption's adverse effect on investments and economic growth is strengthened by political violence, government inefficiency, and weak legal institutions. Méon and Weill (2010), on the other hand, suggest that the effects of corruption are less perverse in countries with less developed institutions. Also, the authors noted that, in cases of dysfunctional and inefficient institutions, corruption might even be linked to a relative increase in efficiency because, in such extreme cases, the damage caused by bureaucracy and slowness of the institutions outweigh the corruption-related losses. In other words, corruption appears to be a less costly, albeit illegal, solution for business growth (Acemoglu & Verdier, 1998; Blackburn et al., 2011). In such scenarios, fragile legislations and bureaucratic, as well as institutional obstacles end up creating perverse incentives for economic agents.

However, it is unclear how the disclosure of corruption events influences the market values of corrupt and non-corrupt companies in contexts where fraudulent contracts hurt competition fairness and interfere with competitiveness levels. This paper aims to contribute to this debate by identifying the effects of disclosing corruption events on the company market values.

Regarding corruption effects on the financial market, some results suggest that corruption reduces company values through inefficient investments for those involved in fraudulent contracts (Lee & Ng, 2006). In this case, part of the funds invested is diverted toward corrupt public institutions and officials as bribes (Fisman & Svensson, 2007). The misuse of such resources increases the costs of products and services inherent to the business activities, functioning as a "tax" that introduces uncertainty and risk on future profitability (Mauro, 1996; Méon & Sekkat, 2005; Fisman & Svensson, 2007).

On the other hand, the signing of contracts through political interference and fraud in public biddings, while imposing a competitive disadvantage to other companies in the market, provides favoritism and opportunities to the corrupting companies, since products and services are acquired in disregard with the best cost-benefit ratio (Lamdsdorff, 2003). In this case, corruption constitutes an obstacle to competition and provides the corrupting companies with a competitive advantage, which may generate pressure for an increase in the relative market value of such companies (Delavallade, 2006). However, it is unclear how the market creates prices and responds to the disclosure of corruption events both for companies directly involved in corruption schemes and for those in the same segments which are indirectly involved because of competitive disadvantages.

To understand the effects of disclosing corruption events on the market values of the companies involved, we chose the Brazilian scenario in the midst of the facts established and disclosed by the Lava Jato Operation. Hence, the purpose of this paper is to identify the effects of the disclosure of corruption events on the market values of the companies listed on the Brazilian Stock Exchange.

In theoretical terms, this paper contributes to the literature by analyzing a specific corruption scenario outlined by contracts between the public sphere and private companies, in addition to previously related studies (Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998; Lee & Ng, 2006), which indicate that corruption may be linked to uncertainty in future events and the level of investor confidence. Additionally, this study differs from others when analyzing the effects of disclosing corruption events in the market values of directly involved companies as well as companies that are indirectly involved through market competitiveness. In practical

terms, this study indicates that the fight against corruption and the disclosure of facts established by the Lava Jato Operation resulted in a loss of market values for the cited companies and in an increase of market values for the other companies in the same segments. In other words, the disclosure of anti-corruption operations contributes to reducing the pricing discrepancies inherent to the corruption practiced by the companies involved in the respective operations. Such pricing adjustment may be associated with the corrections made by the market due to losses in competitiveness caused by unfair competition.

2 THEORETICAL BACKGROUND

2.1 Corruption and market value

In analyzing corruption effects on firm market values, Porta et al. (1998) and Lee and Ng (2006) suggested that high corruption levels in the public sector negatively influence the share price of publicly traded companies. Using variables such as ROE or ROA, profit margin, research and development spending, and dividend payment, they observed that the effect of corruption is robust in the depreciation of the Price to Book due to the reductions in expected cash flow and the prediction of future profits. Thus, at certain levels, corruption may be a problem for the economy, with the increase in uncertainty and market risk resulting in investment reduction with consequences for economic and social development (Mauro, 1996; Ehrlich & Lui, 1999; Lee & Ng, 2006).

Mauro (1996), for example, pointed out that corruption generates investment inefficiency, since part of the resources are directed at corrupt public institutions and servants through bribes, which increases the cost of public products and services necessary for the business activities, thus functioning as a "tax" that introduces uncertainty and risk about future events (Mauro, 1996; Méon & Sekkat, 2005; Fisman & Svensson, 2007).

O'Toole and Tarp (2014) emphasized the importance of investment efficiency because it is directly related to economic growth and the marginal product of the invested capital. In a study on corruption and investment efficiency in developing countries, it was found that the effect of corruption is negative. It mainly affects the small and medium-sized companies, which are generally the most dependent on public products and services and have a lower payment capacity.

In line with the previous studies, Everhart, Martinez-Vazquez, Martinez-Vasquez, and McNab (2003) observed that corruption has the effect of reducing the efficiency of the public and private sectors, once it allows people to assume relevant positions in various spheres of power with diverse objectives or without the required competencies to support the promotion. In such unstable environments, returns on investments are harder to predict, which affects decisions about private investments, with negative consequences on long-term economic and sustainable development. In addition to reducing investment efficiency, the signing of contracts through political interference and fraud in public biddings imposes a competitive disadvantage to the other companies in the market, since products and services are acquired in disregard of the best cost-benefit (Lambsdorff, 2003).

If, on the one hand, the adverse effects of corruption on investments and economic growth is evident, on the other hand, Méon and Weill (2010) suggested that they are less perverse in countries with less developed institutions. Also, the authors noted that in cases of dysfunctional and inefficient institutions, corruption might even be linked to an increase in relative efficiency. This is because, in such extreme cases, the damage caused by institution bureaucracy and slowness outweigh the corruption-related losses. In other words, corruption appears to be a less costly, albeit illegal, solution for business growth (Acemoglu & Verdier, 1998; Blackburn et al., 2011). In this scenario, bureaucratic and institutional obstacles end up creating perverse incentives for economic agents.

The paper by Méon and Weill (2010) tests two hypotheses. First, "Grease on the Wheels", which, in summary, defends that corruption may have beneficial effects on a country's productivity in cases of severe institution deterioration such as political violence, weakened Judiciary system, and inefficient public administration. Second, "Sand on the Wheels", which proposes corruption is perverse in all scenarios and its costs are higher even when a country's

institutions are weaker. Briefly, both hypotheses point to corruption as a factor of economic detriment in a context of strong and effective institutions. However, the first hypothesis states that in extreme cases of inefficiency, corruption may be beneficial, while the second presents corruption as an obstacle to growth independent of the scenario.

The results of Méon and Weill (2010) point, on average, to a non-rejection of the "Grease on the Wheels" hypothesis. That is, in countries with deteriorating institutional contexts, there are indications of marginal benefits of corruption. The authors emphasize, however, that such an interpretation is extreme and risky, and that a country that benefits from such effects may eventually fall into a future trap of inefficiency and mismanagement.

Under balanced conditions, in fact, the economy is always in a more fragile situation when its agents are submitted to excessive bureaucracy and experience corruption and political-institutional instability. The strengthening of institutions, of the political-economic environment, and the establishment of appropriate legal punishments for corruption crimes are, therefore, fundamental so that perverse incentives to economic agents are not created.

2.2 The Lava Jato Operation and the agency costs

According to the Brazilian Federal Police (FP) (Polícia Federal, 2016), the Lava Jato Operation is an anti-corruption and money laundering investigation that covers several mixed-economy and privately-owned companies accused of fraud in public biddings, money laundering, and bribery. In this scenario, the embezzlement of resources from Petrobrás, Brazil's main mixed-economy company, amounts to billions of dollars in contract fraud.

The first phase of the Lava Jato Operation was started by the Federal Police on March 17th, 2014, with the purpose of dismantling organizations that practiced crimes against the National Financial System, mainly the laundering of money resulting from contractual fraud and bribery. According to the Financial Activities Control Council (COAF) of the Brazilian Department of Treasury, the investigated groups registered atypical financial operations involving billions of Reais.

Such contractual relationships may be explored through the Agency theory, which analyzes commercial relations established using contracts between the principal and the agent. Such relations are susceptible to conflicts and require governance mechanisms that limit the behavior of the actors, evidencing the actions and obligations of the parties to reduce the conflict of interests between the principal and the agent. Legislations, mechanisms to reduce the informational asymmetry, rules for capital allocation, and remuneration and reward systems are used to mitigate risks and prevent self-interest actions with the purpose of assuring organization efficiency (Fama & Jensen, 1983; Brudney, 1985).

Such governance mechanisms, however, generate agency costs which may indirectly affect the company's expected profit due to high expenses associated with bureaucratic systems and with the control and inhibition of unwanted behaviors and actions. Nevertheless, omitting these mechanisms may imply an increased risk for investors, with direct impact on a company's capital costs. As verified by Porta et al. (1996), the differences and characteristics of legal systems and investor protection are relevant for reducing both agency costs and the risks associated with capital costs. In more corrupt regimes, insiders and controller blocks act with greater impunity, increasing market uncertainty and the need for protection mechanisms. Consequently, they generate higher agency costs.

Examples of problems involving such mechanisms may be given by the initial target of the Lava Jato Operation: Petrobrás, in which public agents were receiving bribes to facilitate the closing of overpriced public biddings. Others companies were also identified as participants in this corruption network.

Specifically, the actions of the Lava Jato Operation are divided into phases, which partly unfold from previous phases. The unfolding phases were included in this study because they are directly related to the investigations and the enforcement of legal warrants against companies or individuals involved in the frauds, thus indicating the continuity and progress of the Operation. Figure 1 shows a summary of the first phases of the Lava Jato Operation. One may obtain information about other phases from the website of the Brazilian Federal Police.

Phase	Date	Goal	Results	Main Targets
1st	March 1th, 2014	Disarticulate the illegal action by moneychangers who would use people and companies on behalf of third parties to commit crimes against the national financial system and money laundering.	FP enforces 81 search and seizure warrants, 18 preventive arrest warrants, 10 temporary arrest warrants, and 19 coercive conduction warrants.	Moneychangers.
2nd	March 20th, 2014	Investigation of the same crime category with focus extended to other moneychangers and the involvement of a former director of Petrobrás.	FP enforces 6 search warrants and 1 temporary arrest warrant.	Moneychangers, former Petrobrás Director Paulo Roberto Costa.
3rd	April 11th, 2014	Continuation of investigations from previous phases.	FP enforces 16 search warrants, 3 temporary arrest warrants, and 6 coercive conduction warrants.	Moneychangers.
4th	June 11th, 2014	Technical unfolding of the previous phases.	FP enforces 1 search warrant and 1 preventive arrest warrant.	Former Petrobrás Supply Chain Director Paulo Roberto Costa.
5th	July 1st, 2014	Enforcement of court orders.	FP enforces 7 search warrants, 1 temporary arrest warrant, and 1 coercive conduction warrant.	Partners of moneychanger Alberto Youssef and front companies that moved accounts in Switzerland.
6th	August 22nd, 2014	Technical unfolding of the previous phase.	FP enforces 15 search warrants and 1 coercive conduction warrant.	Companies linked to Paulo Roberto Costa.
7th	November 14th, 2014	Arrest of contractors and operators of the bribe distribution scheme involving illicit contracts with Petrobrás.	FP enforces 49 search warrants, 6 preventive arrest warrants, 21 temporary arrest warrants, and 9 coercive conduction warrants.	Presidents and executives of contractor companies.
8th	January 14th, 2015	Technical unfolding of the previous phase.	FP enforces 1 preventive arrest warrant.	Former Petrobrás International Director, Nestor Cerveró.
9th	February 5th, 2015	Investigate the bidding fraud scheme in Petrobrás and consequent distribution of bribes involving other boards of the company.	FP enforces 40 search and seizure warrants, 18 coercive conduction warrants, 3 temporary arrest warrants, and 1 preventive arrest warrant.	Operators of the corruption scheme.
10th	March 16th, 2015	Enforcement of court orders for the crimes of criminal association, false documents, passive corruption, active corruption, bidding process fraud, and money laundering.	FP enforces 2 preventive arrest warrants, 4 temporary arrest warrants, and 12 search and seizure warrants.	Former Petrobrás Service Director, Renato Duque, operators and beneficiaries of the scheme.
11th	April 10th, 2015	Investigation of criminal acts attributed to three groups of former political agents in the context of misappropriation of resources from Petrobrás and federal public agencies.	FP enforces 7 arrest warrants, 9 coercive conduction warrants, and 16 search and seizure warrants.	Politicians and former politicians.
12th	April 15th, 2015	Enforcement of court orders.	FP enforces 1 search and seizure warrant, 1 preventive arrest warrant, 1 temporary arrest warrant, and 1 coercive conduction warrant.	Accused of receiving undue advantages derived from fraud in Petrobrás contracts.
13th	April 21st, 2015	Technical unfolding of the previous phase.	FP enforces 4 search and seizure warrants, 1 coercive conduction warrant, and 1 preventive arrest warrant.	Financial operators that acted on contracts signed by contractors with Petrobrás.
14th	June 19th, 2015	Expand the investigation into crimes of cartel formation, biddings fraud, corruption, misappropriation of public funds, and money laundry regarding two large national and international contractors.	FP enforces 8 preventive arrest warrants, 4 temporary arrest warrants, 38 search warrants, and 9 coercive conduction warrants.	Executives, contractors, and their controlled contractors.
15th	July 2nd, 2015	Investigate the receipt of illicit benefits within the international board of directors of Petrobrás	FP enforces 4 search warrants and 1 preventive arrest warrant.	Former Petrobrás International Director Jorge Zelada
16th	July 28th,	Investigate the cartel formation and the prior	FP enforces 23 search	President of state-

	2015	bidding adjustments, as well as the undue payment of financial advantages to employees of state-owned Eletronuclear.	warrants, 2 temporary arrest warrants, and 5 coercive conduction warrants.	owned Eletronuclear.
17th	August 3rd, 2015	Enforcement of precautionary measures regarding payers and recipients of undue advantages from contracts with the Public Power.	FP enforces 26 search warrants, 3 preventive arrest warrants, 5 temporary arrest warrants, and 6 coercive conduction warrants.	Politicians, former lobbyists, and straw men used in transactions.
18th	August 13th, 2015	Enforcement of precautionary measures regarding the operator identified in the previous phase, responsible for raising funds related to undue advantages from a payroll loan contract with the Brazilian Ministry of Planning.	FP enforces 1 temporary arrest warrant and 10 search and seizure warrants.	Operator identified in the previous phase.
19th	September 21st, 2015	Development of the investigations from previous phases and of contractors already investigated in the Lava Jato Operation.	FP enforces 7 search and seizure warrants, 1 preventive arrest warrant, 1 temporary arrest warrant, and 2 coercive conduction warrants.	Executives and contractors.
20th	November 16th, 2015	Investigate the participation of former Petrobrás employees investigated for the undue receipt of funds from representatives of the contracted companies.	FP enforces 11 search and seizure warrants, 2 temporary arrest warrants, and 5 coercive conduction warrants.	Former Petrobrás employees and new identified financial operator
21st	November 24th, 2015	Investigate the financial scheme used by the investigated to conceal the real destination of the undue amounts paid to public agents and Petrobrás directors.	FP enforces 25 search and seizure warrants, 1 preventive arrest warrant, and 6 coercive conduction warrants.	Lobbyist José Carlos Bumlai, appointed as a friend of former president Luiz Inácio Lula da Silva, and Luiz Esteves, partner of investment bank BTG Pactual.
22nd	January 27th, 2016	Investigate the scheme for opening offshore companies and accounts to conceal and disguise resources deriving from fraud and embezzlement in contracts with Petrobrás.	FP enforces 15 search and seizure warrants, 6 temporary arrest warrants, and 2 coercive conduction warrants.	Senator Delcídio do Amaral and banker André Esteves, partner of investment bank BTG Pactual.
23rd	February 22nd, 2016	Enforcement of precautionary measures related to the payment and receipt of bribes.	FP enforces 38 search and seizure warrants, 2 preventive arrest warrants, 6 temporary arrest warrants, and 5 coercive conduction warrants.	Bribing companies, an operator, and bribe recipients of the scheme.
24th	March 4th, 2016	Investigate the receipt of advantages from contractors directly linked to the corruption scheme.	FP enforces 33 search and seizure warrants and 11 coercive conduction warrants.	Former president Luiz Inácio Lula da Silva and his son Fábio Luiz Lula da Silva.
25th	March 21st, 2016	Enforcement of the arrest of the operator appointed as responsible for paying bribes to former Petrobrás directors.	FP enforces 1 arrest warrant and 1 search and seizure warrant, both in Lisbon, Portugal.	Operator Raul Schmidt Felipe Junior.
26th	March 22nd, 2016	Investigate the parallel accounting scheme of one of the business groups involved, intended to pay undue advantages to third parties, several of which are directly or indirectly linked to the public power.	FP enforces 67 search and seizure warrants, 28 coercive conduction warrants, 11 temporary arrest warrants, and 4 preventive arrest warrants.	Odebrecht business group and financial operators linked to the parallel exchange market.
27th	April 1st, 2016	Investigate scheme for laundering money derived from a loan with the Schahin bank involving a transfer to the Brazilian Workers Party (PT).	PF enforces 8 search and seizure warrants, 2 temporary arrest warrants, and 2 coercive conduction	Former Secretary-General of the Workers Party (PT), Sílvio Pereira, former PT Treasurer Delúbio

			warrants.	Soares, and entrepreneurs linked to the scheme.
28th	April 12th, 2016	Investigate the collection of bribes to avoid the convening of contractors to provide testimony in a Parliamentary Commission of Inquiry (CPI) established in 2014 by the federal senate and the chamber of deputies to investigate embezzlement in Petrobrás.	FP enforces 14 search and seizure warrants, 1 preventive arrest warrant, 2 temporary arrest warrants, and 5 coercive conduction warrants.	Former senator and vice-president of the Petrobrás CPI, Gim Argello.
29th	May 23rd, 2016	Continue investigating conspiracy to commit crimes, money laundering, and passive and active corruption involving funds diverted from Petrobrás.	FP enforces 6 search and seizure warrants, 1 preventive arrest warrant, and 2 temporary arrest warrants.	Former treasurer of the Progressive Party, João Cláudio Genu, and entrepreneurs linked to the scheme.
30th	May 24th, 2016	Investigate fraudulent contract for embezzlement in Petrobrás.	FP enforces 28 search and seizure warrants, 2 preventive arrest warrants, and 9 conduction warrants.	Business groups, operators, and Petrobrás employees.
31st	July 1st, 2016	Investigate bidding process fraud, bribery to servers of Caixa Econômica Federal and Petrobrás, and transfer of funds from private companies to a political party due to success in specific signings.	FP enforces 7 coercive conduction warrants, 4 temporary arrest warrants, 2 preventive arrest warrants, and 42 search and seizure warrants.	Money changers to companies that kept relations with the former president of the chamber of deputies Eduardo Cunha. A former treasurer of the Workers Party, Paulo Ferreira, and businesspeople.
32nd	July 7th, 2016	Investigate the Panamanian financial institution that acted clandestinely in Brazil and practices of crimes against the National Financial System, asset laundering, and transnational criminal organization.	FP enforces 7 coercive conduction warrants and 10 search and seizure warrants.	Clandestine financial institution FBP Bank.
33rd	August 2nd, 2016	Investigate the participation of contractor Queiroz Galvão in the so-called "cartel of contractors", a group of companies with the purpose of executing construction work contracted by Petrobrás.	FP enforces 23 search and seizure warrants, 2 preventive arrest warrant, 1 temporary arrest warrant, and 6 coercive conduction warrants.	Officers and employees of contractor Queiroz Galvão.
34th	September 22nd, 2016	Investigate facts related to the contracting by Petrobrás of companies for the construction of two platforms.	FP enforces 33 search and seizure warrants, 9 temporary arrest warrants, and 8 coercive conduction warrants.	Companies Mendes Junior and OSX, businesspeople, and politicians.
35th	September 26th, 2016	Investigate indications of a criminal relationship between a former Minister of the Civil House and Treasury with the command of the main contractor in the country.	FP enforces 27 search and seizure warrants, 3 temporary arrest warrants, and 15 coercive conduction warrants.	Contractor Odebrechet, former minister Antônio Palocci.
36th	November 10th, 2016	Investigate money laundering and illegal fund movement, mainly derived from criminal relationships between contractors and companies headquartered in Brazil with executives and employees of Petrobrás.	FP enforces 16 search and seizure warrants and 2 preventive arrest warrants.	Financial operators, contractors, and other companies contracted by the public administration.
37th	November 17th, 2016	Investigate irregularities and embezzlement of funds from large construction works contracted by the public administration of the state of Rio de Janeiro.	FP enforces 15 search and seizure warrants, 1 preventive arrest warrant, and 2 temporary arrest warrants.	Former governor Sérgio Cabral and contractors.

Figure 1. Phases of the Lava Jato Operation

Source: Adapted from Polícia Federal, 2016.

3 METHODOLOGY

3.1 Structure of the research

To identify the effects of disclosing corruption events on the market values of companies listed on the Brazilian Stock Exchange, we performed a quantitative research using a survey of secondary data obtained from the Economática and CVM databases for all types (classes) of shares of the companies listed as active in B3 from January 1st, 2014, to December 31st, 2016. During this period, we used data from the first 37 phases of the Lava Jato Operation, the first of which took place on March 17th, 2014, and the last on November 17th, 2016.

In order to capture the impacts of the onset of the events in each of the phases of the Lava Jato Operation on the shares' return of the companies listed in B3, we employed the event studies methodology. Simply put, this methodology consists in evaluating how a piece of information affects the market at a specific moment given the disclosure of a presumably relevant and unanticipated fact. In this sense, we used the sum of the abnormal daily returns of each company on the days that are part of the 1-day window surrounding the event (CAR_LavaJato), aiming to capture the informational content around this event (Kolari & Pynnone, 2010).

We performed the analyses considering the effects of the Operation both on the companies cited in the investigations and on the other companies in the same segments of those cited. In the latter case, we also intended to establish whether corruption operations generate information transfer between companies in the same segment. To be able to control for the disclosure of other events that may influence the annual abnormal returns, we also considered the sum of abnormal daily returns of each company on the days that are part of the 1-day window surrounding events of mandatory and voluntary disclosures made by the respective companies (CAR_Mandatory and CAR_Voluntary, respectively). The mandatory information set includes the disclosure of the events related to financial statements such as Balance Sheet, Income Statement, Statement of Changes in Shareholders' Equity, Statement of Comprehensive Income, Statement of Added Value, Explanatory Notes, and Audit Report. In turn, voluntary events refer to the information given to the market such as subscriptions, dissent or recess, voluntary conversions, and retractions. We collected both mandatory disclosures and voluntary releases to the market manually on the CVM website.

Thus, independent variables CAR_LavaJato, CAR_Mandatory, and CAR_Voluntary represent, in consolidated terms, the sum of the CARs of the respective types of events throughout the year, always considering a 1-day window surrounding each event of the same type (i.e., Lava Jato, mandatory, or voluntary). In cases when a voluntary disclosure event is in the same window as a Lava Jato event, only the Lava Jato event was considered. The model proposed by Equation 1 aims to establish if the disclosure events of the phases of the Lava Jato Operation throughout 2014, 2015, and 2016 presented information that could explain the cumulative abnormal returns in that year of the shares that compose the market, as well as the market's reaction to the shares of the companies in the same segments as those cited in the Lava Jato Operation.

$$CAR_{ano} = \beta_0 + \beta_1 CAR\text{ Lava Jato} + \beta_2 CAR\text{ Lava Jato} * Dummy\text{ Citada} + \beta_3 CAR\text{ Lava Jato} * Dummy\text{ Segmento} + \beta_4 CAR\text{ Obrigatório} + \beta_5 CAR\text{ Voluntário} + Controles + Erro$$

(1)

in which CAR_{ano} represents the annual cumulative abnormal return; *Dummy Citada* is 1 for the companies mentioned in the Lava Jato Operation, and 0 otherwise; *Dummy Segmento* is 1 for the companies that were not mentioned but belong to the same segment as those mentioned, and 0 otherwise; and *CAR Lava Jato*, *CAR Obrigatório*, and *CAR Voluntário* represent the sum of daily abnormal returns of each company on the days that are part of the 1-day window surrounding the events of the Lava Jato Operation, mandatory disclosures, and voluntary releases, respectively.

This model allows verifying the incremental effects of disclosing each type of event on the annual cumulative abnormal return. Specifically, in addition to the possibility of establishing the effects on the abnormal returns surrounding the disclosures of the phases of the Lava Jato Operation on the cumulative abnormal returns (significance and direction of coefficients β_1 and β_3), the analysis of the R2 adjusted in specifications that do and do not consider variable *CAR Lava Jato* has a potential to indicate the incremental relevance that the information that guided the phases of the Operation has to explain abnormal variations of the returns of shares throughout the year. The choice of the model described in Equation 1 is in line with the methodology used by Basu, McGavock, and Zhang (2013).

In general terms, the obtained results point to a negative effect on the annual cumulative abnormal returns of shares for companies cited in the phases of the Lava Jato Operation, and a positive effect on the annual cumulative abnormal returns of shares for companies in the same segment as those cited. Nevertheless, we observed that the effects on the annual cumulative abnormal return of shares for companies that were not cited in the Lava Jato Operation nor listed in the same segment as those cited is statistically equal to zero. Such findings suggest that the events of the Operation, although not significantly influencing the companies that were not cited nor listed in the same segment as the companies cited, affected the returns for companies directly and indirectly affected by the Operation. This becomes relevant when analyzing the extension of the impacts of the Lava Jato Operation on the Brazilian Stock Market.

Specifically, the results indicate that the Operation reduced the market values of companies directly involved in the corruption scandals above market variations. Such evidence is aligned with the findings of Everhart, Martinez, and McNab (2003), which suggest that, in the presence of corruption, the returns on investments are harder to predict, which affects decisions on private investments with negative consequences on long-term economic and sustainable development.

Figure 2 shows the companies cited in the investigations during the period from the 1st to the 37th phase of the Lava Jato Operation. The cited companies and the respective phases when the citation occurred are shown. Based on such data, one may distinguish the cited companies from those not cited in the Lava Jato Operation.

COMPANY	BOVESPA SEGMENT	LISTING SEGMENT	LAVA JATO MENTION
BRASKEM	Basic / Chemical / Petrochemical Materials	N1	14th; 35th phases
JBS	Non-Cyclic Consumption / Processed Foods / Meat and Derivatives	NM	31st phase
ELETRORBRAS	Public Utility / Electric Power / Electric Power	N1	16th phase
GOL	Industrial Goods / Transportation / Air Transportation	N2	31st phase
HYPERMARCAS	Non-Cyclic Consumption / Miscellaneous / Miscellaneous Products	NM	31st phase
PETROBRAS	Petroleum. Gas and Biofuels / Petroleum. Gas and Biofuels / Exploration. Refining and Distribution	-	2nd; 3rd; 4th; 6th; 7th; 8th; 9th; 10th; 11th; 12th; 13th; 15th; 20th; 21st; 22nd; 28th; 29th 30th; 31st; 33rd; 34th, 36th, 37th phases
OI	Telecommunications / Telecommunications / Telecommunications	N1	23rd phase
BTG Pactual	Financial and Others / Miscellaneous Financial Services / Resource and Investment Management	DDR3	21st phase
BTG Banco	Financial and Others / Financial Intermediaries / Banks	-	21st phase

Figure 2. A sample of companies mentioned in the Lava Jato Operation that have shares traded on BM&F Bovespa

Source: Adapted from Polícia Federal, 2016; Bovespa, 2016.

3.2 Data processing

Based on the proposed model, we consolidated the observations for calculating the CAR into shares of different classes and companies in a given year. The database was initially composed of 371 companies and 579 share classes, with a total of 453,412 daily observations in the base period. For data processing, we removed companies that did not present any daily returns in 365 days. Altogether, we excluded 152,447 observations, leaving 300,965 regarding 298 companies and 411 shares.

We also removed, in the following order: 33,488 observations from companies with negative Shareholders' Equity; 32,886 of companies listed in the "Finance and Insurance" segment in Economática; and 73 observations of companies that did not have consolidated ROA, Financial Leverage, Total Assets, and Market Value data during the analyzed period. After processing and consolidation of daily return data into annual data, 243 companies and 329 share classes remained, totaling 866 company-class-year observations in the base period. We winsorized the control variables at 2.5% to mitigate the possible influence of outliers in the results.

3.3 Calculation of the cumulative abnormal returns

To calculate the cumulative abnormal returns, we employed the market-adjusted statistical model, widely used to calculate abnormal returns in event studies (Brown & Warner, 1980), according to Equation (2):

$$AR_{it} = Rit - R_{mt}, \quad (2)$$

where AR_{it} is the abnormal return of share i on date t , Rit is the return of share i on date t , and R_{mt} is the average market return on date t .

At first, we calculated the return of share i on date t (Rit) for all companies listed at BM&F Bovespa, for all days in the base period, using the logarithm method:

$$Rit = \ln \left(\frac{P_t}{P_{t-1}} \right) \quad (3)$$

Then, we calculated the average market return on date t (R_{mt}) using the Market Value-Weight Return method, a result of summing the return of the market portfolio weighted by its respective weight (W_i) in Reais (R\$) over the total value of the market on date t in Reais (R\$). For this calculation, we disregarded the shares for companies mentioned in the Lava Jato Operation.

$$R_{mt} = \sum_{i=1}^T Rit \cdot W_{it} \quad (4)$$

To standardize the abnormal returns of the different assets, we divided the excessive return of the share by its standard deviation, thus generating an abnormal return coefficient (SAR), as presented in Equation (5) (McWilliams & Siegel, 1997):

$$\text{Standardized Abnormal Return: } SAR = \frac{AR_{it}}{\sigma_{it}}, \quad (5)$$

where σ_{it} is the standard deviation of share i on the date of the event, calculated over the 365 previous days.

Finally, we calculated the cumulative abnormal return of the share during the event window using the sum of the standardized abnormal returns:

$$CAR_{it} = \sum_{t=1}^T SAR_{it} \quad (6)$$

3.4 Control variables

As control variables, we chose indicators based on accounting information relevant to shareholders, investors, and the market (Kulmar & Sopariwala, 1992; Hitt, Hoskisson, Johnson, & Moesel, 1996; Gompers, Ishii, & Metrick, 2003), namely:

- **Profitability:** Lee and Ng (2006) found that the corruption impact on shareholder value is robust, controlled by statistically significant indicators such as historical profitability (ROE or ROA);
- **Size:** Fama and French (1992) posited that the average returns of companies with low market values would be higher than expected due to their estimated betas;
- **Liquidity:** to Amihud and Mendelson (1988), investors are willing to pay more for increased liquidity, while expecting higher returns for less liquid actives;

- **Indebtedness:** the degree of financial leverage would be a condition of an additional risk factor to the share's beta, positively related to abnormal returns (Bhandari, 1988);
- **Book-to-Market:** book and market values are related to growth opportunities, financial costs, and the firm's profitability (Chen & Zhao, 2006).

Variable	Analysis	Formula
Return on Asset (ROA)	Profitability	$\frac{\text{Lucro Líquido}}{\text{Total do Ativo}}$ Liquid Profit / Total Assets
Stock Trading	Liquidity	Traded Volume
Total Assets	Size	Ln Total Assets
Degree of Financial Leverage	Indebtedness	$\frac{\text{Lucro Líquido} / \text{PL}}{\text{Total do Ativo}}$ (Liquid Profit/Profit Sharing) / (Liquid Profit/Total Assets)
Book to Marketing	Growth Opportunity	Profit Sharing / Market Value

Figure 3. Summary Table – Control Variables used in the Model

4 RESULTS

4.1 Descriptive statistics

In Table 1, we show that both the CAR of voluntary events and that of Lava Jato events have standard deviations approximately three times higher than the CAR of mandatory events. This difference suggests that non-mandatory events such as voluntary announcements and events related to the Lava Jato Operation may be associated with a higher volatility of the assets listed in the stock exchange.

Table 1

Descriptive Statistics of the Variables

The descriptive statistics of the variables used in the model include position and dispersion measures, with information on the set of shares of companies listed at BM&F Bovespa which were active in the base period within the parameters adopted in this paper.

Variable	Mean	Median	Standard Deviation	1st Quartile	3rd Quartile
CAR_Year	0.07	-0.01	1.10	-0.21	0.13
CAR_LavaJato	-0.00	0.00	0.31	-0.05	0.02
CAR_Mandatory	-0.01	0.00	0.10	-0.01	0.01
CAR_Voluntary	0.02	0.00	0.34	-0.02	0.03
ROA	1.72	2.50	7.77	-1.10	5.90
Financial Leverage	3.04	1.61	8.85	0.95	2.67
Liquidity	0.21	0.01	0.45	0.00	0.17
Ln(Total_Assets)	15.10	15.24	1.73	13.89	16.25
Book-to-Market	1.59	1.05	1.55	0.54	2.09

We point out that both CAR_LavaJato and CAR_Mandatory have negative mean values, while CAR_Voluntary has, on average, positive values. Such results provide evidence that investors penalized the Brazilian market in the period of disclosure of information from the Lava Jato Operation, and that the announcement of the companies' balance sheets was surrounded by negative surprises with results below market expectations.

However, these analyses do not allow us to establish whether the decrease in company values during the disclosure of the phases of the Lava Jato Operation are related to systemic movements or if the companies were affected differently by the Operation. In the next section, we present the Operation's effects on companies both directly and indirectly involved compared to companies in segments that are uninvolved with the Operation.

4.2 Regression results

Table 2 presents four different specifications for model 1, which considers the effects of disclosing mandatory (CAR_Mandatory), voluntary (CAR_Voluntary), and Lava Jato Operation (CAR_LavaJato) events on the annual cumulative abnormal returns (CAR_Year) of Brazilian

companies. Column A of Table 3 presents a specification that considers only the influence of mandatory events, while column B also takes into account the effects of voluntary events.

On the other hand, the specifications in columns C and D equally consider the influence of the Lava Jato Operation. Specifically, column C allows establishing if the Operation influenced the Brazilian market regardless of whether or not the companies were cited. In turn, column D segregates the effects of the Lava Jato Operation between cited companies and others that belong to the same segment as those cited compared to unrelated companies.

The results of the estimates for specification A show that the coefficient of the CAR_Mandatory variable is significant at 95% confidence, which suggests that the mandatory disclosures bring relevant information that is priced by the market also in the Brazilian case. The R^2 of the model in specification A, however, was only 1.28%, suggesting that other events may have informational relevance to explaining the variations in annual cumulative abnormal returns of the companies. Such a result corroborates evidence presented by Ball and Shivakumar (2008), whose results point to a discrete presence of new information during the disclosure of the quarterly balance sheets.

Considering, in specification B, the voluntary disclosure events, we observed a significant coefficient for the CAR_Voluntary at 99% confidence, as well as an increase of R^2 to 5.86%. This result has two interpretations: i) as in Ball and Shivakumar (2008), the significance of the coefficient and the increase in the explanatory power of the model indicate that voluntary events bring new information to the Brazilian market which allows better explaining of the variations in annual cumulative abnormal returns; ii) however, although the R^2 value increased, the 5.86% is in line with that found by Basu et al. (2013) when considering the complete sample of companies that did and those that did not make voluntary announcements annually. In this case, we notice that the explanatory power, although higher, still suggests the existence of other information that considerably has the potential to explain the variations in annual abnormal return of the companies.

Specifications in columns C and D present evidence that, in the Brazilian case, the Lava Jato Operation is one of those sources of great informational relevance. One may notice that the coefficient of variable CAR_LavaJato was significant at 99% confidence in specification C, which suggests that the Lava Jato Operation influenced the returns of market shares. Also, the 25.67% R^2 value, considerably higher than the previous regression (5.86%), indicates that the Lava Jato Operation had a significant impact on the Brazilian market.

Segregating the effects between cited companies and those in the same segments relative to those unrelated to the Lava Jato Operation, according to specification D, one may notice that the information content of the Lava Jato Operation is only significant for companies that were directly involved in the Operation and for companies that were not directly involved but belong to the sectors affected by the Operation. In this case, we observe that the coefficient of the uninvolved companies (0.3009) was not significant, while the coefficients for cited companies (-3.6922) and those belonging to the same segments (1.3408) were significant at 95% and 99% confidence, respectively.

The negative coefficient of the CAR_LavaJato*DummyCited interaction evidences the cost generated by the Lava Jato Operation to the companies directly involved in the corruption scandals. Such results indicate that the Operation reduced the market values of these companies above the market variations, in line with the results found by Macnab (2003), which suggest that, in the presence of corruption, returns on investments are harder to predict. The result affected decisions on private investments, with negative consequences on long-term economic and sustainable development.

When analyzing the companies that were indirectly involved in the Lava Jato Operation using the CAR_LavaJato*DummySegment interaction, we observed an opposite result to that of directly cited companies. Specifically, information contained in the Lava Jato Operation positively influenced the abnormal return of uninvolved companies that belong to the same segments of those directly involved in the Operation. This result corroborates evidence in the literature that corruption tends to be an obstacle to competition, since the signing of contracts through political interference and fraud in public biddings imposes a competitive disadvantage to the other companies in the market, given that products and services are acquired from the corrupting companies with disregard to the best cost-benefit (Lambsdorff, 2003). In this case,

the disclosure of anti-corruption operations contributes to reducing the pricing discrepancies inherent to the corruption practiced by the companies involved in the respective operations. This pricing adjustment may be associated with the correction made by the market due to damage to competitiveness caused by unfair competition.

Table 2

Effects of the Lava Jato Operation on the Returns of Involved and Uninvolved Companies

This table shows results of model

$$CAR_{amo} = \beta_0 + \beta_1 CAR_{Lava\ Jato} + \beta_2 CAR_{Lava\ Jato} * Dummy\ Cited + \beta_3 CAR_{Lava\ Jato} * Dummy\ Segment + \beta_4 CAR_{Obrigat\ orio} + \beta_5 CAR_{Volunt\ ario} + Controles + Erro$$

(1)

We used variables DummyCited and DummySegment to highlight the effects of the Lava Jato Operation events on the cumulative abnormal returns of cited companies ($CAR_{LavaJato} * DummyCited$) and the cumulative abnormal returns of companies in the same segments of those cited ($CAR_{LavaJato} * DummySegment$).

Variable	Specifications							
	A		B		C		D	
	Coef.	P-Value	Coef.	P-Value	Coef.	P-Value	Coef.	P-Value
CAR_Mandatory	.9527	0.027	1.3183	0.001	1.3009	0.001	1.5125	0.000
CAR_Voluntary			.8385	0.000	1.1187	0.000	1.1861	0.000
CAR_LavaJato					1.1472	0.000	.3009	0.132
CAR_LavaJato*DummyCited							-3.6922	0.035
CAR_LavaJato*DummySegment							1.3408	0.000
ROA	-.0046	0.554	-.0047	0.529	-.0053	0.444	-.00764	0.260
Financial Leverage	.0079	0.089	.0062	0.161	.0038	0.357	.00392	0.329
Liquidity	.2994	0.427	.0694	0.847	-.1446	0.666	.0126	0.969
Ln(Total Assets)	-.2779	0.389	-.2388	0.437	-.0000	1.000	-.0330	0.906
Book-to-Market	-.1333	0.010	-.1250	0.011	-.0801	0.080	-.1292	0.005
R-sq: overall	0.0128		0.0586		0.2567		0.2565	

Regarding the controls, we observed that, in all regressions, variable Book-to-Market (BtM) presents a statistically positive coefficient. This indicates an explanatory relevance over the dependent variable, at a 90% confidence level, which corroborates the model proposed by Ohlson (1995) relating the BtM to the cumulative abnormal returns, as well as by Chen and Zhao (2006) relating the indicator to the firm's growth possibility, profitability, and, consequently, its market value. In regression A, control variable Financial Leverage also presented a statistically significant positive coefficient at 90% confidence to explain the cumulative abnormal returns, providing indications of its explanatory capacity on abnormal returns. The remaining control variables did not present statistically significant results in any of the regressions, suggesting that they do not influence the model's dependent variable.

4.3 Sensitivity analysis

In general, the results of the proposed model indicate that the events of the Lava Jato Operation, although not significantly influencing the companies that are not listed in the same segments as those investigated, affected the returns of companies both directly and indirectly involved in the Operation. It is unclear, however, if the effects refer to preexisting differences between the analyzed groups or if they are in fact associated with the unfolding of the Operation.

To check whether or not the investigated companies already had differences in returns relative to companies unrelated to the Lava Jato Operation even before it began, we performed t-tests of the difference of averages to compare the means of the control and CAR variables considering the data from 2013 of companies cited in the Lava Jato Operation (Cited) with the group of companies that were not cited and do not belong to the same segment as those cited (Unrelated).

Comparing the cited companies with those unrelated to the Lava Jato Operation in terms of cumulative abnormal returns, we observed, as shown in panel B of Table 2, that there are no statistically significant differences between the average abnormal returns within the total set of annual information (CAR_{Year}) or for the mandatory ($CAR_{Mandatory}$) and voluntary ($CAR_{Voluntary}$) information. These results are significant as they indicate that, regarding returns and informational content, the analyzed groups of companies were not different in the period before the Lava Jato Operation.

In addition, as shown in panel A of Table 3, regarding the control variables of Liquidity and Total Assets, the mean difference test presented a significant coefficient at a 99% confidence, which indicates the existence of statistically significant differences between these two indicators for the companies cited and those not cited in the Lava Jato Operation. Thus, on average, the Liquidity and Total Assets of the cited companies were higher than those of the companies not cited in the Lava Jato Operation.

These results indicate that, in general, the companies investigated in the Lava Jato Operation are those that, on average, already had greater liquidity and size (total assets) in the period before the start of the Operation. Since the model in Equation (1) seeks to capture the informational relevance of windows surrounding the phases of the Lava Jato Operation to explain the annual abnormal return, there is a lower sensitivity of the coefficients of the employed model (referring to 3-day windows) to variations in liquidity and size of the companies (annual variations). However, this result underscores the importance of controlling for size and liquidity in valuation models that involve corruption in Brazilian companies. For the variables ROA, Financial Leverage, and Book to Market, we did not observe statistically significant differences between the companies cited in the Lava Jato Operation and other companies before the start of the Operation.

Table 3

Test of Difference of Means between the cited companies and those unrelated to the Lava Jato Operation

The panel presents the tests of differences of means between the companies with no relation to the Lava Jato Operation and those cited in the Operation. We sought to evaluate if significant initial differences exist between the two groups, independently of the Lava Jato Operation events. To do so, we compared the company shares using the consolidated data from 2013, a period immediately before the start of the Lava Jato Operation, considering the control variables (Panel A) as well as information regarding the mandatory and voluntary disclosures (Panel B).

Panel A: Comparison of the cited companies and those unrelated to the Lava Jato Operation regarding the control variables from 2013.

Variable	Unrelated		Cited		Difference of Means	
	Mean	Standard Deviation	Mean	Standard Deviation	A-B	P-Value
ROA	1.245	17.467	-0.2	3.834	-0.755	0.827
Financial Leverage	2.535	4.613	1.117	1.528	1.007	0.418
Liquidity	0.192	0.334	0.622	0.486	-0.43	0.0012
Ln(Total Assets)	14.851	1.530	17.688	1.048	-2,837	0.000
Book_to Market	0.866	0.823	1.362	1.207	-0,496	0.125

Panel B: Comparison of the cited companies and those unrelated to the Lava Jato Operation regarding the CARs in the year and around the windows of mandatory and voluntary events in 2013.

	Unrelated		Cited		Difference of Means	
	Mean	Standard Deviation	Mean	Standard Deviation	A-B	P-Value
CAR_Year	0.0363	1.052	-0.0154	0.2442	0.0517	0.785
CAR_Mandatory	-0.0133	0.1293	-0.0110	0.0543	-0.0022	0.923
CAR_Voluntary	0.0123	0.3099	-0.0630	0.3607	0.0754	0.200

5 CONCLUSION

This study aimed to identify the effects of disclosing corruption events on the market value of companies listed in the Brazilian Stock Exchange. The results of the research indicate that corruption-related events, disclosed by the Lava Jato Operation, have greater informational relevance in explaining the variations in the annual cumulative abnormal returns of the companies listed in the Brazilian Stock Exchange than events of mandatory (accounting and financial events) and voluntary announcement.

Additionally, the results point to a negative effect on the annual cumulative abnormal returns of companies cited in the phases of the Lava Jato Operation, as well as a positive effect on the cumulative abnormal returns of companies in the same segment as those cited. Nevertheless, we found that the effects on the annual cumulative abnormal returns of the shares of companies that were not cited in the Lava Jato Operation and are not listed in the same segment of those cited is statistically equal to zero. These findings suggest that the events of the Lava Jato Operation, although not significantly influencing the companies that

were not cited nor are listed in the same segment as those cited, affected the returns of companies directly and indirectly affected by the Operation.

Specifically, the results indicate that the Operation reduced the market value of companies directly involved with the corruption scandals above market variations. These results are in line with Macnab (2003), whose findings suggest that, in the presence of corruption, the investment returns are harder to predict, affecting the decisions on private investments with negative consequences on long-term economic and sustainable development.

When analyzing the companies indirectly involved in the Lava Jato Operation, we observed the opposite result to the directly cited companies. Specifically, the information contained in the Lava Jato Operation positively influenced the abnormal return of uninvolved companies that belong to the same segment as those investigated. This corroborates evidence in the literature that corruption tends to be an obstacle to competition, as it provides favoritism and opportunities to the corrupting companies such as the signing of contracts through public bidding fraud, in which products and services are acquired in disregard to the best cost-benefit (Lambsdorff, 2003).

Our findings suggest that the events of the Lava Jato Operation, although not significantly influencing the companies that were not investigated nor are listed in the same segment as those cited, affected the returns of companies directly and indirectly affected by the Operation. This becomes relevant when analyzing the extent of the impacts of the Lava Jato Operation on the Brazilian Stock Exchange.

Overall, the results partly support the "Grease on the Wheels" hypothesis of Méon and Weill (2010) and raise an alert for the Brazilian scenario. The results found by Méon and Weill (2010) indicate that, on average, in countries with deteriorating institutional contexts present indications of marginal corruption benefits. The reduction of the market value of the companies directly cited and the increase in market value of those indirectly involved may be reflecting a competitive imbalance in the market, in which companies that engage in corruption schemes have a competitive advantage over other companies in the same segment.

Under balanced conditions, however, the economy is always in a more fragile situation in the presence of corruption. The strengthening of institutions, of the political-economic environment, and the establishment of appropriate legal punishment for corruption crimes are, therefore, fundamental so that perverse incentives are not created for the agents of the economy.

As a contribution, this paper empirically shows the effects of the disclosure of corruption on the Brazilian Stock Exchange from fraudulent contracts between the public and private sectors. Results are even more relevant for analyzing a specific scenario in which an extensive ongoing investigation against corruption crimes (the Lava Jato Operation), which provides a range of information and corruption data verified through facts that become public. Moreover, this study differs from others in the literature when analyzing the effects of disclosing corruption events on the market value of both directly involved companies and those indirectly involved via market competitiveness.

In practical terms, this paper indicates that the fight against corruption and the disclosure of facts established by the Lava Jato Operation resulted in losses of market values for companies cited and in gains of market values for companies in the same segment as those cited. In other words, the disclosure of anti-corruption operations contributes to reducing the pricing discrepancies inherent to corruption practiced by the companies involved in the respective operations. Such pricing adjustment may be associated with the correction made by the market due to the competitiveness losses caused by unfair competition.

This study presents some limitations. First, the companies not cited in the Lava Jato Operation may present other mechanisms for improving returns which are unidentifiable from the employed database. Second, companies that were not cited may still be involved in corruption schemes. In this case, we suggest that other methods be used to eliminate possible specification problems, such as matching or the use of another type of corruption event.

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