Does governmental corruption affect entrepreneurship in Brazil?[*]

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Abstract

This paper aims to analyze the relationship between entrepreneurship and corruption in the Brazilian states. A theorist approach and empirical evidence are used. Although many authors emphasize the importance of entrepreneurship for the long-run economic growth, few works consider the

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effect of corruption as a reducer of economic growth once it diminishes incentives to entrepreneurship. In order to achieve that, we use an instrumental variable as a way to overcome the endogeneity problem presented by the nature of our variables of interest. Based on the political economy literature, the chosen instrument was the margin of victory for regional elections, as a proxy for political competition. However, the results show no relation between corruption and entrepreneurship whatsoever. Other dependent variables are also tested and the evidence seems to show that corruption influences the number of workers in the public sector.

Keywords

Entrepreneurship; corruption; panel data

Resumo

Este artigo tem por objetivo avaliar a relação existente entre empreendedorismo e corrupção nos estados do Brasil. Embora muitos autores enfatizem a importância do empreendedorismo para o crescimento econômico de longo prazo, são poucos os estudos que relacionam os efeitos negativos da corrupção sobre o crescimento econômico, uma vez que ela reduz os incentivos ao empreendedorismo. Para o cumprimento da proposta desta pesquisa, utiliza-se o método de variáveis instrumentais, para lidar com os clássicos problemas de endogeneidade. A variável instrumental adotada é a margem de vitória nas eleições estaduais, uma proxy *para a competição política nos estados. Os resultados obtidos não encontram relação entre corrupção e empreendedorismo no nível dos estados. Outras variáveis dependentes foram testadas também, e a única evidência obtida é que a corrupção influencia o número de trabalhadores empregados no setor público.*

Palavras-chave

Empreendedorismo; corrupção, dados em painel

JEL Classification: **D73, O18, M13, R30**

1 Introduction

Entrepreneurship is a theme that has been gaining wide repercussion among both academics and policy makers, as a result of its importance to the context of economic growth. Part of this can be explained by a number of works that relate entrepreneurial activity to job creation, innovation and social well-being (ACS; AMORÓS, 2008; ACS; STOREY, 2004; AUDRETSCH; FELDMAN, 1996; BAUMOL, 1990; HART; OULTON, 2001; LIBECAP, 1999). Classical economists had already understood the importance of entrepreneurship to economic growth, but it was not until Schumpeter's **The theory of economic development**, of 1912 (SCHUMPETER, 1982), that it started being considered essential, due to the understanding of business cycles and the importance of innovative entrepreneurs.

Since Schumpeter's work, the analysis and discussion of the Schumpeterian entrepreneur has become quite frequent, not only in the economic literature, but also in different fields of study. In more recent years, Schumpeter's definition of innovation has helped inspire endogenous growth models based on research and development (R&D) (JONES, 1995; MANKIW; ROMER; WEIL, 1992) and on the uncertain innovation process (GROSSMAN; HELPMAN, 1991). Authors such as Gartner and Carter (2003) and Audretsch (2007) argue that the variable entrepreneurship should be included in growth models under the name of Entrepreneurship Capital. Their main argument is that the role of an entrepreneur is different both from that of the variables of physical capital (technology) and that of human capital (knowledge), which are usual in recent economic growth models. In general, the physical capital stock is used as a representation of investment and savings levels, while the human capital is used to measure the effort applied in work qualification. On the other hand, the entrepreneurship capital determines the effort a society makes to spread knowledge, not to create it. Hence, they are not to be interchanged or taken for each other.

That being said, the establishment of new companies is strongly related to economic growth, as it allows and enables innovation to be spread.[1]

An extensive part of the literature explores the regional determinants to the establishment of new companies, especially in developed countries such as Germany (AUDRETSCH; FRITSCH, 1994; FRITSCH, 1992; HARHOFF, 1999), Italy (CARREE; SANTARELLI; VERHEUL, 2008; GAROFOLI, 1994),

[1] Without the establishment of new companies, all the knowledge created in R&D could be forgotten under the form of papers.

England (FOTOPOULOS; SPENCE, 2001), the USA (ACS; ARMINGTON, 2006) and Spain (ARAUZO-CAROD *et al*., 2007). These authors study the creation of new companies by exploring regional characteristics of the economic, social and political environment and the regional productive structure. The explanatory variables, usually considered important to understanding this phenomenon, are related to demand, urbanization, unemployment and firm size.

On the other hand, there is also an important part of the literature that emphasizes the role of corruption — typically defined as the abuse of public power in order to obtain private gains (ROSE-ACKERMAN, 2004) — as an inhibitor of economic growth, whether by reducing external investments (LAMBSDORFF, 2003; MAURO, 1995) or input productivity (LAMBSDORFF, 2003; RIVERA-BATIZ, 2002), or by reducing income itself (KAUFMANN; KRAAY, 2003). However, the relationship between corruption and entrepreneurial activity — here understood as the net establishment of companies (number of companies created minus number of companies closed) —, has not received the same attention. In this particular case, the literature is still scarce and mainly based on a cross-section analysis of countries (ANOKHIN; SCHULZE, 2009; DREHER; GASSEBNER, 2013; EL HARBI; ANDERSON, 2010).

There are few studies of the Brazilian case, and the results so far have been inconclusive. Palifka (2006) and Melo, Sampaio and Oliveira (2015) found evidence of a positive association between corruption and firm creation. Bologna and Ross (2015), on the other hand, found a persistent negative relation between corruption and entrepreneurship, both in the short and in the long run.

This paper aims to contribute to the literature by studying the impact of regional corruption on the establishment of new companies in Brazil. We believe this analysis is relevant for a number of reasons. First, Brazil is an emerging country that, along with Russia, India, China and South Africa, is part of the BRICS, a group of countries with growing economic and political participation in the world economy. Second, in order to identify the statistical causal relationship between corruption and the establishment of new companies, the paper tries to solve the econometric problem of endogeneity. The possibility that non-observable factors could be simultaneously affecting both corruption and establishment of new companies would generate biased estimates if we used the Ordinary Least Squares (OLS) method. To overcome this problem, we used an instrumental variable (IV) for a two--stage least squares estimation. The chosen IV is widely used in the political economy literature to conduct quasi-experiments (regression discontinuity design): the margin of victory in municipal and regional elections (BROLLO;

NANNICINI, 2011; BROLLO; TROIANO, 2014; GALASSO; NANNICINI, 2011; PAOLA; SCOPAA, 2011). The main idea is that political competition is fiercer in states where the result of the elections is more disputed, which would restrict corruption (this will be better discussed in the **Methods and data** section).

The main hypothesis in this paper is that the decision of an individual to allocate his talent in the entrepreneurial activity depends on his capacity to appropriate the economic gains created in the process (BAKER; GEDAJLOVI; LUBATKIN, 2005). Corruption, rent-seeking, lack of transparency, weak institutional framework and lack of trust in a particular region decrease the economic gains an entrepreneur might obtain when he starts a business. Just like a new tax, the requirement of some kind of payment in order to use a public good or service might make the entrepreneurial activity less profitable or even increase the risk of failure. In such a scenario, the existence of a corrupt bureaucratic structure may ruin the entrepreneur's willingness to start a business, or at least reduce his incentives to undertake a project. Thus, corruption may reallocate talent from the entrepreneurial activity to some other less productive activity (ACEMOGLU; VERDIER, 1998; DUTTA; KAR; ROY, 2011).

This paper is organized into five parts (this **Introduction** is the first one of them). First, we document the traditional theoretical foundations for the spatial variation models that analyze the establishment of new companies and the theoretical approach to corruption. Next, we present the methodology, the variables considered and the regional corruption index. After that, we discuss the results. Finally, we draw our conclusions.

Our results indicate that corruption did not affect firm creation in the Brazilian states from 1998 to 2008. In addition, we found no effects on the informal job market or on the size of firms. The only evidence of causality is the increase of public sector jobs, a phenomenon known in the literature as a misallocation of talent (ACEMOGLU; VERDIER, 1998).

2 Literature review

The establishment of new companies has been considered an important factor to determine regional development policies for over 20 years. The creation of new businesses is an important key to promote economic growth (JOHNSON, 2004). However, policy makers are constantly challenged by spatial variations in the rate of firm creation, both inside a country and between countries. The variations between countries are constantly demonstrated in the studies of the Global Entrepreneurship

Monitor (GEM). Their study for 2013 (AMORÓS; BOSMA, 2013), for example, which covered 70 countries, showed that the Total Early-Stage Entrepreneurial Activity (TEA) — which assesses the percentage of working age population, both those about to start an entrepreneurial activity and those that started one at most 3 and a half years prior to the study — ranged from 39% in Zambia and Nigeria to only 5% in Italy and Japan. The same study showed a wide variation between different regions of the world. The highest rates were in Latin America and in Sub-Saharan Africa.

Spatial variation is also considerable within a country. In the United States, for example, Reynolds (1994) found that the quotient between the highest and the lowest regional rates was 4.1%. Johnson (2004), in a study of Great Britain in the period between 1994 and 2001, found the highest rate in London and the lowest in North Ireland. Ashcroft, Coppins and Raeside (1994), using municipal data for the United Kingdom, discovered that the rate of establishment of new companies varies both in time and in space.

An expansion of demand is usually related to an incentive for the creation of new companies, which would lead to the growth of businesses and new opportunities for economic gains. On the other hand, the availability of production factors would ease the creation of new firms. In the literature, it is common to see variables associated with income, schooling and unemployment used as proxies for demand (BOSMA *et al*., 2008; REYNOLDS, 1994).

Empirical evidence shows that new companies might originate from small-scale production industries. Sutaria and Hicks (2004) and Audretsch and Thurik (2001) assume that the smaller the firm size in a region, the higher the number of new companies created.

The third group includes measures of cultural attitude and policies that incentivize entrepreneurship in the analysis of regional determinants. Although this group is important to the theoretical literature, its empirical relevance is limited (DAVIDSSON; WIKLUND, 1997). In general, papers have been using proportion of immigrants (GAROFOLI, 1994) and public expenditure as proxies for the attitude and effect of policies (SUTARIA; HICKS, 2004).

Although this field of study — regional variations of the establishment of new companies — originated from empirical evidence in developed countries, it is even more important in emerging countries. Generally speaking, their economic institutions and policies are not consolidated yet, making them more vulnerable to external influences. In an ambient with bad institutions, the existence of corruption might alter the economic incentives to being an entrepreneur.

In economics, corruption is usually defined as the abuse of public power in order to obtain private gains (AKÇAY, 2006; SCHLEIFER; VISHNY, 1993). It takes place when economic agents approach politicians with the intention of obtaining some kind of advantage or benefit.[2] Thus, bureaucrats try to maximize their personal gains through their influence on the market and negotiations with economic agents. As a result, corruption may alter the economic performance of an investment. Economically viable projects may be set aside for projects chosen through corrupt ways.

The process of innovation, uncertain in its nature, needs the certainty that the best project will be chosen. In a society in which market rules do not define which projects are the best, entrepreneurial activity turns riskier, transactional costs increase and the creation of new companies is discouraged.

The hypothesis is that the decision about allocating talents in entrepreneurial activity depends on the capacity of appropriating the economic gains created by the entrepreneur's effort (BAKER; GEDAJLOVI; LUBATKIN, 2005). Corruption increases the risks of having to share the economic gains with government members in exchange for a public good, service or authorization, reducing the benefits and incentives of being an entrepreneur.

Since the 1990s, with the appearance of several empirical works, everything known about corruption and its interaction with other economic and social variables has been put to the test. Mauro (1995) was the first to use cross-section analysis to estimate the effects of corruption on economic growth. Tanzi and Davoodi (1998) studied the behavior of public investment when facing corruption, while Al-Marhubi (2000) chose inflation as his object of study. Akçay (2006) and Rose-Ackerman (2004) analyzed the impact of corruption on the countries' Human Development Index. Several other works could be cited, but little has been done to analyze the impact of corruption on entrepreneurship.

Desai, Gompers and Lerner (2003) used panel data with fixed effect estimates to industrial sectors and found that the rate of entry of new companies is not affected by the corruption index in the euro zone, although a negative effect was found in a subsample relative to Eastern and Central Europe. Ovaska and Sobel (2005), with a sample of ex-socialist countries from Eastern Europe, found that corruption reduces the number of new companies. Dreher and Gassebner (2013) tested a similar hypothesis for a sample of 43 countries in unbalanced panel data. They found evidence that corruption increases entrepreneurial activity.

[2] The worst possible result in a corrupt economy is bad resource allocation. This is a common corollary in every model cited in this paper.

Regarding the effect of corruption on the informal sector, Dutta, Kar and Roy (2011) analyzed India. They used three informality definitions and did not find robust results. Only one of the definitions seemed to be affected and presented a *slight* link between corruption and the informal sector.

In Brazil, the literature dedicated to understating the relationship between corruption and entrepreneurship is still incipient. In a survey on this issue, Palifka (2006) analyzes the results of the 2004 Global Corruption Barometer. The survey respondents emphasized that the presence of corruption among different branches of the government is an obstacle to business development in Brazil. Melo, Sampaio and Oliveira (2015) used a panel data model to estimate the empiric relation between firm creation and corruption from 2000 to 2008. Their main source for the corruption variable was the Register of Irregular Accounts of the Court of Audit (Cadirreg). Their fixed effects model evidenced a positive relation between corruption and firm creation. Bologna and Ross (2015) used municipal data from a 2003 random auditing carried out by the Federal Court of Accounts of Brazil (TCU) in 467 Brazilian cities. They used the proportion of resources audited by the TCU as a proxy for corruption, and the total number of companies by sector as a proxy for entrepreneurship. Their results indicated a negative relation between the variables, both in the short and in the long run.

As a whole, this paper contributes to the literature in several ways. First, by evaluating the impact of corruption, based on regional data for the Brazilian states. Second, the method of instrumental variables is used to analyze not only the correlation but also the causality between corruption and the creation of firms. Third, we seek alternatives to the hypothesis that the entrepreneurial activity is affected by its effects on other sectors of the economy.

3 Methods and data

Since the purpose of this paper is to identify the causal effect of corruption on entrepreneurship, simple differences in means, as offered in methods of selection based on observable factors, are not enough. This stems from the fact that there probably are unobservable factors, fixed and/or variable in time, correlated with both corruption and entrepreneurship. For example, immigrants from different parts of the world have settled in different regions of Brazil and brought along their social rules, which are not likely to change a lot as time passes. Some aspects of social rules might be correlated with corruption (e.g. the rules of the mafia) and, at the same time, with entrepreneurial activities (e.g. the mafia business). As a consequence,

we need to explore an alternative in which regional corruption is not correlated with unobservable factors related to both entrepreneurship and corruption. In this paper, we use the method of instrumental variables in two stages. Our instrument is created from the concept of margin of victory in regional elections.

The margin of victory is the smallest number *k* such that changing *k* votes can change the winners. The idea is that the high level of political competition (evidenced by 'tight' elections) indicates randomness in the results, and this would make them uncorrelated with unobservable factors. As mentioned in the **Introduction**, the margin of victory is widely used in political economy literature. It is also reasonably established in the same literature that electoral disputes reflect political competition. The smaller the margin of victory, the more competitive the political environment, and the opposite is also true. That being said, the main hypothesis here is that the more competitive the political environment, the lower the levels of corruption. That is, indirectly, the smaller the margin of victory is, the less corruption there is. Therefore, a binary variable is equal to 1 when the state election is decided in the second round and within a margin of victory of 1.5 percentage points (p.p.), and 0 otherwise.[3]

In this paper, the method of instrumental variables is used in the first stage to estimate the effect of the margin of victory (of 1.5 p.p., according to our binary variable) on corruption. In the second stage, we estimate the effect of corruption, obtained from the regional and temporal variations of the margin of victory, uncorrelated with unobservable factors variable in time, conditional to some observable factors and to factors fixed in time, on entrepreneurship.

Therefore, these are the equations to be estimated:

$$CP_{it} = \delta MV_{it} + \gamma X_{it} + \lambda_t + \mu_i + \varepsilon_{it} \quad (1)$$

$$EP_{it} = \beta \widehat{CP}_{it} + \theta X_{it} + \lambda_t + \mu_i + \nu_{it} \quad (2)$$

CP_{it} is the corruption index in the state i for the period t, MV_{it} is the binary variable for the margin of victory in the state i for the period t, EP_{it} is the net establishment of new companies for 10,000 inhabitants (proxy for entrepreneurship), X_{it} is a vector containing the independent variables, λ_i is the tendency, μ_i is the fixed effect of the state i and ε_{it} and ν_{it} are randomly distributed error terms.

[3] The variable margin is equal to 0 whenever the election is decided in the first round. Besides that, it is clear from the creation process that its value is constant between elections. Also, a closer to 1.5 margin of victory is uninteresting because it allows for little or no cross-section variation in the dummy variable.

Five models with different groups of explanatory variables were estimated. The explanatory variables used are: average years of schooling of adults over age 25, proportion of unionized workers, unemployment rate, real Gross Domestic Product (GDP) *per capita*, tax revenue *per capita* and number of homicides per 1,000 inhabitants. All of these variables were carefully selected in accordance with both the literature of corruption and entrepreneurship and the three big groups of regional determinants organized by Bosma *et al*. (2008), as seen in the previous section. The descriptive statistics of the variables used is presented in Table 1.

Table 1

Descriptive statistics of the variables used in this study

VARIABLES	DESCRIPTION	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
Firm creation	Net establishment of companies per 10,000 inhabitants	19.99465	8.410339	4.03794	55.10973
Public sector	Proportion of public sector workers	0.092698	0.0432654	7,22E-05	0.2430386
Informality1	Informality measure 1	63.61808	11.89057	38.00683	90.47856
Informality2	Informality measure 2	63.26797	11.97816	36.7684	90.99865
Informality3	Informality measure 3	60.34131	11.76549	35.69151	88.23217
Firm size	Average firm size	1.888177	0.0180852	1.845706	1.932242
Corruption	Corruption index	0.251185	0.2481855	0	1
Schooling	Average years of schooling	5.922141	1.157827	3.477499	9.392572
Union	Proportion of unionized workers	0.172106	0.057766	0.050283	0.3439199
Unrate	Unemployment rate	9.404792	2.752824	4.4193	20.5375
gdppercapita	Gross Domestic Product *per capita*	5.829123	3.660374	1.496361	23.79954
Homicides	Homicides per 1,000 inhabitants	0.264657	0.1344884	0.04614	0.6054857
tax_revenue	Real tax revenue *per capita*	474.7572	256.5107	95.52549	1437.106
margin_1v5	Margin of victory of 1.5 p.p.	0.087542	0.2831048	0	1
margin_2v5	Margin of victory of 2.5 p.p.	0.13468	0.3419578	0	1
margin_5	Margin of victory of 5.0 p.p.	0.306397	0.4617748	0	1
margin_10	Margin of victory of 10.0 p.p.	0.430976	0.4960486	0	1

In order to validate the instrumental variable, we estimated equation (1), while relaxing the margin of victory from 1.5 to 2.5, 5.0 and finally 10.0 p.p. If

the idea behind this instrument is valid, these estimates with larger margins of victory should not present statistically significant coefficients.

Besides the net establishment of new companies, other dependent variables connected with entrepreneurship, and likely to be affected by corruption, were used: proportion of public sector workers, proportion of informal sector workers and average firm size (measured by the number of employees). The first one was used to examine the possibility that employees from the private sector would prefer working in the public sector because of corruption. The second one was used to study the possibility that entrepreneurs and workers would choose informality to other sectors, again because of corruption. And the third one was used to explore the possibility that an entrepreneur could change the size of his firm because of corruption. In this case, it is believed that an entrepreneur might choose to embark on a project in spite of corruption; however, he would probably want to keep his firm small. Apart from that, we estimated the effect of corruption on the number of formal companies in different size ranges.

The data used in this paper were obtained from several sources. The numbers relative to workers in the public sector, unionized workers, employed workers and economically active population were obtained from the National Household Sample Survey (PNAD)[4]; the number of homicides is available in the Department of Informatics of the Unified Health System (Datasus); the electoral results used to create the instrumental variables are from the Superior Electoral Court (TSE); schooling data are from the Institute for Applied Economic Research (IPEA); the tax revenue values are from the National Treasury Secretariat, corrected by the GDP deflator published by the Brazilian Institute of Geography and Statistics (IBGE). The GDP *per capita*, the unemployment rate and informality measures[5] are also from IBGE. Firm size variables were obtained from the Ministry of Labor and Employment, and data about created and closed companies are from their respective state's Board of Trade and from the National Department of Business Registration (DNRC). The net firm creation was divided by population size.

[4] When data for the year of 2000 were not available, the mean between the information of 1999 and 2001 was used.

[5] Three definitions of informality were tested. The first one comes from the following quotient: (unregistered workers + self-employed individuals) / (workers under the protection of the Consolidation of Labor Laws (CLT) + unregistered workers + self-employed individuals). The second one was calculated according to this: (unregistered workers + self-employed individuals + unpaid workers) / (workers under the protection of the CLT + unregistered workers + self-employed individuals + unpaid workers + employers). And the third one considered (unregistered workers + self-employed individuals) / (workers under the protection of the CLT + unregistered workers + self-employed individuals+ employers).

Special attention must be given to the regional corruption index. One of the mechanisms created to guarantee the proper use of public resources is the Office of the Comptroller General[6] (CGU), created in 2001, whose main goal is to defend public assets and prevent and combat corruption through internal control activities and public audits. Every program and project that involves federal resources is audited for irregularities. When a case is judged irregular, it becomes part of a database of irregular accounts (Cadirreg), created by the TCU.

This database comprises every case judged irregular after the auditing has taken place. According to Brasil (2013), the accounts are analyzed under aspects of legality, legitimacy, financial soundness, efficiency and effectiveness and then judged as:

a) regular, when they reflect exactly the accounting documents and demonstrate the legality, legitimacy and financial soundness of the acts of the party in charge;
b) regular with reservations, when the accounts contain inappropriate characteristics or any type of fault that does not result in loss to the public treasury;
c) irregular, when one of the following instances is confirmed: failure to submit accounting for approval; performance of an administrative act that is deemed illegal, illegitimate, unsound or not in compliance with legal or statutory norms; losses to the public treasury resulting from any illegitimate or unsound administrative act, embezzlement or misappropriation of public funds, assets or valuables.

When accounts are considered irregular and an amount is owed, the Court demands that the responsible party pay the debt with applicable fines added. This Cadirreg database is analyzed and every irregular case that does not result in loss to the public treasury is removed. Thus, cases whose irregularities are considered honest mistakes by the Court are discarded and the final database comprises only accounts deemed irregular and judged for financial loss to the public treasury.

Some authors (BROLLO; NANNICINI, 2011; FERRAZ; FINAN, 2011; FERRAZ; FINAN; MOREIRA, 2012) used Cadirreg data to study the chances of reelection in corrupt regions and the effect of corruption on public spending on education. In this paper, the methodology applied to build the regional corruption index is based on the multivariate analysis of Carraro *et al*. (2015), specifically on the principal component analysis. A set of regional variables related to the value and the amount of irregular accounts is used, resulting in a regional corruption index for every Brazilian state.[7] The

[6] See www.cgu.gov.br for further information.

[7] See Carraro *et al*. (2015).

variables used by Carraro *et al*. (2015) are the following: federal transfers received by each state following the Annual Budget Law (LOA); proportion of irregular accounts on Cadirreg by state; proportion of the total monetary value of the irregular accounts by state.

The database used in this paper presents a panel data structure from 1998 to 2008. Therefore, there are 297 observations, 11 for every one of the 27 states under analysis. Table 1 presents a description of the variables used.

During the period analyzed in this paper, four gubernatorial elections took place, in a total of 108 regional elections. Fifty-four of these were decided in the second round, 9 of which fit in the 1.5 p.p. margin of victory definition. Fifteen governors were elected with a margin of up to 2.5 p.p., 32 with a margin of up to 5 p.p. and 48 with a margin of up to 10 points.

4 Results

The estimates of equation (1) are presented in Table 2. In every model, from the simplest to the most complete, the margin of victory seems to have a negative impact on the corruption index. The estimated coefficients present similar values in the five different models and are always statistically significant at 1.0% level. The effect of a disputed election reduces, on average, the corruption index in 13 points.

The results are robust, since the 'placebo' study (presented in Table 3), with wider margins of victory, shows decreasing coefficients until it stops being significant. When the margin of victory is defined in 2.5 p.p., the coefficient is about half the one obtained with the main definition. When the 10.0 p.p. definition is used, the coefficient is close to zero and is not significant.

The second stage estimates (equation (2)) for the five IV models are presented in Table 4. The last column shows pooled OLS estimates in order to compare the coefficients.[8] Along with the coefficients in every second stage estimate, we present the R^2, F and Lagrange Multiplier (LM) tests (for underidentification (Kleibergen-Paap)) statistics.

In every estimated model, although the coefficients for the corruption variable were positive, they did not show statistical significance. The same result was obtained from the pooled OLS model. These estimates suggest that corruption does not affect entrepreneurship. This is different from what was found by Melo, Sampaio and Oliveira (2015) and Bologna and Ross

[8] Pooled OLS was used to estimate only the most complete model.

(2015), although comparison is made difficult because of the diverse corruption and entrepreneurship variables used in each study. Regardless of this fact, this paper is conceptually more similar to what was done by Melo, Sampaio and Oliveira (2015), who found a statistically significant (at 1%) positive coefficient.

Table 2

Effect of margin of victory on corruption

	CORRUPTION	CORRUPTION	CORRUPTION	CORRUPTION	CORRUPTION
margin_1v5	-0.1319***	-0.1323***	-0.1331***	-0.1273***	-0.1278***
	(0.0439)	(0.0440)	(0.0442)	(0.0449)	(0.0450)
schooling		0.0112	0.0124	0.0121	0.0121
		(0.0374)	(0.0378)	(0.0384)	(0.0385)
union			0.1242	0.0147	0.0319
			(0.4639)	(0.4785)	(0.4855)
unrate				-0.0038	-0.0042
				(0.0070)	(0.0072)
Gdppercapita				-0.0131	-0.0112
				(0.0133)	(0.0158)
homicides				0.0521	0.0533
				(0.1931)	(0.1936)
tax_revenue					-0.0000
					(0.0002)
r2	0.17	0.17	0.17	0.18	0.18
F	4.81	4.40	4.05	3.37	3.17
N	297	297	297	297	297

NOTE: 1. Standard errors in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
3. The regressions include a tendency control.

Table 3

Validation of the instrumental variables (IV)

	CORRUPTION	CORRUPTION	CORRUPTION
margin_2v5	-0.0683*		
	(0.0386)		
margin_5		-0.0655**	
		(0.0326)	
margin_10			-0.0298
			(0.0294)
R^2	0.16	0.16	0.15
F	2.83	2.89	2.68
N	297	297	297

NOTE: 1. Standard errors in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
3. The three regressions include the same explanatory variables as the most complete IV models.

Table 4

Effect of corruption on entrepreneurship

	INSTRUMENTAL VARIABLES					POOLED ORDINARY LEAST SQUARES
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	
Corruption	5.6420 (7.7479)	6.6730 (7.8673)	7.6059 (7.7776)	7.6250 (7.8714)	7.1063 (7.8997)	1.7062 (1.2403)
Schooling		3.5104* (1.9275)	3.6866* (1.9151)	3.3264** (1.5766)	3.3321** (1.5558)	3.3849** (1.5406)
Union			19.1726 (12.2946)	12.1149 (10.4547)	9.6554 (10.3609)	9.1802 (7.9860)
Unrate				-0.1110 (0.1594)	-0.0657 (0.1577)	-0.0891 (0.2444)
Gdpper-capita				-0.2655 (0.3244)	-0.5450 (0.3549)	-0.6434* (0.3379)
Homicides				12.2976** (5.1361)	12.1506** (5.0216)	12.1774 (10.4415)
tax_revenue					0.0071* (0.0038)	0.0070 (0.0065)
R^2	0.40	0.43	0.43	0.46	0.47	0.93
F	19.94	18.17	16.68	14.29	13.82	280.46
LM test	8.56	8.58	8.32	8.57	8.53	
N	297	297	297	297	297	297

NOTE: 1. Standard errors in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
3. The regressions include a tendency control.
4. Net establishment of companies per 10,000 inhabitants.

The same lack of causality is observed when the effect of corruption on informality is estimated — a robust result, since the coefficients are not significant for all three of the informality definitions (Tables 5 to 7).

Table 5

Effect of corruption on informality (definition I)

	INSTRUMENTAL VARIABLES					POOLED ORDINARY LEAST SQUARES
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	
Corruption	-3.0834	-3.9153	-4.8071	-4.9691	-4.5076	2.4503*
	(3.4402)	(3.2328)	(3.2826)	(3.4206)	(3.5223)	(1.4601)
Schooling		-2.8324***	-3.0008***	-2.9810***	-2.9861***	-4.5892***
		(0.5221)	(0.5238)	(0.4942)	(0.4765)	(0.9331)
Union			-18.3274**	-17.9335**	-15.7453**	-28.2092***
			(7.2048)	(7.3208)	(7.2926)	(7.7880)
Unrate				-0.1667	-0.2070*	0.0118
				(0.1141)	(0.1135)	(0.1953)
gdppercapita				-0.0315	0.2171	0.1384
				(0.2133)	(0.2272)	(0.4790)
Homicides				-0.4292	-0.2984	-0.3443
				(2.2522)	(2.1356)	(3.1517)
tax_revenue					-0.0063***	-0.0243***
					(0.0023)	(0.0048)
R^2	0.61	0.65	0.65	0.65	0.66	0.75
F	37.37	40.57	35.94	29.61	30.51	38.08
LM test	8.56	8.58	8.32	8.57	8.53	
N	297	297	297	297	297	297

NOTE: 1. Standard errors in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
3. The regressions include a tendency control.

Table 6

Effect of corruption on informality (definition II)

	INSTRUMENTAL VARIABLES					POOLED ORDINARY LEAST SQUARES
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	
Corruption	-1.0655	-2.1098	-3.0736	-2.7643	-2.3615	2.3019*
	(3.4317)	(3.0048)	(3.0198)	(3.2457)	(3.3843)	(1.2971)
Schooling		-3.5560***	-3.7380***	-3.7530***	-3.7574***	-5.6108***
		(0.5631)	(0.5786)	(0.5275)	(0.5144)	(0.8617)
Union			-19.8065***	-18.8343**	-16.9243**	-21.5077***
			(7.3313)	(7.3226)	(7.2810)	(6.8463)
Unrate				-0.1776	-0.2128*	0.0852
				(0.1210)	(0.1211)	(0.1837)
gdppercapita				0.0860	0.3030	0.4032
				(0.1883)	(0.2098)	(0.4153)
Homicides				0.1500	0.2642	0.6955
				(2.4118)	(2.3143)	(2.9420)
tax_revenue					-0.0055**	-0.0256***
					(0.0023)	(0.0043)
R^2	0.65	0.71	0.72	0.73	0.74	0.80
F	47.49	59.94	54.32	46.05	46.13	52.15
LM test	8.56	8.58	8.32	8.57	8.53	
N	297	297	297	297	297	297

NOTE: 1. Standard errors in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
3. The regressions include a tendency control.

Table 7

Effect of corruption on informality (definition III)

	INSTRUMENTAL VARIABLES					POOLED ORDINARY LEAST SQUARES
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	
Corruption	-2.7510 (3.4932)	-3.6656 (3.2094)	-4.7023 (3.2408)	-4.6397 (3.3763)	-4.3325 (3.4459)	2.5371* (1.4198)
Schooling		-3.1140*** (0.5684)	-3.3098*** (0.5873)	-3.3207*** (0.5309)	-3.3240*** (0.5216)	-4.6357*** (0.9431)
Union			-21.3058*** (7.5338)	-20.8770*** (7.5000)	-19.4201*** (7.4885)	-28.0086*** (7.5457)
Unrate				-0.1914 (0.1192)	-0.2182* (0.1200)	0.1605 (0.2002)
gdppercapita				0.0141 (0.1956)	0.1796 (0.2137)	0.2443 (0.4729)
Homicides				0.3336 (2.2419)	0.4207 (2.1718)	0.1167 (3.1457)
tax_revenue					-0.0042* (0.0023)	-0.0257*** (0.0048)
R^2	0.59	0.64	0.65	0.65	0.66	0.75
F	36.16	41.13	36.14	30.04	29.45	39.44
LM test	8.56	8.58	8.32	8.57	8.53	
N	297	297	297	297	297	297

NOTE: 1. Standard errors in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
3. The regressions include a tendency control.

These results are in accordance with the ones obtained by Dutta, Kar and Roy (2011) for India. Among the three informality definitions used by them, only one seemed to be slightly affected by corruption.

There is also no evidence that corruption affects the number of workers in the formal sector. Although the estimated coefficients are negative, none of them is statistically significant (Table 8). The estimates for number of companies of different size ranges are consistent. In this case, although the coefficients are decreasing, which suggests heterogeneous effects, none of them is statistically significant (Tables 9 and 10).

Table 8

Effect of corruption on average firm size (number of employees/number of companies)

	INSTRUMENTAL VARIABLES					POOLED ORDINARY LEAST SQUARES
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	
Corruption	-0.0066	-0.0058	-0.0070	-0.0074	-0.0080	0.0083**
	(0.0082)	(0.0081)	(0.0080)	(0.0083)	(0.0082)	(0.0034)
Schooling		0.0026*	0.0023	0.0029*	0.0029*	-0.0021
		(0.0016)	(0.0015)	(0.0015)	(0.0015)	(0.0013)
Union			-0.0241*	-0.0128	-0.0156	0.0457**
			(0.0133)	(0.0130)	(0.0131)	(0.0197)
Unrate				-0.0004	-0.0003	0.0031***
				(0.0002)	(0.0002)	(0.0004)
gdppercapita				0.0003	-0.0000	0.0018***
				(0.0004)	(0.0005)	(0.0007)
Homicides				-0.0185***	-0.0186***	0.0127
				(0.0055)	(0.0055)	(0.0078)
tax_revenue					0.0000	-0.0000***
					(0.0000)	(0.0000)
R^2	0.44	0.46	0.46	0.49	0.49	0.38
F	34.49	36.48	34.25	29.41	27.12	15.35
LM test	8.56	8.58	8.32	8.57	8.53	
N	297	297	297	297	297	297

NOTE: 1. Standard errors in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
3. The regressions include a tendency control.

Table 9

Effect of corruption on firm size by ranges (sizes 1 to 5)

	Size 1	Size 2	Size 3	Size 4	Size 5
Corruption	-1015.28	-1417.76	-1408.39	-896.72	-864.05
	(2250.69)	(11481.89)	(3655.80)	(2063.71)	(1063.04)
Schooling	932.92***	6740.29***	2360.48***	1395.93***	803.75***
	(215.67)	(1410.76)	(542.85)	(358.32)	(223.24)
Union	-3779.54	-45986.97***	-16550.89***	-10020.76***	-5750.69***
	(2628.09)	(15614.58)	(5552.56)	(3456.55)	(2085.05)
Unrate	-96.76	-881.10*	-379.63**	-262.11**	-169.61**
	(69.04)	(464.01)	(172.88)	(110.55)	(68.33)
gdppercapita	-118.73	-1008.55	-349.64	-186.90	-104.32
	(117.57)	(617.14)	(218.89)	(136.00)	(82.39)
Homicides	-2871.79	-33843.12*	-17478.60***	-12815.43***	-8338.90***
	(3102.86)	(17805.95)	(6761.82)	(4538.35)	(2864.90)
tax_revenue	0.72	-3.09	-2.87	-2.44	-1.57
	(1.74)	(9.76)	(3.44)	(2.13)	(1.27)
R^2	0.43	0.48	0.48	0.47	0.45
F	9.83	13.40	12.95	11.84	10.63
LM test	8.53	8.53	8.53	8.53	8.53
N	297	297	297	297	297

NOTE: 1. The variables of size refer to the amount of firms with a certain number of employees, within the following ranges: size 1 refers to companies with 0 employee; size 2, from 1 to 4 employees; the next variables refer to these ranges, respectively: 5-9, 10-19, 20-49.
2. Standard errors in parentheses.
3. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
4. The regressions include a tendency control.

Table 10

Effect of corruption on firm size by ranges (sizes 6 to 10)

	Size 6	Size 7	Size 8	Size 9	Size 10
Corruption	-391.81	11.83	-93.69	-35.62	-12.84
	(333.28)	(165.84)	(73.80)	(27.64)	(23.70)
Schooling	237.15***	111.41***	44.29***	20.64***	18.34***
	(72.75)	(30.76)	(11.50)	(5.33)	(5.86)
Union	-1720.42***	-731.50**	-209.96*	-88.06*	-143.92***
	(650.70)	(285.87)	(116.55)	(51.95)	(54.38)
Unrate	-56.23**	-25.35**	-8.73**	-3.47**	-4.25**
	(22.28)	(10.03)	(3.75)	(1.69)	(1.72)
Gdppercapita	-32.01	-11.72	-8.75*	-4.88**	-3.57*
	(26.91)	(12.37)	(5.21)	(2.04)	(2.02)
Homicides	-2824.24***	-1230.58***	-407.60**	-151.93**	-192.26**
	(994.31)	(452.78)	(171.62)	(73.48)	(75.89)
tax_revenue	-0.56	-0.18	-0.06	-0.03	-0.05*
	(0.40)	(0.17)	(0.07)	(0.03)	(0.03)
R^2	0.41	0.42	0.36	0.47	0.47
F	8.46	9.29	7.73	13.37	12.93
LM test	8.53	8.53	8.53	8.53	8.53
N	297	297	297	297	297

NOTE: 1. The variables refer to companies with the following number of employees, respectively: 50-99, 100--249, 250-499, 500-999 and, finally, 1,000 or more employees (Size10).
2. Standard errors in parentheses.
3. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
4. The regressions include a tendency control.

The only variable corruption seems to affect is the proportion of public sector workers. The estimated coefficients (presented in Table 11) are positive and, for the last three models, statistically significant, which suggests that, when corruption is higher, more workers choose to work in the public sector. This result is known as a misallocation of talent (ACEMOGLU; VERDIER, 1998). The estimated coefficient is 0.0343 for the most complete model (significant at level 5%).

Table 11

Effect of corruption on the public sector

	INSTRUMENTAL VARIABLES					POOLED ORDINARY LEAST SQUARES
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	
Corruption	0.0143 (0.0157)	0.0204 (0.0141)	0.0311* (0.0159)	0.0348** (0.0173)	0.0343** (0.0171)	-0.0230*** (0.0080)
Schooling		0.0210*** (0.0054)	0.0230*** (0.0051)	0.0227*** (0.0052)	0.0227*** (0.0052)	0.0316*** (0.0042)
Union			0.2192*** (0.0606)	0.2207*** (0.0616)	0.2180*** (0.0623)	0.0481 (0.0514)
Unrate				0.0006 (0.0007)	0.0007 (0.0007)	0.0035*** (0.0009)
gdppercapita				0.0009 (0.0009)	0.0006 (0.0011)	-0.0007 (0.0024)
Homicides				0.0066 (0.0184)	0.0065 (0.0184)	0.0268* (0.0155)
tax_revenue					0.0000 (0.0000)	-0.0001*** (0.0000)
R^2	0.07	0.18	0.21	0.19	0.20	0.89
F	1.74	2.41	2.74	2.47	2.34	173.01
LM test	8.56	8.58	8.32	8.57	8.53	
N	297	297	297	297	297	297

NOTE: 1.Standard errors in parentheses.
2. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
3. The regressions include a tendency control.
4. Proportion of public sector workers among the employed workers.

5 Discussion

Promoting economic development is a constant preoccupation in every country. Among the factors that can do such a thing, the creation of new firms is considered essential to support it. Thus, political and academic interest in factors that can stimulate firm creation has grown a lot in the last 30 years. Simultaneously, there has also been a mounting concern about how the presence of governmental corruption can slow down growth. It is known that both corruption and firm creation are heterogeneous inside a country.

The purpose of this paper was to link corruption and firm creation by analyzing the causal effect between regional corruption and the establishment of new companies. While there is a solid part of the literature

whose purpose is to identify the positive effects of entrepreneurship on the economic growth of a region, it is still not clear how corruption affects entrepreneurship. There are basically two theoretical arguments regarding this topic. The first one is based on the 'grease the wheels' assumption (HUNTINGTON, 1968; LEFF, 1964), which suggests that corruption might increase the firm creation rate and stimulate entrepreneurial activity by reducing bureaucratic costs and making the government machine work. Therefore, corruption would bring benefits to a potential entrepreneur by accelerating the processes for the obtainment of the necessary permits. On the other hand, the second approach, the public choice school theory, states that corruption is a major economic expense which elevates transaction costs and increases the uncertainty of gains (BAUMOL, 1990). In an environment where the capacity to appropriate the economic gains of a project is uncertain, there is an incentive for inefficiently allocating the potential entrepreneur in unproductive activities (ACEMOGLU; VERDIER, 1998).

Brazil was chosen for several reasons. First, like other emerging countries, it presents limited economic growth based on public expenditures because of its indebtedness. This limitation has been forcing the government to give more importance to entrepreneurship as an engine for economic development. Second, corruption is already part of the process of business and negotiations between society and government. Third, as a member of the BRICs, Brazil is a country with growing economic and political participation in the international market, and is the leading economy in Latin America.

Since the purpose of this paper was to identify the causal effect between corruption and entrepreneurship, overcoming the endogeneity problem was a necessity. Thus, a two-stage regression with an instrumental variable was used. The chosen instrument was the intensity of the electoral dispute in each state. The hypothesis is that high political competition levels promote better supervision and inhibits corruption. The first stage of the regression showed robust results. After that, we had to analyze the causal effect.

How does corruption affect entrepreneurship? The results seem to indicate that the presence of corruption affects neither firm creation nor firm size, and it seems not to affect the informal market either. The hypothesis of an inefficient allocation of labor resources was also tested. In this case, corruption seemed to affect the proportion of public sector workers positively. This result supports the idea that in a society where there is corruption, unproductive activities are incentivized, which would reallocate existing talents to the public sector.

The results obtained indicate that while corruption in Brazil does not affect firm creation or the structure of formal and informal sectors, it does stimulate public employment. This combination leads to a lot of questions. It seems logical and would be expected that an increase in the number of public workers — as a result of corruption — would be a consequence of a decreasing entrepreneur activity. Under this assumption, potential entrepreneurs would choose to work in the public sector, given the twisted incentives. However, it seems not to be the case.

One hypothesis that arises is that only less talented agents, the ones who would hardly want to risk engaging in an unsafe activity, would be more likely to seek public sector employment, thus allowing more talented ones to undertake more projects and not affecting the establishment of new companies as a whole — at least quantitatively. On the other hand, one might argue that maybe it is the more talented ones who are drawn to the public sector when faced with governmental corruption. In this case, there would be a high demand for new entrepreneurs, which would attract only the 'second-best' human capital available to the activity. Again, firm creation would not be quantitatively affected. Nevertheless, in either case, there is a high possibility that corruption affects the **quality** of the entrepreneurial activity, hence interfering with the channels through which it promotes economic growth. New research could contribute to the literature by exploring the effect of corruption on the quality of entrepreneurship, for instance, analyzing the human capital dedicated to the activity.

It is worth emphasizing that our evidences are subject to the usual critiques of the instrumental variables. To reach a consensus about the causal impact of corruption on entrepreneurship a lot more papers are required. More studies with different methodologies and database are crucial for our better understanding of the role of corruption in economic development.

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