Does Corruption Deter Female Leadership in Firms?

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August 7, 2025

Abstract

We investigate the impact of corruption on female leadership in Brazil using cross-sectional municipal-level data. Our findings suggest that corruption significantly reduces the proportion of working women in leadership roles. Additionally, corruption decreases female representation in leadership relative to men, though this effect is less robust. When examining sectors most vulnerable to corruption, the results remain largely consistent, but we also note that women tend to avoid these sectors entirely. Our findings suggest that corruption acts as a significant barrier to female leadership.

JEL Codes: D73; L26; O1.

Keywords: Corruption, Entrepreneurship, Economics of Gender, Brazil.

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1 Introduction

There is now a vast literature that examines discrepancies between female and male labor market outcomes under a variety of settings.[1] A general sentiment, at least in the developed world, is that though these differences have lessened in recent years, there are important gaps that remain (Fortin et al., 2017; Goldin, 2023). One such gap is the noticeable lack of women in leadership positions (Pande and Ford, 2012). This has led to the adoption of gender quota laws concerning the appointment of women on corporate boards across a number of countries.[2] While these laws have increased the number of women on corporate boards, they have not been successful in increasing female representation more generally (Bertrand et al., 2019; Maida and Weber, 2022).[3] Thus, understanding the barriers that inhibit female participation in leadership positions remains an important area of research.

We study the effect of political corruption on the presence of women in leadership positions in Brazil. While there is a small but growing literature suggesting harmful effects of corruption on female-led firms (e.g., Breen et al., 2017; Hanousek et al., 2019; Bastos and Bologna Pavlik, 2023), the focus of this literature is on the *firm* rather than the *individual*.[4] We believe this is an important omission in the study of gender inequality not only because it could improve the income potential of aspiring female leaders but also because it has been shown that women are more likely to hire other women (Sekkat et al., 2015; Bossler et al., 2020). If corruption is a deterrent to female leadership, this suggests that fighting corruption could be effective in reducing gender inequality overall.

Corruption tends to be nepotistic with a reliance on networks of patronage and clien-

[1] See Claudia Goldin's work for a review of this literature in the U.S. (e.g., Goldin, 2014; Goldin et al., 2017; Goldin, 2023). See also Jayachandran (2015), Olivetti and Petrongolo (2016), Kunze (2018), and Jayachandran (2020) for more general reviews.

[2] Norway was the first to implement a gender quota law in 2003; Belgium, France, Germany, Iceland, India, Israel, Italy, and Spain followed Norway's example. There is no countrywide quota in the U.S., but California adopted a gender quota law in 2018.

[3] There are some studies that find that the presence of women on corporate boards can have other effects such as the reduction in the use of debts in microfinance firms (Adusei and Sarpong-Danquah, 2021).

[4] Likewise, there is a literature studying the effects of political regimes on corruption in firms in general (Nishioka et al., 2023).

telism as a means of distributing scarce resources. [5] Historically, these networks have favored men (Niven, 1998; Beck, 2003; Krook, 2010; Bjarnegård and Kenny, 2015; Stockemer and Sundström, 2019; Lalanne and Seabright, 2022). Corruption is also a risky endeavor and, as such, it is hypothesized that women are less likely to participate in corrupt transactions than men (Serra and Wantchekon, 2012). It has also been shown that in some corrupt environments, bribery is required to obtain certain jobs (Weaver, 2021). Taken together, this could imply that corruption is an important deterrent to women aiming to acquire leadership positions.

However, that corruption reduces female leadership is not a foregone conclusion. There is evidence that risk tolerance is similar in subgroups of the population with an interest in business (Johnson and Powell, 1994; Dwyer et al., 2002). Business leaders self-select into leadership and may be relatively risk-tolerant regardless of gender. Moreover, while many studies find that corruption is more harmful for female- versus male-led firms, this finding is notably absent for firms in Latin America (Wellalage et al., 2020; Bastos and Bologna Pavlik, 2023). Wellalage et al. (2020) even find some evidence that women receive a higher payoff from corruption in their sample. Thus, the question of whether corruption reduces female presence in leadership positions is very much an open one in Brazil.

We test whether higher levels of corruption impact female leadership across Brazilian municipalities. Our corruption data is derived from the public release of reports concerning results from random audits of municipal expenditures. Specifically, we use the corruption measures developed in Avis et al. (2018), defined as the (log) number of corruption instances uncovered in the audit program (per capita). Municipal leadership measures come from the 2010 Census and can be grouped into two categories: (1) female leaders as a percentage of all leadership positions and (2) female leaders as a percentage of all working women. In regard to category (2), we also look at female labor force par-

[5] Kubbe et al. (2025) emphasize the importance of informal practices in determining corruption. Hodgson (2025) highlights the role of informal institutions and their relation to gender norms, more generally.

ticipation (the percent of working age women that are employed and/or own a business). The first set of outcomes should be interpreted relative to men – of all leaders in a municipality, these outcomes represent the percentage that are women. We refer to this set as the "glass-ceiling" outcomes, and they tend to be our focus. The second set of outcomes examine only the female labor force and the types of jobs that women hold. That is, this second set of outcomes should *not* be interpreted relative to men. Corruption may reduce the availability of jobs and leadership positions in particular, regardless of gender. This is still an important deterrent to consider.

We believe both sets of outcomes are necessary to understand the nature of the corruption–female leadership relationship. For example, if corruption is a deterrent to working women, we may find that it reduces female labor force participation. If this effect is specific to women (i.e., does not impact male labor force participation), we should see a decrease in the share of leadership positions held by women. However, if corruption also induces a selection effect such that the women that remain in the labor force are the ones that are more likely to hold positions of power, corruption's effect female presence among leadership (relative to men) could be positive. Alternatively, if the selection effect discourages working women from obtaining positions of leadership, we might see all outcomes moving in the same direction. These are all empirical questions.

We find that the percentage of leadership positions held by women tends to be lower in municipalities with more corruption. Given that this measure focuses on female leadership relative to men, this result suggests that corruption could induce a "glass-ceiling" effect. However, this effect is not robust to an instrumental variable analysis, where we instrument for corruption using plausibly exogenous measures of political participation and competition, state capacity, and judicial representation. We find stronger evidence that corruption decreases the percentage of working women that hold positions of leadership. There is no evidence that corruption impacts female labor force participation. Taken together, this implies that if there is a "glass-ceiling" effect, it is stemming from a differential selection among leaders. It does not imply that corruption is driving away

female workers in general.

Our results are similar when we consider female participation and leadership presence in sectors that are prone to corruption. We follow Bologna and Ross (2015) and re-calculate our main outcome measures using the following sectors: extractive industries, manufacturing, construction, and transportation and communication. These four sectors accounted for nearly 70% of corruption cases studied in an OECD Foreign Bribery Report (2014). We find even less evidence that corruption reduces female leadership presence (relative to men) in these sectors – all results are insignificant less one. We similarly find that the percentage of working women that hold positions of leadership to be lower in highly corrupt municipalities.

A key difference between the full sample and the corruption-prone subsample, is that we now find a negative effect of municipal corruption on female participation in these sectors. In other words, working women are avoiding these sectors more so in highly corrupt municipalities. Moreover, less than 20% of leadership positions in corrupt sectors are held by women, whereas this number increases to 33% when considering all sectors. Thus, while *municipal* corruption might not reduce female leadership presence relative to men, it does seem that the vulnerability of these industries are keeping women out of leadership implying a glass-ceiling effect at more macro scale. This implies, further, that there are fewer sectors in which women can rise to leadership.

Section 2 provides a thorough review of the literature concerning corruption and gender. Section 3 describes the data and empirical strategy. Section 4 discusses the results. Concluding comments are given in Section 5.

2 Gender and Corruption

2.1 Corruption as a Barrier to Political Advancement

Research surrounding the relationship between gender and corruption is voluminous. Much of this research is focused on gender and corruption in politics. Swamy et al.

(2001) and Dollar et al. (2001) were among the first to document the negative relationship between corruption and female representation in government using cross-country data. More recently, Decarolis et al. (2023) find evidence that women are less likely to engage in corruption using two separate micro-level datasets from Italy and China. While there are exceptions and debates surrounding causality, the idea that women in politics are less corrupt than men is standard.[6]

This finding has led researchers to question how to increase female representation in corrupt environments and, in doing so, has yielded two key reasons as to why these environments might be the most difficult for women to achieve political advancement. First, corruption is fueled by social networks and clientelistic practices. This can result in a gate-keeping effect for women on the outside of this network (Niven, 1998; Stockemer and Sundström, 2019). Second, because women tend to be viewed as more honest than men in politics (Fridkin et al., 2009; Dolan, 2014; Armstrong et al., 2022), they may face a harsher punishment by voters when caught engaging in corrupt acts. Evidence of voters punishing female candidates more for corrupt behavior has been found in both an experimental setting (Eggers et al., 2018) and as a result of corruption exposure from audits (Brollo and Troiano, 2016). If corruption is required for political advancement, both effects work as effective barriers for female candidates.

Thus, it is likely that corrupt environments make it more difficult for women to be in positions of political power. Moreover, the fact that women are less inclined to engage in corruption could amplify these existing barriers. Of most importance to this paper, if these behaviors and barriers exist in the political world, it is likely that they are present in industry. We discuss literature surrounding this possibility next.

[6]See Branisa and Ziegler (2010), Debski et al. (2018), and Barnes and Beaulieu (2019) for other examples of this research.

2.2 Corruption as a Barrier in Industry

The topic of corruption and gender in industry is a growing area of interest. Like politics, this research focuses mainly on whether female-led firms are less corrupt than their male-led counterparts in the business world (Breen et al., 2017; Clarke, 2022; Bastos and Bologna Pavlik, 2023). This is a particularly relevant question, despite the existing research on gender representation in politics, because the idea that women are less corrupt than men is based on theories surrounding risk aversion (Byrnes et al., 1999; Eckel and Grossman, 2008). Specifically, women tend to be more risk-averse than men. However, the subgroup of the population that includes business leaders is comparatively risk-tolerant, and there is evidence that risk preference in this subgroup is similar across gender (Johnson and Powell, 1994; Dwyer et al., 2002). Thus, it is not clear that women would be less corrupt than men in the business world. Indeed, the results of this literature are extremely mixed. They also yield some nuance to the simple idea that women are more or less likely to engage in corruption.

Breen et al. (2017) use survey level firm data and find a strong negative association between bribery and female-led firms. However, using a subset of the same dataset, Clarke (2022) finds no association once the gender of the respondent is controlled for. Bastos and Bologna Pavlik (2023) take a different approach and study how this relationship changes when looking at different regions of the world. They find that though female-led firms sometimes bribe more than their male-led counterparts, these same firms also report corruption as being a larger obstacle to the operations of their business. Furthermore, this latter finding is strongest in areas of the world with substantial gender inequality.

Thus, this research is quite mixed and far from settled. However, a key takeaway (particularly from the Bastos and Bologna Pavlik (2023) study) is that even if women do engage more with corruption, it is unlikely that this corruption is efficiency-enhancing. Along these lines, there is also a small literature concerning the differential effects of corruption on male- versus female-led firm outcomes and entrepreneurs. Hanousek et al. (2019) finds that corruption reduces firm efficiency and that this effect is more pronounced

in firms with female-CEOs. Similarly, Statnik et al. (2023) finds that corruption increases the gender gap in access to finance.

Despite the partial consensus that corruption is particularly harmful for women in the business world, it is important to highlight two exceptions. First, Latin America – and potentially Brazil – might be different. In a sample of Latin American firms, Wellalage et al. (2020) finds that, if anything, female-led firms receive a higher payoff from bribery (in terms of innovation). Similarly, Bastos and Bologna Pavlik (2023) find no evidence that corruption differs across female- versus male-led firms in Latin America. Second, Fang et al. (2022) find no evidence that corruption increases what they call the "women-led firms disadvantage" in productivity and growth. However, they do find that the prevalence of female-led firms is higher in less corrupt countries.

Our focus is on how corruption impacts a woman's ability to acquire a leadership position within industry. While the aforementioned research is relevant because its focus on female-led *firms*, this literature mostly ignores corruption's impact on the presence of women in leadership positions.[7] The evidence found in Fang et al. (2022), for example, suggests that the prevalence of women-led firms is smaller in highly corrupt countries but this finding is not causal. They do not present an empirical test of this hypothesis as their focus is on the productivity gap between female- and male-led firms. We aim to fill this gap here.

3 Empirical Strategy and Data

3.1 Empirical Strategy

We use cross-sectional, municipal level data to test whether corruption has an effect on female presence in leadership positions in Brazil. All outcome and control variables come from the 2010 Census, except municipal GDP per capita and population density, collected

[7]There is, however, a complementary literature focusing on legal obstacles shows that these barriers can reduce female participation (Hallward-Driemeier and Gajigo, 2015; Iqbal et al., 2016), but these studies do not focus on the effects of corruption specifically.

from IPEAData. The corruption data comes from Avis et al. (2018), who construct a municipal corruption measure stemming from a random audit program. While this measure considers any corrupt activity occurring between 2003 – 2013, we treat it as cross-sectional as (1) we do not know the precise timing of the corrupt activity, and (2) corruption is a highly persistent activity (Mishra, 2006). However, we note that there could be some variation in corruption levels depending on when the municipality was audited and we therefore always include audit number fixed effects. (These audits occur according to national lotteries where a subset is selected at a given time.) Our cross-sectional sample is limited to the 935 municipalities that were audited and have corruption data available. We give more details pertaining to the audit program, the construction of the corruption measurement, and the sample in Section 3.2.

We aim to estimate the effect of corruption on two sets of female leadership variables, described in detail below, after controlling for a number of municipal level characteristics. In other words, we estimate the following equation:

$$y_{ms} = \beta \times Corruption_{msl} + \theta \times X_{ms} + \alpha_s + \delta_l + \epsilon_s \tag{1}$$

where *m, s, and l* index the municipality, state, and audit number (lottery) of the program; y is one of our several outcomes of interest, detailed in Section 3.3; *Corruption* is a measure of corruption per capita; X is a matrix of municipal level controls; δ is an audit/lottery fixed effect; α is a state fixed effect; ϵ is the error term. Standard errors are clustered by state. Though the corruption data is cross-sectional, we use the *m, s, and l* subscripts to emphasize that these corruption scores come from different audits.

We estimate Equation (1) using Ordinary Least Squares (OLS). This is our baseline and focus. We also test the robustness of our results using Two-Stage Least Squares (2SLS) and an instrumental variable analysis, where we instrument for corruption with measures of political participation, management capacity, and judicial representation. We motivate and discuss the plausibility of these instruments in Section 3.6. However, because our sample size is dictated by the corruption data and understanding the details

of this measure is necessary to describe the nature of the IVs, we detail the corruption measure first.

3.2 Corruption

We use Avis et al. (2018)'s measure of corruption, defined as the (log) number of corruption instances uncovered in a random audit of the municipality. We scale this number by population to account for the large variation in municipal size. We explain the details of the random audit program, the corruption measure, and sample in this section.

In Brazil, a significant portion of municipal funding comes in the form of constitutionally-mandated transfers from the federal government. Discretion concerning how to use these funds is largely left to the municipality, which invites misuse and corruption at the local level. To combat this corruption, Brazil implemented a random audit program (*Programa de Fiscalização por Sorteios Públicos*) commencing in 2003 where municipalities were selected via national lottery and subsequently audited for corruption.[8] Each lottery includes a subset of municipalities, ranging anywhere from 5 to 60, and the frequency of the lotteries has varied throughout the program. The goal of the audits is to uncover malfeasance in the use of public funds. Teams of auditors are sent to investigate any irregularities in the application of the federal transfers, and the results of the audits are made public. Avis et al. (2018) use these reports to construct their measure of corruption. They define any irregularity that the *Corregedoria Geral da União* (CGU) defines as moderate to severe as an act of corruption; the sum of these acts is their measure of municipal level of corruption.[9] Similar measures derived from these audits are now commonly employed in the literature (e.g., Ferraz and Finan, 2008, 2011; Bologna and Ross, 2015; Brollo and Troiano, 2016; Bologna Pavlik, 2018; Colonnelli and Prem, 2022).

Brazil has a total of 5,570 municipalities. From 2003 through 2015, 1,949 of these

[8]Extremely large municipalities, specifically those greater than 500,000 in population, and state capitals were excluded from nearly all audits. Only one state capital (Aracaju) was audited once in lottery 22. Our analysis includes only those that were audited and therefore excludes these large municipalities.

[9]The CGU is the agency responsible for conducting audits and disseminating reports.

municipalities experienced at least one audit with 2,241 audits in total (Avis et al., 2018). Because Avis et al. (2018) focus on two electoral terms (namely, 2004-2008 and 2008-2012) and because audits ceased the random component in 2015, their dataset focuses on corruption uncovered in audits that occurred anytime between July of 2006 to March of 2013; i.e., lotteries 22 through 38. Since these audits uncover corrupt activity occurring anytime in the 3–4 years prior to the audit, they expose corruption *ex post*. In principle, then, this corruption measure contains corruption occurring anytime in the 2003 through 2013 period. We cannot obtain information on the exact timing of the corrupt activity.

The fact that these audits expose corruption *ex post* is particularly important for our analysis. First, even audits occurring in 2013 are likely to contain corrupt activities from 2010 or earlier. Thus, given our focus on 2010 outcomes, these later audits are relevant for our analysis.[10] Second, we are interested in the cross-sectional variation of corruption. Because corruption is extremely persistent, corrupt activity occurring at any point in this ten year period is likely reflective of the corrupt environment that exists within the municipality. For example, taking the sub-sample of municipalities in Avis et al. (2018) that were audited multiple times *and* have corruption measurements available in each audit (48),[11] we find that the average change in their corruption scores (log number of corruption instances) is approximately zero.[12] More importantly for this paper, the relative ranking of corruption scores moves little over time for these municipalities.

[10]In Online Appendix A we test the robustness of our results using two different measures of corruption. First, we use the Avis et al. (2018) discussed here but exclude all audit data that comes from 2010 or beyond. Our outcomes come from the 2010 Census and including post-2010 corruption could introduce reverse causation concerns. Second, we use a much more limited sample and measure from Ferraz and Finan (2011). This measure considers only the first 11 lotteries and is constructed using the authors' own definition of corruption. Lastly, though our focus is on the municipal level, we also weight regressions based on population for robustness. We construct our outcomes using averages of individual level data and thus smaller municipalities could have measures that are inaccurate. Our results are robust to these changes. We only lose significance as sample size falls.

[11]The Avis et al. (2018) identification strategy is not a standard difference-in-difference and/or event study and thus does not rely on time variation. Rather, they compare corruption scores within each lottery of those that were audited for the first time versus those that were audited in the past and rely on the randomization of the program to difference out unobservable effects.

[12]This is not contradicting the Avis et al. (2018) result that the audits reduce corruption as there is no counterfactual here. The mean change in logged corruption irregularities is -0.067. To understand the impact of the audits and whether this change is significant, we would need a counterfactual over the same time period where corruption is observed but no audit occurred. However, measurement of corruption depends on being audited.

Though, as cautioned in Avis et al. (2018), audit protocol differed across lotteries making corruption levels difficult to compare through time. This is why all regressions include lottery fixed effects and our focus is on cross-sectional, within lottery effects.

Avis et al. (2018)'s sample contains 1,020 audits across 967 municipalities. For the 53 municipalities that were audited multiple times in this period, we average their corruption scores across the multiple audits (when possible).[13] We also drop municipalities where corruption scores were missing in the Avis et al. (2018) dataset. There were only 37 instances of this, 5 of which were municipalities that were audited twice and thus we have a corruption score from the other audit.[14] This leaves with us 935 municipalities for which we can study the corruption–female leadership relationship. This sample is limited to only those eligible and selected for audit; large municipalities are excluded.[15]

3.3 Measures of Female Leadership

Our measures of the presence of women in leadership positions come from the 2010 Census. For each working individual in the sample, we identify their worker type (employee or employer). For those that are "employees" we further classify their occupation type using 3-digit occupational codes. We define employees to be leaders if they are coded as a general director, executive, or manager. Employers are leaders by definition. All outcome definitions are summarized in Table 1.

Before describing the details of our measures, we note the importance of the employer versus employee with a leadership role (e.g., manager) distinction. Employers exhibit more individual choice and are likely exposed to more corruption. Employers are business owners and are explicitly in charge of their business. They are not chosen or assigned by

[13]There are 224 that experienced a "treatment" in their sample. Given the results of Avis et al. (2018), in Online Appendix A we include a dummy variable to control for whether the municipality was audited twice. Our results are largely unchanged.

[14]It is unclear why the data is missing in these cases, but we note that these observations are missing all audit data. Since Avis et al. (2018) rely on the CGU's coding of corruption rather than their own, this likely indicates that the CGU did not code the results of these specific audits.

[15]We compare summary statistics for control variables in this sample of 935 with other eligible but non-audited municipalities in Appendix C, Table C2. Given the random nature of the audit program, there is very little (meaningful) difference between these groups.

other individuals with higher levels of power within the firm and are more likely to interact with local administration directly. Management, however, could be more reflective of how women – relative to men – acquire different levels of employment in high corruption areas. Both are important aspects of the female leadership – corruption relationship and thus we combine them as our main measure of "leadership". However, it is plausible that they exhibit slightly different associations with corruption and thus are also always analyzed separately.

3.3.1 Female Leadership Presence - The "Glass-Ceiling" Effect

Our main measure is the share of all leadership positions - i.e., employees that are in a manager, general director, or executive role *and* employers - that are occupied by women. To avoid ambiguity, this measure is calculated as:

$$y_{ms} = \frac{\sum_{i=1}^{I} WomanInLeadershipRole}{\sum_{i=1}^{I} LeadershipRole} \tag{2}$$

where i indexes the individual and I represents the last individual in the sample. We also consider the share of positions in each category held by women: employees in management roles (managers, directors, or executives) and employers. Note that in these latter two cases, the denominator focuses only on total leadership positions in the respective category. For example, for employers, our measures is total female employers divided by all employers in the municipality. This also helps explain why the observation numbers drop for these separate categories: some municipalities are very small and have *no* employers and/or positions of leadership. On average, around 33% of all leadership positions are held by women in our sample (see Table 2). This number is lower when looking at shares of employers (26.3%), and higher when looking at employees in management roles (35%).

3.3.2 Female Labor Force Participation and Leadership

Additionally, we examine the share of working-age women that are in the labor force. We then further narrow in on these working women and calculate the share that hold a leadership position. As above, "leadership" is defined as an employer or an employee that is either a manager, general director, or executive. On average, 33% of working age women are in the labor force, and only 3.6% of working women hold a leadership position.

Again, for clarity, we calculate these measures as follows:

$$y_{ms} = \frac{\sum_{i=1}^{I} WomanInLaborForce}{\sum_{i=1}^{I} WorkingAgeWomanCensusRespondent} \tag{3}$$

$$y_{ms} = \frac{\sum_{i=1}^{I} WomanInLeadership}{\sum_{i=1}^{I} WomanInLaborForce} \tag{4}$$

The first set of outcomes that examine the share of women in specific categories of leadership aims to capture leadership presence. The second set of outcomes, however, focuses on labor force participation and the types of jobs that women hold *if* they are working – thus implicitly controlling for labor force participation. Corruption may reduce female leadership presence because it decreases female labor force participation *or* because it inhibits female career advancement, or both.

3.4 Control Variables

Following Bologna and Ross (2015) and Bologna (2016), our control variables aim to capture the general economic environment of the municipality, with an emphasis on the level of overall development. These variables include (logged) GDP per-capita, (logged) population density, the size of the informal sector (measured as a share of employment), the percent of the adult (25 years or older) population with a college degree, the percent of the population that is male, the percent of the population that is of a standard working age (18–65), and the share of the population that lives in an urban area. These are referred to as our baseline controls.

Most of these controls are relatively standard in development, but the size of the informal economy perhaps warrants further discussion. Bologna (2016) emphasizes the importance of controlling for the size of the informal sector in any analysis of corruption and income, as corruption and informality are likely correlated.[16] Indeed, Bologna (2016) finds that informality is a stronger predictor of income than corruption in their sample of Brazilian municipalities. Moreover, given the independent importance of informality in explaining gender gaps (Malta et al., 2019), this is an important control in our analysis.

Summary statistics are presented for these baseline controls in Table 3 using the largest sample of municipalities (935) in our study.[17] Note that these municipalities are diverse, and some municipalities are very small (as low as 1,409 in population). This striking diversity is also reflected in the informality and urban measures. For example, while informality is common in Brazil (approximately 60% of employment is informal on average), some municipalities rely almost exclusively on informal employment (97%). The share of the population that lives in an urban area ranges from only 5% to nearly 100% across included municipalities.

In Online Appendix B, we also include industry employment shares as controls. Regressions are at the municipality (as opposed to individual) level and municipalities have different sectoral compositions. However, our focus is on the estimates without these measures, as they are likely "bad" controls à la Angrist and Pischke (2009). The effect of corruption on female leadership is likely to work (in part) through industry choice and, therefore, by including sector composition as a control we could be eliminating one of the main channels through which corruption can impact female leadership. Our results in Online Appendix B confirm this suspicion. Once we control for for sectoral composition, much of the effect of corruption disappears. This does not suggest that corruption is irrelevant, however, it simply implies that much of corruption's effect works through sectoral composition and that the two are highly correlated. We believe studying the

[16]Though, as noted in Dreher and Schneider (2010) the nature of the corruption–informality relationship is likely context specific.

[17]See Online Appendix C for additional summary statistics using alternative (smaller) samples.

effect of corruption on sector choice for women would be beneficial for future research, but it is beyond the scope of this paper to do so.

3.5 "Corrupt" Sector Sub-Sample

Our main set of results uses all individual level Census data to create female leadership presence and labor force measures for each municipality. As such, we get an estimate of how municipal corruption impacts female leadership overall. However, this average effect includes corruption's impact on female leadership across all sectors and may not be reflective of corruption's impact on leadership in sectors that are more or less prone to corruption. Traditionally corrupt sectors could have lower female presence in general, making it particularly difficult for women to advance their careers. On the other hand, the women that are willing to work in these sectors within a relatively corrupt country could be more risk-tolerant and willing to engage in corruption which could increase female representation among leaders in this group. A highly corrupt municipality could signal a stronger corruption "treatment" in these sectors, relative to others, and thus may have a different effect on leadership in corruption prone sectors than the average.

We follow Bologna and Ross (2015) and consider the following four sectors as corruption-prone: (1) extractive (e.g., mining), (2) manufacturing, (3) construction, and (4) transportation/communication sectors. Bologna and Ross (2015) identify these four sectors as "corrupt" using the the Organization for Economic Cooperation and Development (OECD) Foreign Bribery Report (2014). Within this report, these four sectors accounted for nearly 70% of all corruption cases studied. While corruption can and likely does exist in any industry,[18] we define these four sectors as "corrupt" sectors and focus our analysis on this sub-sample. However, in Online Appendix D, we also present data and results for the "non-corrupt" sub-sample, defined as all remaining industries as a comparison.

Table 2 presents summary statistics for this sub-sample along with the full sample discussed above. Female labor force participation in these "corrupt" sectors is much lower

[18]See, e.g., Colonnelli and Prem (2022) for a discussion of corruption uncovered in these audits.

than the overall average. Only 2.1% of working age women are employed in these sectors, though 33% of women in this group are working in general (across any sector). Thus, these industries comprise only 6.36% of total female workers in the economy; this is compared to the 19.72% of total employment that these industries constitute overall. Perhaps more importantly, women are less likely to be leaders within these industries. Female leaders as a share of total leadership positions across all industries averages 33.1%, whereas female leaders within these four sectors is less than 20%. Moreover, female leadership shares in the other (non-corrupt) sectors is much higher at 35.2% (Online Appendix, Table D1). These statistics highlight potential differences in female representation in corruption-prone industries and thus motivate the idea that the effect of corruption could be different in this more susceptible group.

3.6 Instrumental Variables

A concern with our OLS results, and any study of corruption, is endogeneity. There are many potential unobservable causes of corruption that could result in omitted variables biasing the estimates. Culture, for example, has been linked to corruption and is notoriously difficult to measure and control for (Barr and Serra, 2010; Pillay and Kluvers, 2024). An ideal solution would be to utilize an experimental or quasi-experimental design. However, given our cross-sectional data, this is not possible here. We therefore rely on an instrumental variable approach. More specifically, we utilize a two stage least squares (2SLS) estimator where we (1) get an estimate of corruption in the first stage using a set of instrumental variables (along with our controls) and (2) use this predicted corruption value to estimate the causal effect of corruption on our outcomes in the second stage.

For instruments to be valid, they need to satisfy two criteria: relevance and exogeneity. The first is relatively easy to satisfy in that many factors are related to corruption. It is the second, exogeneity, that makes finding a plausible instrument more difficult.

Our instruments include two measures of political competition and participation: the

existence of local councils and whether these councils are active.[19] The former counts the number of municipal councils that exist and creates an index from this information (scaled from 1 (least councils) to 6 (most councils)). A council is coded as active if they have individuals appointed in positions. These measures are taken from a 1998 index (*Indicador de Qualidade Institucional Municipal* - IQIM) constructed by the *Instituto Brasileiro de Geografia e Estatística* (IBGE). Municipal councils serve as a check on corruption.

We additionally include a measure of management capacity, also from the IQIM index and defined at the municipal level. In sum, this indicator measures the government's ability to implement zones, codes, and other laws with the purpose of municipal planning (e.g., zoning laws or building codes). We interpret this as a measure of state capacity where state capacity is defined broadly as the ability to govern, enforce the law, and tax (Piano, 2019). While stronger states might engage in more corruption, they also have a stronger ability to limit it. There is an extensive literature connecting state capacity to development (see, e.g., (Johnson and Koyama, 2017)), and while specific the connection between corruption and capacity has received relatively less attention, it is likely that state strength is an important factor in determining corruption levels (Owen and Vu, 2022).[20]

Lastly, we include an indicator for whether the municipality is a judiciary district (*comarca*). It implies that the municipalities has a branch of the state court. Ferraz and Finan (2011) theorize that the presence of a judge increases the likelihood of being prosecuted for wrongdoing and thus likely reduces corruption as a result.

All four instruments are measured before any occurrence of corrupt activity studied

[19] In the context of Brazil, municipal councils (*conselhos municipais*) are commissions established by law to propose or advise on policy initiatives in a specific area (e.g., health, education) and oversee their implementation. These councils typically include representatives from the local public administration and civil society organizations. Notably, they differ from city councils (*câmaras municipais*), which serve as the local legislative branch.

[20] Defining the causal association between state capacity and corruption is not necessary in determining the relevance of an instrument. All that matters is that the two variables are correlated; and that the instrument is not otherwise associated with the outcome.

in this paper.[21] This is beneficial because it makes reverse causality less of a concern. However, the length of time between instrument measurement (1998 for the IQIM data) and corrupt activity could be concerning (any time between 2003-2013). One might be worried that these instruments are not relevant at the time of the corrupt activity and therefore may not be strong predictors of corruption – in other words, these instruments are predetermined but could be weak. To address this concern, we always report the F-Statistic from the first stage to gauge the strength of the instruments. First stage results are reported in full in Online Appendix E.

Another concern with these instruments is that they are not truly exogenous. We note that all four variables are political instruments with a focus on implementing some sort of check and balance in local government. We argue that these checks and balances only influence our outcomes through corruption. We believe this is a reasonable assumption but cannot rule out other potential channels. We do provide the J-Statistic from a test where the null hypothesis is that the instruments are exogenous. However, this is not a particularly strong test because even if we fail to reject the null at a standard threshold (e.g., 90%) the probability that the null is false can still be reasonably high. We also provide appendix results (Appendix E) where we present "just-identified" 2SLS estimates using each instrument separately to show the consistency of our results. Even so, endogeneity could remain. We therefore view these instrumental variable results as a robustness check only and refrain from making strong causal statements throughout the paper.

[21] Because there were 6 municipalities emancipating after 1998 but before 2010 we have only 929 observations for IV estimates. Summary statistics for instruments are presented in Table 3.

4 Results

4.1 Female Presence in Leadership Positions

We begin the discussion of our results with the first set of outcomes: the share of leadership positions held by women. The focus of these results is on uncovering a potential "glass-ceiling" effect. The main results are summarized in Table 4. ***Panel A*** estimates OLS with the full sample of data; ***Panel B*** uses data from "corrupt" sectors only; ***Panels C*** and ***D*** repeat these specifications using 2SLS and all instruments described above.[22]

Starting with the full sample OLS results (***Panel A***), the effect of corruption per-capita on female leadership presence is negative and statistically significant (5% level) for employers, management[23], and leadership. However, the effect sizes are relatively modest. A one standard deviation increase in corruption (0.115) corresponds to a 3.5 percentage point decrease in the share of employers that are female. This amounts to approximately 20% of a standard deviation change in this category. Similarly for management, a standard deviation increase in corruption reduces female presence by 2.3 percentage points (or 16% of a standard deviation). And, for all categories, this effect reduces female leadership by 2 percentage points (16% of a standard deviation). Moreover, while these effects increase in magnitude (i.e., become *more* negative) when conducting an instrumental variable analysis using all instruments described above (***Panel C***), they fail to exceed standard levels of significance. (On this point, though, we also note that the effects are significant in many of the just-identified cases where we instrument for corruption using each IV separately. These results are in Online Appendix E.) Thus, while there is some evidence of a glass-ceiling effect in the overall sample, it is not particularly strong.

The effect of corruption on the share of employers that are female is largely the same in the corrupt sample as the full sample – a standard deviation increase in corruption

[22]First stage results and additional instrumental variable analyses are available in Online Appendix E. Full results for main specification (***Panel A***) are given in Online Appendix F.

[23]For brevity, we use the term management in reference to the managers, directors, and executives category.

explains approximately 22% of a standard deviation change in this category ***Panels C***. Similarly, this effect is not robust to the full instrumental variable analysis ***Panels D***. The major difference between the full sample results and those for the corrupt sample is that the share of management positions held by women is now positively correlated with municipal corruption. Although this effect is never statistically significant in these main specifications,[24] it is an important difference from the full sample results and warrants further discussion.

Corrupt sectors have a far lower representation in leadership than the overall average. Women account for only 18.8% of employers, 20.7% of management, and 19.7% of leaders in corruption-prone sectors relative to 26.3%, 36.2%, and 33.1% overall. Therefore, while the gender composition of leadership does not vary with municipal corruption - it does seem that women are avoiding these sectors in general. The women that are willing and able to obtain leadership positions within corruption-prone sectors could have similar levels of risk tolerance (or some other unobservable characteristic) as men and, therefore, are similarly affected by municipal corruption. Female employers, however, have more flexibility in avoiding these corruption-prone sectors altogether. This is likely why the singular statistically significant coefficient we find for the corrupt sectors in Table 4 is for employers alone.

Thus, while the two samples yield mixed results, a similar theme remains. If anything, corruption seems to be a deterrent to female leadership presence. For the full sample, municipal corruption has a negative association with the share of leadership positions held by women. For the corrupt sample, it seems that this glass-ceiling effect might exist more at the macro than municipal level. However, none of these results are not robust to a full instrumental analysis where corruption is instrumented by councils (both existence and activity), management capacity, and judicial presence. Thus while we do find some evidence of a "glass-ceiling" effect, one should be careful to interpret this as causal.

[24]It is sometimes significant in the just-identified analyses presented in Online Appendix E.

4.2 Female Labor Force Participation & Job Type

Table 5 presents results for female labor force participation and the share of the female labor force that hold leadership positions. The structure of this table is the same as in Table 4.

As above, we detail the full sample results first – ***Panels A*** for OLS and ***C*** for 2SLS. The share of the female labor force that are employers, managers, or in leadership positions is lower in more corrupt municipalities. These results are significant at the 10% level or better in all cases. However, they are relatively modest - explaining approximately 20% of a standard deviation in the outcomes. What is interesting, however, is that despite the robust effect of corruption on the share of women working leadership roles, there is no (significant) association between female labor force participation and municipal corruption in the full sample. One way to interpret these results – in conjunction with the results concerning female leadership presence (Table 4) – is that municipal corruption changes the types of jobs that women obtain but does not necessarily keep them out of the labor force.

The corrupt sample results largely resembles the full sample, with one exception. Municipal corruption tends to lower female labor force participation in corrupt sectors, though this effect is not robust to the instrumental variable analysis with all instruments included (***Panel D***). The remaining results are similar. The share of working women that hold leadership positions is substantially smaller in corrupt municipalities. Note that this can be true despite the lack of an effect on female presence among leadership uncovered in Table 4. It may be that corruption reduces the number of leadership positions for both men and women, thereby reducing the share of working women that are in leadership but leaving the gender composition of leaders unchanged.[25] Regardless, it is clear that municipal corruption changes the types of jobs that women obtain – a smaller percentage of working women are obtaining positions of leadership.

[25] Bastos et al. (2024) finds that corrupt municipalities have greater firm concentration. This suggests that fewer women (and potentially men) become managers simply because there are fewer firms to be managed overall.

5 Concluding Discussion

We study the effect of corruption on female leadership presence in Brazil. We use cross-sectional municipal level data to test whether municipal corruption impacts (1) female presence among all leadership positions (relative to men) in the municipality and/or (2) female labor force participation and the share of working women that obtain leadership roles.

Our results suggest that corruption is a deterrent to female leadership. There is clear evidence that municipal corruption reduces the share of working women that obtain positions of leadership. Thus, it influences the types of jobs women obtain, but this effect should not be interpreted relative to men. There is less evidence that corruption changes the gender composition of leadership roles (glass-ceiling effect). We do find a general negative association between municipal corruption and the proportion of leadership positions held by women. This latter effect, however, is not robust to a full instrumental variable analysis.

In addition to the full sample of results, including all sectors of the economy, we also follow Bologna and Ross (2015) and study sectors that are prone to corruption separately. These sectors have far lower female representation in general, but given the known potential for corrupt activity, may induce a selection effect that is masked when examining all sectors together. In these sectors, we see that municipal corruption reduces the share of employers that are women, like in the full sample. However, we now find that municipal corruption has a positive, though insignificant, association with the share of management positions held by women. Employers have much more flexibility in avoiding certain sectors, thus we believe this highlights the importance of examining the leadership categories separately.

We also find stronger evidence (relative to the full sample) in the corruption prone sample that municipal corruption reduces female labor force participation. This implies a sorting effect in that perhaps corruption drives sector choice. We believe an interesting

area of future research would be to examine the effect of corruption on female participation across different sectors. If corruption is driving women to work in less corruption-prone sectors and these sectors have less opportunity for career advancement, this could help explain *how* corruption may act as a barrier to women.

We also believe that examining potential spillover effects of corruption on female labor market outcomes would be an interesting future analysis. It could be that women are escaping corrupt environments and moving to nearby, presumably less-corrupt municipalities. Thus, while corruption might reduce female leadership presence in one municipality, it increases it in others. Understanding the spatial dynamics of corruption would help shed light on the full effect of corruption on female leadership.

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Tables and Figures

Table 1: Outcome Variable Definitions

Full Sample	
Variable	Definition
Female Presence in Leadership Positions	
Employer	Total female employers divided by total employers
Managers, Directors, or Executives	Total female managers, directors, or executives (MDE) divided by total MDE
Leadership	Total female employers, managers, directors, and executives (leaders) divided by total leaders
Female Labor Force Participation	
Female Labor Force Participation	Female workers divided by total number of working age women
Female Labor Force Job Type	
Employer	Total female employers divided by total women in the labor force
Managers, Directors, or Executives	Total female managers, directors, or executives (MDE) divided by total women in the labor force
Leadership	Total female employers, managers, directors, and executives (leaders) divided by total women in the labor force
"Corrupt" Sectors Only	
Variable	Definition
Female Presence in Leadership Positions	
Employer	Total female employers in "corrupt" sectors divided by total employers in "corrupt" sectors
Managers, Directors, or Executives	Total female managers, directors, or executives (MDE) in "corrupt" sectors divided by total MDE in "corrupt" sectors
Leadership	Total female employers, managers, directors, and executives (leaders) in "corrupt" sectors divided by total leaders in "corrupt" sectors
Female Labor Force Participation	
Female Labor Force Participation	Female workers in "corrupt" sectors divided by total number of working age women
Female Labor Force Job Type	
Employer	Total female employers in "corrupt" sectors divided by total female workers in corrupt sectors
Managers, Directors, or Executives	Total female managers, directors, or executives (MDE) in "corrupt" sectors divided by total female workers in corrupt sectors
Leadership	Total female employers, managers, directors, and executives (leaders) in "corrupt" sectors divided by total female workers in corrupt sectors

Notes: All outcome variables are calculated using the 2010 Census.

Table 2: Summary statistics for outcome measures.

Variable	Obs	Mean	Std. Dev.	Min	Max
Outcomes					
Female Presence in Leadership Positions[1]					
Female leaders divided by total leadership positions in each category.					
Employers	878	0.263	0.184	0	1
Managers, Directors, or Executives	930	0.362	0.167	0	1
Leadership	933	0.331	0.138	0	1
Female Labor Force Participation					
Female workers divided by total number of working age women.					
Female Labor Force Participation	935	0.330	0.115	0.116	0.728
Female Labor Force Job Type					
Female leaders divided by total number of female workers.					
Employers	935	0.010	0.010	0.000	0.062
Managers, Directors, or Executives	935	0.026	0.014	0.000	0.072
Leadership	935	0.036	0.019	0.000	0.118
Outcomes - "Corrupt" Sectors Only[2]					
Female Presence in Leadership Positions[1]					
Female leaders divided by total leadership positions (per category) in corrupt sectors.					
Employer	553	0.188	0.242	0	1
Managers, Directors, or Executives	639	0.207	0.259	0	1
Leadership	719	0.197	0.240	0	1
Female Labor Force Participation					
Female workers in corrupt sectors divided by total number of working age women.					
Female Labor Force Participation	935	0.021	0.021	0.001	0.181
Female Labor Force Job Type					
Female leaders in corrupt sectors divided by total number of female workers in corrupt sectors.					
Employer	935	0.001	0.002	0	0.024
Managers, Directors, or Executives	935	0.001	0.003	0	0.046
Leadership	935	0.002	0.005	0	0.070

Notes: [1]The observation numbers in this group are lower because some municipalities are small and have *no* leadership positions, making the denominator zero as the denominator is different for each category of leadership (i.e., total employers, total managers, directors, or executives, and total leaders). The denominator is constant across all other categories of leaderships for the other outcome measures. All municipalities have women and working women and thus there are no undefined observations when using the other measures. It is likely that these small municipalities also comprise the minimum (0% of leadership positions held by women) and maximum (100% of leadership positions held by women) of these measures. [2] "Corrupt" sectors are extractive industries, manufacturing, construction, and transportation and communication, following Bologna and Ross (2015).

Table 3: Summary statistics for main independent variable (corruption) and controls.

Variable	Mean	Std. Dev.	Min	Max
Independent Variables				
Corruption				
(Log) Corruption per-capita	0.429	0.067	0.181	0.631
Municipal Level Controls (Baseline Controls)				
GDP per-capita (R$)	11727.39	17367.88	2261.63	298819.8
Population Density	81.360	341.494	0.225	6140.697
Size of Informal Sector (%)	0.597	0.191	0.128	0.970
College Degree (%)	0.050	0.030	0.003	0.235
Male (%)	0.505	0.015	0.465	0.658
Working Age (18-65 years) (%)	0.595	0.046	0.392	0.698
Urban (%)	0.621	0.217	0.050	0.999
Instrumental Variables[1]				
Number of Councils[2]	3.157	0.702	1	6
Number of Councils[2] installed	2.804	0.762	1	5
Management Capacity Index	2.151	1.237	1	6
Has Local Judge	0.318	0.466	0	1

Notes: GDP per-capita and population density enter regression in logged form. Summary statistics given for full sample of 935 municipalities. [1]For instrumental variables, they refer to 929 municipalities; data is unavailable for 6 municipalities emancipated in the early 2000s, after the creation of the Management Capacity Index (IQIM - *Indicador de Qualidade Institucional Municipal*). [2] In the context of Brazil, municipal councils (*conselhos municipais*) are commissions established by law to propose or advise on policy initiatives in a specific area (e.g., health, education) and oversee their implementation. These councils typically include representatives from the local public administration and civil society organizations. Notably, they differ from city councils (*câmaras municipais*), which serve as the local legislative branch. The measures report indexes on the number of councils and number of *active* councils, scaled from 1 (least councils) to 6 (most councils). A council is coded as active if they have individuals appointed in positions.

Table 4: The effect of corruption on the share of leadership positions held by women.

	Employers	**Managers Directors & Executives**	**Leadership**
Panel A: *OLS Estimates, Full Sample*			
Corruption per-capita	-0.303**	-0.198**	-0.172**
	(0.140)	(0.083)	(0.076)
N	878	930	933
adj. R^2	0.023	0.048	0.058
Panel B: *OLS Estimates, "Corrupt" Sectors Only*			
Corruption per-capita	-0.477*	0.338	-0.021
	(0.251)	(0.225)	(0.201)
N	553	639	719
adj. R^2	0.070	0.040	0.058
Panel C: *2SLS Estimates, Full Sample*			
Corruption per-capita	-0.780	-0.414	-0.511
	(0.615)	(0.319)	(0.337)
N	872	924	927
F-Statistic	24.122	26.803	26.997
J-Statistic	6.192	0.970	1.692
Panel D: *2SLS Estimates, "Corrupt" Sectors Only*			
Corruption per-capita	-0.173	0.903	0.204
	(0.997)	(0.559)	(0.568)
N	551	637	716
F-Statistic	12.028	24.814	25.575
J-Statistic	0.801	4.639	5.002

Notes: *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.1. See Table 3 for a list of the baseline controls. Standard errors clustered by state in parentheses. Instruments for ***Panels C*** and ***D*** include two measures of political participation (whether councils exist and the number of councils that are active), an indicator for management capacity, and whether the municipality has a judge. See Online Appendix E for first-stage regressions.

Table 5: The effect of corruption on the share of women that are in the labor force *and* the share of the female labor force that hold leadership positions.

	Labor Force	**Employers**	**Managers Directors & Executives**	**Leadership**
Panel A: *OLS Estimates, Full Sample*				
Corruption per-capita	-0.091	-0.018***	-0.017*	-0.035***
	(0.074)	(0.005)	(0.009)	(0.012)
N	935	935	935	935
adj. R^2	0.697	0.234	0.194	0.274
Panel B: *OLS Estimates, "Corrupt" Sectors Only*				
Corruption per-capita	-0.055***	-0.007***	-0.010***	-0.017***
	(0.018)	(0.002)	(0.003)	(0.004)
N	935	935	935	935
adj. R^2	0.356	0.360	0.429	0.422
Panel C: *2SLS Estimates, Full Sample*				
Corruption per-capita	-0.108	-0.058***	-0.085***	-0.142***
	(0.232)	(0.022)	(0.031)	(0.047)
N	929	929	929	929
F-Statistic	25.775	25.775	25.775	25.775
J-Statistic	4.980	4.101	1.606	2.573
Panel D: *2SLS Estimates, "Corrupt" Sectors Only*				
Corruption per-capita	-0.034	-0.023***	-0.039***	-0.062***
	(0.063)	(0.004)	(0.007)	(0.010)
N	929	929	929	929
F-Statistic	25.775	25.775	25.775	25.775
J-Statistic	5.296	4.282	6.095	5.717

Notes: *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.1. See Table **??** for a list of the baseline controls. Standard errors clustered by state in parentheses. Instruments for ***Panels C*** and ***D*** include two measures of political participation (whether councils exist and the number of councils that are active), an indicator for management capacity, and whether the municipality has a judge. See Online Appendix E for first-stage regressions.