Gender and Corruption in Firms: The Importance of Regional Context

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Abstract

The idea that there are gendered differences in corruption in the political arena is common. Two explanations for these differences include risk aversion and network effects. However, business leaders include a self-selected group of individuals that are comparatively risk tolerant and well-connected. Using firm-level data for 144 countries from 2006 to 2019, we test whether female-run businesses engage in corruption differently than men. In the aggregate, we find a potentially puzzling result: female-managed firms are engaged in less corruption and report it being less of an obstacle compared to their male-counterparts; female-owned firms are just the opposite. Once we disaggregate the data into region specific estimates, a clearer pattern emerges. Corruption is more harmful for female-run firms in the areas of the world that have more gender inequality overall.

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1 Introduction

The idea that there are gendered differences in corrupt behavior is common (Barnes and Beaulieu, 2019). Researchers have shown that women are less likely to engage in corruption than men under a variety of circumstances (Swamy et al., 2001; Dollar et al., 2001; Decarolis et al., 2023). This research has been used to motivate reforms aiming to boost female representation in positions of power (Forgues-Puccio and Lauw, 2021). For example, in 1998 Peru's President Fujimori announced an initiative to recruit female police officers to replace the existing police force in an effort to reduce corruption (Jones, 2000). Mexico has engaged in similar campaigns (Kahn, 2013). While there are some exceptions[1], that females in positions of political power engage in less corruption than their male counterparts is an empirical regularity.

Evidence concerning differences in corrupt behavior across female versus male leaders in the business world is comparatively limited. Because business owners and/or top managers consist of a self-selected group of risk tolerant individuals, and a prominent explanation for gendered differences in corruption is risk aversion (Serra and Wantchekon, 2012), the question of whether gendered differences exist in this environment is uncertain a priori. Moreover, given the prevalence of gender inequality across the developing world (Jayachandran, 2015), understanding corruption differences across male- versus female-run businesses can provide insight into why this inequality persists. If the frequency and/or severity of corruption is *worse* for female-run businesses, this helps explain pervasive inequality faced by women more generally.

In this paper, we examine the relationship between female leadership (defined as either ownership or management) on corruption in firms using the World Bank's Enterprise Surveys (WBES). We first test whether female leadership is associated with *less* bribery (as a % of firm sales). This test most clearly connects to the existing literature concerning corruption and women in positions of political power – are women less likely to engage in corrupt behavior? However, given that networks and clientelism are major drivers of corruption and tend to favor men, we also explore whether corruption is more problematic for female-run firms. More specifically, we test whether female-run firms are *more* likely to report corruption as an obstacle to doing business than their male-run counterparts. This latter test is important because even if female-run firms engage in *less* bribery, the bribery that they do engage in could be relatively harmful compared to men.

Our paper builds off the work of Breen et al. (2017) and Clarke (2022) in that we

[1]Debski et al. (2018), for example, argue that once specific dimensions of culture are controlled for, the negative association between gender and corruption disappears. Similarly, Branisa and Ziegler (2010) highlight the importance of a country's social institutions in determining the gender-corruption relationship. Both studies emphasize the need to examine *within* country data, something we consider carefully in this paper.

utilize the WBES to explore whether corruption differs in female- versus male-run firms. Breen et al. (2017) finds that female-run firms are associated with less corruption, while Clarke (2022) finds that once country and/or firm fixed effects are controlled for, this effect disappears.[2] Our study differs from both Breen et al. (2017) and Clarke (2022) in three key ways.

First, both of the aforementioned studies are limited in terms of sample size. The number of observations in the Breen et al. (2017) study vary from 9,011 to 43,010 in their main set of results (their Table 2). In comparison, our primary set of results have between 87,000 and 125,000 observations, depending on the corruption variable used. The discrepancy lies in the use of specific control variables from the WBES, some of which have low response rates, and an older version of the dataset that has since expanded. The Clarke (2022) study uses a more recent version of the dataset, but focuses only on a panel of firms through which firm fixed effects can be included.[3] While it is important and valuable to identify within firm variation, this cuts the sample size down by approximately 85%. We aim to analyze the relationship between gender and corruption across *all* firms, and explore how this relationship changes across different sub-samples with numerous alternative covariate sets.

Second, because the gender-corruption relationship is likely context dependent, we examine whether our results are conditional upon the region studied. In contrast to the Breen et al. (2017) and Clarke (2022) studies, Wellalage et al. (2020) analyzes the association between gender and corruption in firms using the WBES data but focuses exclusively on firms in Latin America. They test whether female-run firms are less likely to engage in bribery to facilitate innovation, finding no difference in bribery incidence between male- versus female-run firms.[4] It is unclear, however, whether this result would hold in different regions of the world with varying levels of gender inequality. With our expanded sample we are able to explore whether the aggregate associations hold across different regions.[5] We also compare the gender-corruption relationship across other specific sub-samples (e.g., using the country's gender inequality score). These results yield crucial insights into the relationship between gender and corruption in firms. As a preview, and in-line with the Wellalage et al. (2020) study, Latin America is the

[2]The importance of country fixed effects is also highlighted in this paper. Our results differ from Breen et al. (2017), but we show that this is likely due to the absence of a country fixed effect in their analysis.

[3]We cannot identify firms in our version of the dataset.

[4]Similarly, using a different dataset concerning bribes amongst officials in China, Aidt et al. (2020) find no difference in bribery amounts across gender.

[5]More specifically, we separate our data into six regions as defined by the World Bank: (1) Sub-Saharan Africa (AFR), (2) East Asia and Pacific (EAP), (3) Europe and Central Asia (ECA), (4) Latin America and Caribbean (LAC), (5) Middle East and North Africa (MNA), (6) and the South Asia Region (SAR).

only region we find there to be *no* association between gender and corruption across any specification.

Third, we differ in our empirical strategy. Our dataset includes 156,375 firm-level observations across 144 countries. This dataset includes a wealth of information concerning the firm's characteristics. We utilize this information and employ matching methods to test whether our results are robust across a wide range of firm-level characteristics, subsamples, and regions. While we do report regression results as a comparison, we focus on our matching estimates as they present a simple estimate of the Average Treatment Effect on the Treated (henceforth, ATET). Regressions implicitly weight observations and allow for extrapolation. This can be problematic when female- versus male- led firms differ across many dimensions. We utilize both Propensity Score Matching (PSM) and Mahalanobis Distance Matching (MDM) to estimate the difference in corruption experience in female-run firms relative to male-run firms using a simple (i.e., non-weighted) average.

In addition to the above, there is one additional difference between our study and that of Clarke (2022) in particular. The effect of female-leadership is our focus, but these female-leaders are not necessarily survey respondents. Moreover, even if the females in charge are responding to these surveys, women may under-report corruption relative to men. Indeed, Clarke (2022) finds evidence that the respondent's gender is a more important determinant of corruption than other female-leadership indicators. Unfortunately, due to a change in the World Bank's personal data policies, the gender and identity of the respondent is no longer included in the WBES datasets.[6] However, the existing dataset contains another variable that is informative in this regard: the perceived truthfulness of the responses. Our matching results are unaffected by the inclusion of this variable as a covariate. Thus, while we cannot rule out the possibility of respondent bias, we are confident that the uncovered patterns are not due to deception. Moreover, in some regions, we find women report to engage in *more* corruption than men. The results of Clarke (2022) would suggest that we are understating the association in these regions.

Our baseline results match on country, time, sector, and firm size fixed effects (see Table 1). But there are many other ways in which male versus female firms could differ. For example, female-owned firms report that management spends a larger share of their time dealing with government regulations than their male-owned counterparts. If female-owned firms are more involved in government transactions, this could spur more corruption as a result.[7] Another example of a characteristic that might be important in

[6]This was confirmed in email correspondence between one of the authors of this paper and a senior economist at the World Bank on January 23rd, 2023.

[7]Of course, the difference in time spent dealing with government regulations could also be a symptom of unequal treatment. Controlling for this variable across all specifications could mask the true effect of gender on corruption. Thus, we only include this variable as a robustness check.

the case of female-managed firms specifically is the experience of the manager. If male managers are more experienced, they may have access to better networks. Given the breadth of the WBES data and the many potential differences in firm characteristics across gendered-leadership, we first estimate our matching results using only the baseline covariates (country, time, sector, and firm size fixed effects). We then subsequently add in alternative covariate sets to examine the sensitivity of our results to different firm characteristics. Appendix A provides a full list of sector definitions and each covariate group with the characteristics considered within each.

Our results uncover a potentially puzzling pattern. Firms with female *managers* tend to engage in less corruption and report corruption as less of an obstacle, while firms with female *owners* are just the opposite. This pattern is robust across many specifications and covariate groups. However, this apparent puzzle seems to disappear once we examine how our results change across the different regions of the world. When the effect of female leadership is significant for both leadership categories within a given region, the effects are consistent across leadership definitions. The direction of the effect, though, depends on the region in question. In addition, there are some regions of the world where only female-management *or* female-ownership matter for corruption. In this case, there is no divergence in the pattern of the two estimates, it is simply that one type of leadership is more influential. Thus, the aggregate results tend to mask important region-specific relationships.

The regional patterns in the gender-corruption association are expansive and we reserve a detailed discussion of these for Section 4.2. To briefly summarize here, in highly-unequal regions (with respect to gender equality) such as Sub-Saharan Africa, corruption is both more frequent and more harmful for female-run firms. In regions with less inequality (e.g., Europe and Central Asia), corruption incidence amongst female-led firms is indeed lower as traditional theory would predict. We generalize this finding by splitting the sample according to country level gender inequality measures, finding similar patterns. These results highlight the importance of disaggregating the data and reaffirm the idea that the gender-corruption relationship is complex.

The article proceeds as follows. Section 2 provides a further overview of the gender and corruption literature. Section 3 describes our data. Section 4 outlines the empirical strategy. Section 5 discusses the main results and robustness checks. Section 6 concludes.

2 Gender and Corruption

Researchers have exerted considerable effort in understanding the causes of gendered differences in corruption incidence. As a result of this effort, two non-mutually exclusive explanations have been proposed: (1) risk aversion and (2) differential association and opportunity (DAO).[8] Corruption is generally thought of as a relatively risky endeavor that relies on clientelism and patronage networks to operate. In this sense, if women are indeed more risk averse than men as suggested in the existing literature[9] and have historically limited access to networks of political power[10], they may be less likely to engage in corruption. Moreover, given their risk aversion and lack of political connections, any corruption that they do engage in is likely to be harmful.

A problem with applying these theories to business owners and top managers is that, regardless of gender, this is a group comprised of a unique subset of the population. More specifically, this is a subset that is comparatively risk tolerant with existing political networks. There is some evidence in this setting that attitudes toward risk are similar across genders among a subset of the population with a managerial background (i.e., either possessing managerial experience and/or a managerial education) (Johnson and Powell, 1994; Dwyer et al., 2002).[11] Thus, it is not clear that we should see a difference in corrupt behavior amongst female- versus male-run firms due to risk aversion alone. Moreover, while there may be differences in corruption opportunities across genders due to network disadvantages - inline with the DAO theory - these differences are likely smaller in this subgroup versus the general population.

An additional concern is that the network argument can cut both ways. On the one hand, a lack of a political network may suggest that there are less opportunities to engage in corruption. On the other hand, it may also imply that more corruption is required to overcome significant bureaucratic barriers. In this latter case, we may expect female-run business to engage in *more* corruption. However, under both scenarios, corruption is likely more harmful to women.

The corruption and gender literature has also emphasized the importance of context and cultural dependence. In an experimental setting, Alatas et al. (2009) examine gen-

[8]Female integrity has also been proposed as a significant determinant of corruption behavior, but has been heavily criticized. See Frank et al. (2011) for an experimental example where corruption transactions are more likely to fail when they involve a female, but this is not because women are more honest.

[9]See Eckel and Grossman (2008) and Byrnes et al. (1999) for systematic reviews of the gender and risk aversion literature in economics and psychology, respectively. A more comprehensive review of gender differences in behavior can be found in Croson and Gneezy (2009). Also, see the Volume 83, Issue 1, of the *Journal of Economic Behavior and Organization* for a slightly more recent (2012) issue dedicated to the topic.

[10]See Thomas and Bond (2015) for an application of network theory to violent political organizations.

[11]Similar findings are reported for small business owners and managers (Birley, 1988; Masters and Meier, 1988).

der differences in corruption tolerance across four different countries (Australia, India, Indonesia, and Singapore). They do find women to be less tolerant of corruption than men in Australia, but find no difference in any of the other countries, suggesting that the corruption-gender pattern uncovered in the existing literature is not universal. Debski et al. (2018) expand on this idea, but more specifically argue that it is culture and *not* gender that drives the apparent correlation between corruption and female participation in politics. Once controlling for measures of culture using specific components (power distance and masculinity) of Hofstede's conceptualization and measurement of culture, the association between gender and corruption entirely disappears (Hofstede, 1984, 2009, 2011). As mentioned above, the autocracy-democracy divide is also an important factor to consider (Sung, 2003; Esarey and Chirillo, 2013).

To take these contextual and cultural concerns into account, we focus narrowly on within country variation. We also explore whether our effects vary across the different regions of the world and across specific sample splits. We expand on these details further below.

3 Data

3.1 Main Variables of Interest

Our firm level data comes from the World Bank Enterprise Surveys (WBES). Our sample includes data from 144 countries from 2006 to 2019. To be clear, this dataset does *not* have a panel structure. In general, the data is comprised of firm level observations in country c in year t where that year can be anywhere from 2006 through 2019. There are cases where a country is surveyed multiple times within the 2006 through 2019 period, but even so the firms sampled are not necessarily the same.[12]

These surveys aim to provide a representative understanding of the business environment and challenges faced by firms within each country. On average, our sample includes 541 firms per survey per country, with 156,375 firms in total. The surveys are incredibly detailed and include a wealth of information on both firm characteristics (sales, employees, assets, products, innovation, etc.) and their environment (access to finance, electricity, taxes, etc.). To ensure comparability through time and across firms, we use the standardized data from 2006 - 2019 to estimate the effect of gendered leadership on corruption experiences.[13]

[12]We cannot identify or track firms regardless.

[13]We use the October 21, 2021 dataset. This dataset includes some observations for 2020 and beyond. We exclude these years given the interruptions caused by the COVID-19 pandemic. There are method-

Of most importance to our study, the surveys include two classifications of gender leadership: (1) female presence in management and (2) female presence in ownership. We use these two classifications to construct two different indicators of female leadership. This is quite simple for female management. The survey asks the following: "Is the top manager female?". If the firm responds "yes" to this question, our female manager indicator is equal to 1 and 0 otherwise. On average, approximately 16% of firms in our sample have a female as the top manager (see Table 1).

The survey also asks several questions concerning the firm's owner. Defining female ownership is similar but has a few caveats. The survey asks the following question: "Amongst the owners of the firm, are there any females?". As above, if the firm responds "yes" to this question, our female ownership indicator is equal to 1 and 0 otherwise. However, unlike the implied language of the manager question - with reference to the "top" manager - it may or may not be the case that these female owners are also the "top" owners. The survey asks a follow up question concerning the share of ownership that the female owner has, but responses are recorded only about 52% of the time when the firm answered "yes" to the previous question (are there any female owners?). (In comparison, the response rate for the general questions of whether the top manager is female and whether any owner is female is 98% and 96%, respectively.) Therefore, we can only see the share of ownership for about half of our female owners. Taking this into consideration, the average ownership share for females for which we have data is around 53%. This implies that these female owners do have majority say, on average. It is also indicative of important variance. Nevertheless, only 34% of the firms in our sample have *any* female owner, suggesting that this female presence might be important (see Table 1).[14] Table 2 provides a further breakdown of the ownership/management relationship across genders.

In addition to questions of ownership and management, the survey also includes questions relevant to corruption. More specifically, they ask firms to report the percentage of total annual sales paid in informal payments. Importantly, this question is worded carefully in the surveys. It is stated as follows:

> "It is said that establishments are sometimes required to make informal payments to public officials to "get things done" with regard to customs, taxes, license, regulations, services, etc. On average, what percentage of total an-

ological changes in some questions that make comparisons across units difficult. The standardized data only includes comparable questions.

[14]We consider only female-owned firms with information on the percentage owned. We then drop the firms with female owners that have only a small share of the company (i.e., less then 50%) and re-estimate the results. Given the limitations of this data, this does significantly reduce our number of observations. Even so, the main results hold. These results are available upon request.

nual sales, or estimated total annual value, do establishments **like this one** [emphasis added] pay in informal payments or gifts to public officials for this purpose?"

To encourage truthful responses, the survey attempts to disassociate the firm's specific response with the firm's true activity. However, it is expected that the firm replies using their own experience. This question has a reasonable response rate of nearly 70%. The average percentage of sales that go to "informal payments" is around 1.2% with a 5.60% standard deviation. We refer to this variable as $\%Bribes$. Conditional on paying any bribe, this average increases to 7.97% (see Table 1).

We use bribes as a % of sales as opposed to bribes in the level form (i.e., as a monetary value) for two reasons. First, simply put, bribes paid are not frequently recorded in their monetary form in our dataset. It is far more common for firms to respond in percentage terms. For example, of the 147,294 firms for which we can identify the gender of ownership, only 23,952 respond to this question in monetary terms. In comparison, 101,481 firms respond to this in percentage terms. A central component of this paper is to understand how our results change depending on the region of the world in question, which is only feasible with a large enough sample of data. Second, looking at bribes as a % of sales implicitly controls for firm size and automatically adjusts the indicator such that it is comparable regardless of the monetary unit used.

Our use of bribes in percentage form differs from Breen et al. (2017) as they utilize monetary bribe amounts (i.e., dollar value). They do this because there is some evidence that bribes as a % of sales tend to be overestimated. In a study of firms in Africa, Clarke (2011) finds that firms tend to inflate bribes reported as a percentage of sales when comparing this to what they report using monetary values. However, Clarke (2011) argues that this effect could simply be due to the design of the question - which is constant within countries - and likely does not have an impact on the relative variation in responses. Given the possibility that answers depend on the structure of the question, as argued in Clarke (2011), and that the sample is limited with bribes reported as monetary values, we use bribes reported as a percentage of sales as our main results. In the concluding discussion, Clarke (2011) notes that the use of either measure is unlikely to affect the relative rankings of corruption in firms within a country or the ranking of corruption across countries. Since we always include country and year fixed effects and *only* consider bribes reported as a percent of sales, the choice over which measure we use is likely inconsequential.

Nevertheless, we examine several robustness checks related to the choice between these two measures. These robustness checks are described in detail with accompanying tables in Appendix C. We summarize them briefly here. First, we examine a sub-set of firms

(1,262) that paid a bribe and reported this amount in *both* monetary and percentage terms.[15] Using their reported sales numbers, we convert the monetary values to percentage terms and compare these numbers to their self-reported percentages – finding that the reported percentages are slightly inflated but the two have a raw correlation of 0.99. Most importantly, this raw correlation is nearly identical for male- versus female-owned firms (0.994 and 0.990, respectively).[16] Second, using this same sub-sample, we re-estimate our baseline matching results for male- versus female-ownership to see if the estimates substantially differ depending on how the firm answered the question. The estimated treatment effects are similar in magnitude regardless of the reporting method, suggesting that the choice of variable does not impact our results. Third, because our main concern is *not* that bribes are inflated when reported as percentages but that the inflation rate could be different for male- versus female-led firms, we more explicitly test for this using the full sample of data. For firms that reported their bribe payments in monetary terms, we convert this value into a percent of sales estimate for comparison purposes. We combine this information with the firms that reported bribes as a percent of sales in the raw data to create a single "bribery as a % of sales" variable. We then create an indicator equal to zero if bribes are reported in percentage terms and equal to one if bribes are reported as a monetary value and then converted. We interact this indicator variable with either of our female leadership variables and test whether this interaction is significant. If there is a bias suggesting that the inflation amount depends on the gender of firm leadership, this interaction term should be statistically different from zero. We find no evidence of different inflation rates across genders.

While these first three tests suggest that our results are not sensitive to the bribe measure used, we also replicate our main results using the more limited sample of (nearly) 24,000 firms that responded with monetary values. The aggregate estimates are wholly insignificant. We argue that by limiting the sample in this way, we see an over-representation of the Europe and Central Asia (ECA) region and an under-representation of regions such as Sub-Saharan Africa, the Middle East and North Africa, and South Asia. It is important to note that the structure of these questions is constant within each survey/year pairing and thus, by using only this limited subset, we are losing *all* firm observations in some countries. When breaking the results down by region, as is the key emphasis of this paper, the estimates are consistent with those constructed using the larger sample and main bribe measure (bribes reported as a percent of sales). While

[15] We use this comparison because part of the Clarke (2011) study uses firm fixed effects to identify how a given firm's response changes depending on whether the firm used percentages or monetary values. The data no longer provides firm identifiers so firm fixed effects are no longer possible, but running this comparison allows us to see if our data has the same inflation problem.

[16] There are insufficient observations to perform this test with male- versus female-managers.

these robustness checks are reassuring, we also emphasize that the bribes as a percentage of sales variable is not our only measure of corruption. We also look at corruption perceptions in firms as described below.

The surveys also ask about business obstacles across 15 topics. One such topic is corruption. Respondents are asked to rank corruption obstacles as being *very severe*, *major*, *moderate*, *minor*, or as *no obstacle* at all. We transform these values into a 1 (*no obstacle*) to 5 (*very severe*) scale. The response rate for this variable is very high – approximately 95%. The average score is around 2.6, indicating that corruption is a minor to moderate obstacle for most firms.

The summary statistics provided in Table 3 yields some insight into the corruption-gender relationship for female owners. In the full sample, male-owned firms pay more in bribes and report corruption as being a larger obstacle. However, the magnitude of these differences changes and sometimes switches directions (e.g., see Latin America and the Caribbean). Corruption as an obstacle is highest in the Middle East and North Africa (MNA) and South Asia (SAR) regions, though corruption incidence is not necessarily higher. Of course, the patterns in this table are only suggestive and do not contain an empirical test. This female indicator is also just focused on female ownership, not management. We explore these differences more systematically in our empirical section.

3.2 Additional Firm Characteristics

The WBES surveys have a wealth of information that can help us classify firms according to their specific characteristics. It is likely the female ownership and/or management differs according to firm type. Of primary importance is firm size and sector. Most firms in our dataset are small (less than 20 employees), but there are a significant number of medium (20-99 employees) and even large (100 employees or more) firms. Table 1 shows this breakdown. We consider this a key control in our analysis. Over half of female managed firms are small, whereas only 44% of male managed firms fall into the small category.

We also consider sector to be an important characteristic as there can be gendered selection into specific industries. The WBES surveys classify firms in 42 different sectors. However, some of these groups have significant overlap (e.g., Retail versus Wholesale & Retail) and are likely only separate due to minor definitional changes. We therefore group these 42 sectors into seven major sectors: (1) Services, (2) Retail and Wholesale, (3) Manufacturing, (4) Mining & Petrochemical, (5) Food & Hospitality, (6) Logistics, and (7) Construction.[17] The breakdown of these characteristics is also given in Table

[17]The original sectors and their final classification are available in Appendix A Table A2. Ambiguous sectors do exist but they have significantly fewer observations. Our results do not depend on the specific

1. Indicators for firm size and sector are included in all regression and matching results. We also always include country and year indicators as covariates. We consider matching results and regressions with only firm size, sector, country, and year fixed effect indicators as our baseline estimates.

We also consider 12 other covariate groupings in addition to the above listed four baseline indicators (firm size, sector, country, and year). Unlike the baseline indicators, these variables are not always available for every firm and can significantly reduce our sample size. We therefore group relevant characteristics together and explore their impact on our estimated coefficient separately. Appendix A Table A3 lists each group that we consider and the associated number of observations for each.

3.3 Other Data

Lastly, we consider how our results vary across specific sub-samples. This is done first using regions defined according to the World Bank. However, we also explore how our aggregate coefficients change when we examine sub-samples with two specific characteristics.

Our first sample split utilizes the management experience indicator from the WBES. Managers with more than 15 years of experience (median value) are considered “high manager experience" firms; less than or equal to 15 years of experience are considered “low manager experience" firms. We may expect the gender differences to disappear in the sub-sample of high-experience firms. Perhaps women with more experience are better able to penetrate male-dominated networks.

Second, we separate our sample according to the firm’s country’s level of gender inequality. To do so, we use the United Nations Development Program Gender Inequality Index (GII) - an index scaled from 0 (least inequality) to 1 (most inequality). This is a composite index that intends to capture gender inequality across three dimensions - reproductive health, empowerment (e.g., secondary education, roles in government, etc.), and the labor market. As shown in Appendix Table A1, the regions of the world have very different gender inequality scores. Thus, splitting the sample into more and less equal groups (using the median GII as a threshold) might help us discern the region specific patterns uncovered. We use the inequality score from the first year of the country’s existence in the WB data to categorize the data into these two groups.

classification we choose.

4 Empirical Strategy

4.1 Matching

Our goal is to estimate the Average Treatment Effect on the Treated (ATET) of female-leadership on corruption experience in firms. To do so, we first use two different matching methods: Propensity Score Matching (PSM) and Mahalanobis Distance Matching (MDM). Propensity score matching is one of the most commonly employed matching estimators and the one that we detail first. This estimator entails a two-step procedure. First, PSM estimates the probability that a firm has a female leader, conditional on a set of covariates. We use a logistic regression to estimate this probability. Second, given this estimation, a propensity score is assigned to each firm and treated firms are matched to non-treated firms according to the closeness of this score. To be more specific, the logit equation is summarized below:

$$FemaleLeadership_{isct} = \alpha + \beta X_{isct} + \epsilon_{isct} \tag{1}$$

where i, s, c, and t index the firm, sector, country, and year, respectively. $Female\ Leadership$ is either of our female manager or female owner indicator variables. X is a matrix of firm characteristics that we believe to be correlated with the gender of the firm's leadership. We refer to these characteristics as covariates. As discussed above, for baseline matching estimates, we consider only indicators for firm size, sector, country, and year of the survey as our covariates. We also consider 12 alternative covariate groups, in addition to these baseline indicators, as potential predictors of female leadership. These covariate groups are summarized in Appendix A, Table A3.

Given the logit estimates from Equation 2, a propensity score is calculated for every firm. We then match treated units with controls based on the closeness of this score. Intuitively, this results in a comparison group of female-led (treated) firms and firms that were just as likely to have female leadership given the covariates but did not (i.e., are non-treated). We use the "nearest neighbor" criterion to select potential counterfactuals where the number of neighbors = 1, 2, 3, and 4. In other words, we compare corruption in each "treated" firm with the "non-treated" firm that has the closest propensity score. We also compare treated firms with the average of their top two closest, top three closest, and top four closest non-treated firms according to their propensity scores. In addition, in making these matches we force the selection of nearest neighbors to come from the *same* country and survey year. In this way, we are only ever comparing treated firms with non-treated firms within the same country *and* within the same year. This allows

us to take the structure of the WBES data into account and lessens the concern that the responses could vary across surveys depending on the structure of the questions (Clarke, 2011).

MDM, in comparison, matches directly on the covariates using the Mahalanobis distance metric. For two firms, this is essentially a scale-invariant and variance-adjusted Euclidean distance between covariate vectors. King and Nielsen (2019) criticize PSM relative to MDM in that the former collapses all covariate information down into a single value (the propensity score) and then matches based on this score alone. This can result in matches that are extremely dissimilar across individual characteristics despite having a close propensity score overall. For example, if only firm size is considered to be an important predictor of female leadership according to the logit estimation, the resulting PSM matches will place a heavier weight on this characteristic even if we are then comparing firms across different industries. By matching directly on the covariates, MDM can alleviate this concern. As with PSM, we use the nearest neighbor criterion where the number of neighbors = 1, 2, 3, and 4.

A benefit of matching over regression alternatives is that matching aims to eliminate extrapolation. We only compare treated and non-treated firms that are similar across a number of researcher defined characteristics. A drawback to this approach, of course, is that we can only match on observable characteristics. However, this is a problem with regression as well and is often addressed with fixed effects. We emphasize here that all matching specifications include indicators for firm size, firm sector, country, and year of survey. Including these indicators is similar to the inclusion of the analogous fixed effects in a regression. We also include a number of different covariate groups to test whether the coefficients are sensitive to these observable characteristics. Our most robust results are consistent across covariate groups and sub-samples.

4.2 Regression Analysis

In addition to our matching estimates, we also present analogous regression estimates for robustness:

$$Corruption_{isct} = \alpha + \beta FemaleLeadership_{isct} + \theta_i + \gamma_s + \omega_c + \tau_t + \epsilon_{isct} \qquad (2)$$

where i, s, c, and t index the firm, sector, country, and year, respectively; $Corruption_{ict}$ is either bribes as a percentage of sales ($\%Bribes$) or reported corruption obstacles ($Corruption\ Obstacles$) for each firm; and $Female\ Leadership$ is either our female manager or female owner dummy variable. Fixed effects include θ_i for firm size, γ_s, for sector,

ω_c for country, and τ_t for year. ϵ_{isct} is the error term. We cluster our standard errors at the country level. The full sample estimates of Equation (2) are most comparable to the estimates given in Breen et al. (2017). The major difference, as discussed above, is our inclusion of the country fixed effect.[18] We view these regression results as a robustness check for our matching estimates. Matching estimates only compare the treated firm to specified number of control firms, while regressions consider the entire dataset but rely on functional form assumptions and extrapolate.

Like matching, we estimate Equation (2) for the full sample and for each region separately. We utilize OLS to report and interpret these results for simplicity, but results are similar when using a binary variable for $\%Bribes$ and a logistic regression. We also consider an ordered logit for our corruption obstacles indicator with similar results. These estimates are available upon request. In addition to estimating the relationships using only country, time, sector, and firm size fixed effects as controls, we also sequentially add in each covariate group analogous to the matching procedure discussed above.

5 Results

5.1 Aggregate Results

The baseline matching results are presented in Table 4. Of the statistically significant coefficient estimates, all are positive for female owners and all are negative for female managers. Female managers seem to experience less corruption and view corruption as less of an obstacle. Female owners are just the opposite. For female managers, four of the eight estimated coefficients are negative and significant for $\%Bribes$, but only one is significant for *Corruption Obstacles*. Our results are a bit stronger for bribery incidence amongst female owners with six of eight estimated coefficients being positive and significant. In addition, four of eight estimated coefficients are positive and significant for female owners when it comes to *Corruption Obstacles*.

The coefficients on bribe incidence show that, compared to their male counterparts, firms with female managers pay 0.11 percentage points (p.p.) less, and those with female owners pay 0.065 to 0.161 p.p. more, of their total sales in bribes. While these magnitudes seem small, a couple of considerations are in order. First, note that the average bribe payment for *any* firm is only 1.205% of sales in our sample. Second, recall that firms are being matched by sector-country-year, such that the standard deviation of the full sample (5.59%) is not representative of the variability observed within each sector-country-year.

[18] As shown in Table B4, our results are similar to Breen et al. (2017) when the country fixed effect is excluded.

One fourth of the sector-country-year tuples have a standard deviation of 1.44 or less, and half of them have an average bribe rate of 0.89% of total sales. Also, we should highlight that these values are percentages of sales, not profits. In conjunction, it suggests that for at least some fraction of the firms – e.g. those operating with a narrow profit margins and/or in a country-sector not prone to corruption – it can be a meaningful difference.

This same pattern – that female-managers experience less corruption/find it less harmful while female-owners are the opposite – seems to hold across our 12 covariate groups. Table 5 summarizes the statistically significant effects across each of our eight estimates (four for PSM and four for MDM) per covariate group. A '+' indicates statistically significant and positive; a '–' indicates statistically significant and negative. When significant, the estimated effect tends to be negative for female-managed firms and positive for female-owned firms. These effects seem to be strongest when it comes to bribe incidence ($\%Bribes$) for female-managed firms and for corruption obstacles ($CorruptionObstacles$) for female-owned firms. Nevertheless, the seemingly contradictory pattern remains.

Could these results be driven by some region-specific patterns that are being masked by the aggregation of effects? We explore this possibility in the following section.

5.2 Sub-Sample Results

5.2.1 Regions

We split our sample into six regions as defined by the World Bank: AFR (Sub-Saharan Africa), EAP (East Asia & Pacific), ECA (Europe & Central Asia), LAC (Latin America & the Caribbean), MNA (Middle East & North Africa), and SAR (South Asia). We then replicate Table 5 for each region separately. These results are presented in Table 6 and Table 7 for female-managed and female-owned firms, respectively. [19] We immediately start to see a more consistent pattern across female-managed and female-owned firms.

Starting with Sub-Saharan Africa, we find that while managers do report *some* evidence that corruption is less of an obstacle for female-managed firms, there is a much stronger association between for female-owned firms. More specifically, in these female-owned firms, corruption is both more frequent *and* more problematic. Both effects are largely robust across the 12 covariate groups. For female-managers, the effects are largely insignificant and even switch signs in some cases. Thus in the Sub-Saharan Africa region, corruption seems to predominantly harmful for female-owned firms. Female-management is less important overall.

Similarly, in the East Asia and Pacific region (EAP), there is strong evidence that

[19] Estimates with basic controls for ECA includes only MDM (shown as +/– #4) ; we could not achieve convergence when estimating propensity scores.

corruption is more harmful for female-owned firms while there is no association between corruption obstacles and gender when using management as the female indicator. There is some evidence that female-managed and female-owned firms differ in their incidence of corruption in this region. Female-managed firms report paying less in bribes as a percentage of sales; female-owned firms report paying more. However, for both female-manager and female-owner indicators, the signs switch direction depending on the covariate group, indicating that these bribery incidence ($\%Bribes$) results are not robust.

Not all regions suggest a stronger gender/corruption relationship with the female-ownership as opposed to the female-management indicator. Female-management is strongly associated with *less* bribery in the Middle East and North Africa (MNA) region, whereas there is little evidence that female-ownership matters for bribery incidence. Interestingly, these same female-managed firms also tend to report corruption as more of an obstacle, though this effect is less robust. The MNA region has a high level of gender-inequality, thus even small amounts of corruption could be particularly harmful to women in this region. Along these same lines, in another region with substantial amounts of gender inequality – the South Asia region (SAR) – female-leadership is strongly associated with increased corruption obstacles. It does not matter if leadership is defined according to ownership or management in this case. Comparing these latter results to the region in our sample with the least amount of gender inequality – Europe and Central Asia (ECA) – we see that this is the only group with a significant negative association between female-led firms and corruption. While this latter association is strongest for female-managed firms and their association with corruption obstacles, it does provide support for the idea that women are less likely to engage in corruption than men in more equal environments.

5.2.2 Other Sample Splits

We split our sample two additional ways: management experience and the country's level of gender inequality. These results are summarized in Table 8. We focus on these two sample splits because they help distinguish the risk aversion versus network effect theories and help generalize the regional findings from above (using gender inequality).

Firms with experienced managers likely have access to better networks. In this case, there should be little statistical difference between female- and male-managed firms. This is exactly what we see for female-managed firms. Firms with highly experienced managers *and* managers that are female, report little difference in corruption experience relative to men. The gender discrepancy becomes a bigger factor in inexperienced female-managed firms – inexperienced female-managed firms pay less in bribes than inexperienced male-managed firms.

For female-owned firms, they are *more* likely to pay bribes than their male-counterparts

when managers are experienced. This result does not hold for the less experienced female-owned firms. Now, we should be clear that the experience categorization may or may not apply to ownership – it is unclear if the *owners* are experienced. But that female-owned firms with experienced managers engage in more corruption is an interesting finding in that this is the group that is likely to have better network connections. These same firms do report corruption being more problematic. This suggests that even if these women do have better networks than less connected female-owned firms, this corruption is still harmful.

Lastly, to connect the results of this section to the region specific results and to help generalize those findings, we split the sample according to the country's gender inequality score. These patterns are telling. Even though corruption is less frequent for female-led firms for both highly equal and highly unequal countries, it is only more problematic in the unequal sub-sample. This is true for both female-managed and female-owned firms. This is important because even if these women engage in less bribery in these highly unequal countries, existing corruption still acts as an additional barrier. This highlights the importance of looking at both corruption frequency and corruption severity in firms. In addition, it shows that the risk aversion theory is perhaps only relevant in more equal settings.

5.3 Other Robustness Checks: Regression Results

Our most robust results given above have been shown to be consistent across 12 different covariate sets, two different matching methods, and various sub-samples. Nevertheless, matching estimators rely only on a subset of the data (i.e., the matched data) to estimate treatment effects. We therefore also present analogous regression results using a simple OLS estimator.

Our regression estimates are summarized in Appendix B. Table B1 presents the aggregate results for the baseline set of covariates and each covariate set. Table B2 and Table B3 do the same for female-managed and female-owned firms, respectively. These results are assuredly very similar to our matching estimates.

Comparing our matching estimates (Table 4 and 5) with the regression estimates (Table B1) we find a similar pattern in the full sample of firms. Firms with female managers report spending less in bribes as a percentage of sales; firms with female owners report corruption as more of an obstacle. The regression effects do lose statistical significance for female ownership, but this is unsurprising as we are now comparing treated firms to all non-treated firms and are now relying on extrapolation.

The results become even more similar when looking at the regional sample splits (Tables 6 and 7 for matching; Tables B2 and B3 for regression). In both cases, our

strongest results suggest that female-managed firms face more corruption obstacles in the South Asia (SAR) region and less obstacles in the Europe and Central Asia (ECA) region. Firms with female-ownership view corruption as more problematic and pay more in bribes (as a percent of sales) in the Africa (AFR) region and South Asia (SAR) region. Corruption is less problematic in female-owned firms in the Europe and Central Asia (ECA) region. As above, regression results do lose some significance, but in general the patterns remain the same.

6 Conclusion

Corruption is often cited as a significant barrier to development (Mauro, 1995; Olken and Pande, 2012). It has prompted many policy advocates and international organizations to pursue numerous anti-corruption initiatives. It has also encouraged researchers and public officials alike to examine the various causes of corruption. Among these endeavors, the idea that women are less likely to engage in corruption has become common.

There is now a substantial body of literature that focuses on the effect of female representation in the political sphere on corruption (Swamy et al., 2001; Dollar et al., 2001; Branisa and Ziegler, 2010; Debski et al., 2018; Decarolis et al., 2023). But evidence in the business world is comparatively limited – and the existing studies yield inconclusive results. Breen et al. (2017) find that female-led firms are associated with less corruption, while Wellalage et al. (2020) find no difference in bribery incidence between female-led versus male-led firms in Latin America. Using the same dataset, Clarke (2022) takes a different approach and argues that female respondents may under-report corruption. As evidence of this, Clarke (2022) finds that the gender of the respondent is a stronger predictor of corruption than female leadership indicators.

The importance of understanding the relationship between corruption and gender in the business world should not be understated. The intuition behind the gender–corruption association in the political sphere relies on two non-mutually exclusive theories. First is that women are more risk averse, and second is that women do not have the same access to networks as men. Female business leaders, however, represent a relatively risk tolerant and connected group. It is not clear, then, that these theories should apply in this context. Furthermore, it could be the case that corruption represents an additional obstacle faced by women in the developing world. If this is the case, finding a strong association between gender and corruption in firms could help explain the pervasive inequality faced by women in general.

In this paper, we estimate the effect of female-leadership on corruption outcomes in

firms. We follow the literature and utilize the dataset employed by Breen et al. (2017), Wellalage et al. (2020), and Clarke (2022) – the World Bank's World Business Environment Survey. We are careful to consider the truthfulness of the responses – similar in spirit to Clarke (2022) – though the World Bank no longer publishes data on the respondent's gender. Our primary contribution is to show that the gender-corruption association is heavily dependent upon the region studied. In highly (gender) unequal regions such as Sub-Saharan Africa, female-owned firms report being engaged in more corruption and report corruption as a larger obstacle than their male-owned counterpoints. In more gender equal settings, such as Europe and Central Asia, gender and corruption are negatively associated.

We believe these results add some important caveats to the risk aversion theory prominent in the gender–corruption literature. In settings with substantial gender inequality overall, the association between corruption and gender should be viewed as an additional barrier to women. Even if women are more risk averse than men, they still engage in and suffer from corruption. In other, more gender equal contexts, the risk aversion theory is more applicable. Even so – there are some areas where gender does not seem to matter with regard to corruption. We find no difference between corruption in female-run versus male-run firms in Latin America, supporting the findings of Wellalage et al. (2020).

We hope that our results spur further research on the institutional contexts in which these firms operate. Perhaps doing so can shed more light on the divergence in results across the different regions of the world. Further, by highlighting that corruption is a problem particularly for women in countries that have elevated gender inequality, policymakers could focus on targeted anti-corruption initiatives to encourage more female entrepreneurship. Eliminating or reducing the corruption barrier facing women specifically and thereby boosting female leadership in business could be one way in which policymakers in these countries seek to reduce gender inequality overall.

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Tables and Figures

Table 1: Summary statistics of main variables.

Variable	Obs.	Mean	St. Dev.
Female Leadership in Firms			
Female Manager	132,697	0.160	0.366
Female Owner	147,294	0.335	0.472
Corruption in Firms			
$\%Bribes$	105,901	1.205	5.597
$\%Bribes \mid > 0$	16,010	7.974	12.380
Corruption Obstacles	149,806	2.678	1.483
Other Key Firm Characteristics			
Small Firms (0-19 employees)	156,375	0.470	0.499
Medium Firms (20-99 employees)	156,375	0.336	0.474
Large Firms (100 or more employees)	156,375	0.194	0.499
Service Sector	156,375	0.252	0.442
Retail & Wholesale	156,375	0.178	0.384
Manufacturing	156,375	0.467	0.487
Mining & Petrochemical	156,375	0.054	0.222
Food & Hospitality	156,375	0.012	0.119
Construction	156,375	0.010	0.107
Logistics	156,375	0.008	0.089

Table 2: Gender by owner and manager breakdown.

	Male Owner		Female Owner		All Firms	
Manager	#	%	#	%	#	%
Male	79,068	62.79	26,610	21.13	105,678	83.92
Female	4,233	3.36	16,007	12.72	20,240	16.08
Total	83,301	66.15	42,617	33.85	125,918	100

Notes: This table only includes data for which we information on both the gender of ownership *and* management. There is a subset of firms with information on one variable, but not the other (19.5 % of the sample).

Table 3: Summary statistics of corruption by owner's gender and region.

Region		$CorrObst$		$\%Bribes$		$\%Bribes \mid > 0$		
	Gender	Mean	Std	Mean	Std	Mean	Std	Obs
All Regions	Total	2.652	1.476	1.165	5.545	8.034	12.521	147,294
	Male	2.689	1.471	1.189	5.574	8.216	12.526	97,936
	Female	2.579	1.483	1.115	5.482	7.662	12.504	49,358
AFR	Total	2.585	1.410	2.179	7.549	8.673	13.059	27,223
	Male	2.600	1.408	2.180	7.453	8.667	12.830	19,184
	Female	2.551	1.414	2.175	7.772	8.687	13.592	8,039
EAP	Total	1.915	1.204	1.388	7.168	7.502	15.231	16,176
	Male	1.900	1.189	1.453	7.608	8.140	16.432	8,263
	Female	1.930	1.220	1.319	6.676	6.880	13.942	7,913
ECA	Total	2.337	1.426	0.753	3.755	7.371	9.444	48,621
	Male	2.344	1.422	0.756	3.734	7.554	9.377	31,470
	Female	2.323	1.434	0.747	3.796	7.034	9.563	17,151
LAC	Total	3.123	1.478	0.751	4.216	8.622	11.678	26,826
	Male	3.092	1.469	0.760	4.181	8.571	11.422	15,861
	Female	3.168	1.489	0.739	4.265	8.696	12.051	10,965
MNA	Total	3.262	1.501	1.337	6.756	10.011	15.969	12,160
	Male	3.301	1.494	1.445	7.036	10.527	16.288	9,481
	Female	3.122	1.518	0.948	5.611	7.882	14.415	2,679
SAR	Total	3.117	1.372	0.665	3.339	5.231	7.989	16,286
	Male	3.125	1.366	0.663	3.299	5.473	7.975	13,675
	Female	3.076	1.404	0.682	3.562	4.205	7.978	2,611

Notes: AFR = Sub-Saharan Africa, EAP = East Asia & Pacific, ECA = Eastern Europe & Central Asia, LAC = Latin America & Caribbean, MNA = Middle East & North Africa, SAR = South Asia Region. $\%Bribes$ is the share of total sales paid in bribes. $\%Bribes \mid > 0$ is the share of total sales paid in bribes, conditional of having paid any. Number of observations for which we have data on the gender of the owner(s).

Table 4: The effect of female leadership on corruption; baseline matching.

	% of Sales Paid in Bribes			
Panel A: Propensity Score	NN1	NN2	NN3	NN4
Female Manager	0.344	-0.057	-0.021	0.013
	(0.166)	(0.716)	(0.860)	(0.915)
Female Owner	0.235	0.179	0.161*	0.160*
	(0.127)	(0.103)	(0.083)	(0.060)
Panel B: Mahalanobis	NN1	NN2	NN3	NN4
Female Manager	-0.110**	-0.116**	-0.117**	-0.115**
	(0.027)	(0.019)	(0.019)	(0.021)
Female Owner	0.071**	0.067*	0.065*	0.065*
	(0.050)	(0.064)	(0.071)	(0.073)
	Corruption Obstacles			
Panel C: Propensity Score	NN1	NN2	NN3	NN4
Female Manager	-0.099*	-0.050	-0.001	0.009
	(0.060)	(0.204)	(0.987)	(0.751)
Female Owner	0.017	0.049	0.040	0.019
	(0.682)	(0.106)	(0.140)	(0.408)
Panel D: Mahalanobis	NN1	NN2	NN3	NN4
Female Manager	-0.012	-0.012	-0.011	-0.011
	(0.278)	(0.278)	(0.307)	(0.306)
Female Owner	0.017**	0.017**	0.016**	0.016**
	(0.038)	(0.043)	(0.046)	(0.047)

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively. We match on firm size, sector, country, and year; we force exact matches on both country and year for PSM. *P*-values given in parentheses.

Table 5: Statistically significant estimations of female-run firms on corruption with alternative sets of covariates.

	Female Managers		**Female Owners**	
	% Bribes	Obstacle	% Bribes	Obstacle
Baseline Only	-4/8	-1/8	+5/8	+4/8
Basic	-1/8	0/8	+4/8	+1/8
Firm Sales	-5/8	0/8	+2/8	+4/8
Employment	-1/8	0/8	0/8	+1/8
Credit, Finance, & Assets	-2/8	0/8	+4/8	+5/8
Formality	-4/8	-4/8	0/8	+6/8
Crime	-4/8	0/8	+6/8	0/8
Bus. Env. & Infrastructure	0/8	-2/8	+7/8	+2/8
Government Contract	0/8	0/8	+5/8	+4/8
Tax and Regulation	0/8	0/8	+3/8	+8/8
International Trade	0/8	0/8	+1/8	+5/8
Innovation	-4/8	-4/8	0/8	+3/8
Truthful	-5/8	0/8	+6/8	+0/8

Notes: We always match on firm size, sector, country, and year (Baseline); we force exact matches on both country and year for PSM. Each set of estimates then include the above listed covariate groups.

Table 6: Statistically significant estimations of female managers on corruption; baseline matching plus additional groups of covariates.

% of Sales Paid in Bribes							
Baseline match *plus*:	Total	AFR	EAP	ECA	LAC	MNA	SAR
Baseline	-4/8	0/8	-3/8	0/8	0/8	-4/8	0/8
Basic	-1/8	0/8	0/8	0/8	0/8	-4/8	0/8
Firm Sales	-5/8	0/8	-4/8	0/8	0/8	-7/8	0/8
Employment	-1/8	0/8	-1/8	0/8	0/8	-2/8	0/8
Credit, Finance, & Assets	-2/8	0/8	0/8	0/8	0/8	-7/8	0/8
Formality	-4/8	0/8	-4/8	0/8	0/8	-5/8	0/8
Crime	-4/8	0/8	-4/8	-1/8	0/8	-4/8	0/8
Bus. Env. & Infrastructure	0/8	0/8	0/8	0/8	0/8	-4/8	0/8
Government Contract	0/8	0/8	0/8	0/8	0/8	-4/8	0/8
Tax and Regulation	0/8	0/8	0/8	0/8	0/8	-4/8	0/8
International Trade	0/8	0/8	+1/8	0/8	0/8	-3/8	0/8
Innovation	-4/8	-1/8	-1/8	0/8	0/8	-4/8	+1/8
Truthful Response	-5/8	0/8	-4/8	0/8	0/8	-4/8	0/8
Corruption Obstacles							
Baseline match *plus*:	Total	AFR	EAP	ECA	LAC	MNA	SAR
Baseline	-1/8	0/8	0/8	-4/8	0/8	0/8	+4/8
Basic	0/8	0/8	0/8	-3/8	0/8	0/8	+8/8
Firm Sales	0/8	-6/8	0/8	0/8	0/8	0/8	+7/8
Employment	0/8	0/8	0/8	-4/8	0/8	0/8	+8/8
Credit, Finance, & Assets	0/8	0/8	0/8	-4/8	0/8	0/8	+6/8
Formality	-4/8	0/8	0/8	-4/8	0/8	0/8	+4/8
Crime	0/8	0/8	0/8	-4/8	0/8	+1/8	+5/8
Bus. Env. & Infrastructure	-2/8	-1/8	+1/8	-4/8	0/8	+4/8	+7/8
Government Contract	0/8	0/8	0/8	-4/8	0/8	0/8	+5/8
Tax and Regulation	0/8	0/8	+1/8	0/8	0/8	+1/8	+8/8
International Trade	0/8	+2/8	0/8	+1/8	0/8	0/8	0/8
Innovation	-4/8	0/8	0/8	-4/8	0/8	0/8	+5/8
Truthful Response	0/8	0/8	0/8	-5/8	0/8	0/8	+7/8

Notes: We always match on firm size, sector, country, and year (baseline); we force exact matches on both country and year for PSM. Each set of estimates then include the above listed covariate groups. Values indicate the number of positive (+) or negative (–) significant results for each covariate group out of 8 estimations, 1-4 nearest neighbors using PSM and MDM.

Table 7: Statistically significant estimations of female owners on corruption.

% of Sales Paid in Bribes							
Baseline match *plus*:	Total	AFR	EAP	ECA	LAC	MNA	SAR
Baseline	+5/8	+4/8	0/8	0/8	0/8	0/8	+4/8
Basic Controls	+4/8	+4/8	0/8	0/4	0/8	0/8	+4/8
Firm Sales	+2/8	+1/8	-1/8	0/8	0/8	0/8	+4/8
Employment	0/8	0/8	0/8	0/8	0/8	0/8	+3/8
Credit, Finance, & Assets	+4/8	+2/8	+4/8	-1/8	0/8	-2/8	+2/8
Formality	0/8	+4/8	0/8	0/8	0/8	0/8	+5/8
Crime	+6/8	+3/8	+4/8	0/8	0/8	0/8	+3/8
Bus. Env. & Infrastructure	+7/8	+5/8	+2/8	0/8	0/8	0/8	+5/8
Government Contract	+5/8	+1/8	+6/8	0/8	0/8	-1/8	+4/8
Tax and Regulation	+3/8	+3/8	0/8	0/8	0/8	0/8	0/8
International Trade	+1/8	0/8	0/8	0/8	0/8	-3/8	0/8
Innovation	0/8	0/8	0/8	0/8	0/8	0/8	+4/8
Truthful Response	+6/8	+4/8	+4/8	0/8	0/8	0/8	+4/8
Corruption Obstacles							
Baseline match *plus*:	Total	AFR	EAP	ECA	LAC	MNA	SAR
Baseline	+4/8	+6/8	+7/8	-4/8	0/8	-4/8	+4/8
Basic Controls	+1/8	+1/8	+8/8	-4/4	+1/8	0/8	+6/8
Firm Sales	+4/8	+4/8	+7/8	0/8	0/8	0/8	+5/8
Employment	+1/8	+4/8	+3/8	-8/8	+1/8	0/8	+1/8
Credit, Finance, & Assets	+5/8	+5/8	+7/8	-1/8	0/8	0/8	0/8
Formality	+6/8	+6/8	+7/8	-2/8	+1/8	-2/8	+4/8
Crime	0/8	+5/8	+7/8	-4/8	0/8	-5/8	+4/8
Bus. Env. & Infrastructure	+2/8	0/8	+7/8	0/8	+1/8	0/8	0/8
Government Contract	+4/8	0/8	+7/8	-2/8	0/8	-1/8	+4/8
Tax and Regulation	+8/8	+6/8	+8/8	0/8	+4/8	0/8	+8/8
International Trade	+5/8	+8/8	+8/8	0/8	0/8	-1/8	0/8
Innovation	+3/8	+7/8	+6/8	-4/8	0/8	-2/8	+4/8
Truthful Response	+0/8	+4/8	+8/8	-4/8	0/8	0/8	+4/8

Notes: We always match on firm size, sector, country, and year (baseline); we force exact matches on both country and year for PSM. Each set of estimates then include the above listed covariate groups. Values indicate the number of positive (+) or negative (–) significant results for each covariate group out of 8 estimations, 1-4 nearest neighbors using PSM and MDM. Estimates with basic controls for ECA includes only MDM; we could not achieve convergence when estimating propensity scores.

Table 8: Statistically significant estimates of female leadership on corruption; split samples.

Female Manager	**Baseline**		**Basic Controls**	
Sample	**% Bribes**	**Cor. Obs.**	**% Bribes**	**Cor. Obs.**
High Manager Experience	-4/8	0/8	0/8	0/8
Low Manager Experience	-4/8	-5/8	-6/8	-2/8
High Gender Inequality	-2/8	+1/8	-2/8	+3/8
Low Gender Inequality	-6/8	-5/8	0/8	-7/8
Female Owner	**Baseline**		**Basic Controls**	
Sample	**% Bribes**	**Cor. Obs.**	**% Bribes**	**Cor. Obs.**
High Manager Experience	+4/8	+4/8	+6/8	+6/8
Low Manager Experience	+2/8	0/8	0/8	0/8
High Gender Inequality	0/8	+6/8	0/8	+8/8
Low Gender Inequality	-1/8	0/8	0/8	-1/8

Notes: Baseline controls include firm size, sector, country, and year; we force exact matches on both country and year for PSM. Basic controls include these baseline characteristics *plus* the age of the firm, the (log) # of employees, the top manager's experience, and the informality of the firm. Definitions: High Manager Experience (top manager experience $>$ 15 years, median value); Low Manager Experience (top manager experience $\leq$ 15y.); High Gender Inequality (country-year with GII score $>$ 0.432, median); Low Gender Inequality (country-year with GII score $\leq$ 0.432, median).

Appendices

A Data Definitions

Table A1: Countries within each region and the associated survey years.

Country	Years of Surveys	Country	Years of Surveys
Eastern Europe & Central Asia (ECA)		**Latin America & the Caribbean (LAC)**	
Region Gender Inequality Score = 0.330		**Region Gender Inequality Score = 0.452**	
Albania	2007, 2013, 2019	Antigua & Barbuda	2010
Armenia	2009, 2013	Argentina	2006, 2010, 2017
Azerbajian	2009, 2013, 2019	Bahamas	2010
Belarus	2008, 2013, 2018	Barbados	2010
Bosnia and Herzegovina	2009, 2013, 2019	Belize	2010
Bulgaria	2007, 2009, 2013, 2019	Bolivia	2006, 2010, 2017
Croatia	2007, 2013, 2019	Brazil	2009
Cyprus	2019	Chile	2006, 2010
Czech Republic	2009, 2013, 2019	Colombia	2006, 2010, 2017
Estonia	2009, 2013, 2019	Costa Rica	2010
Georgia	2008, 2013, 2019	Domicana	2010
Greece	2018	Domincan Republic	2010, 2016
Hungary	2009, 2013, 2019	Ecuador	2006, 2010, 2017
Italy	2019	El Salvador	2006, 2010, 2016
Kazakastan	2009, 2013, 2019	Grenada	2010
Kosovo	2009, 2013, 2019	Guatemala	2006, 2010, 2017
Kyrgyz Republic	2009, 2013, 2019	Guyana	2010
Latvia	2009, 2013, 2019	Honduras	2006, 2010, 2016
Lithuania	2009, 2013, 2019	Jamaica	2010
Moldova	2009, 2013, 2019	Mexico	2006, 2010
Montenegro	2009, 2013, 2019	Nicaragua	2006, 2010, 2016
North Macedonia	2009, 2013, 2019	Panama	2006, 2010
Poland	2009, 2013, 2019	Paraguay	2006, 2010, 2017
Portugal	2019	Peru	2006, 2010, 2017
Romania	2009, 2013, 2019	St. Kitts & Nevis	2010
Russia	2009, 2012, 2019	St. Lucia	2010
Serbia	2009, 2013, 2019	St. Vincent & the Grenadines	2010
Slovak Republic	2009, 2013, 2019	Suriname	2010, 2018
Slovenia	2009, 2013, 2019	Trinidad & Tobago	2010
Sweden	2014	Uruguay	2006, 2010, 2017
Tajikistan	2008, 2013, 2019	Venezuela	2006, 2010
Turkey	2008, 2013, 2019		
Ukraine	2008, 2013, 2019		
Uzbekistan	2008, 2013, 2019		

Notes: "Region Gender Inequality Score" from the United Nations Development Program Gender Inequality Index (GII). Score is in a 0 to 1 scale where higher values represent higher gender inequality. We report the regional score from the first year that had a country from that region surveyed for WBES.

Table A1: Countries within each region and the associated survey years (continued).

Country	Years of Surveys	Country	Years of Surveys
Sub-Saharan Africa (AFR)		**East Asia & Pacific (EAP)**	
Region Gender Inequality Score = 0.619		**Region Gender Inequality Score = 0.373**	
Angola	2006, 2010	Cambodia	2013, 2016
Benin	2009, 2016	China	2012
Botswana	2006, 2010	Fiji	2009
Burkina Faso	2009	Indonesia	2009, 2015
Burundi	2006, 2014	Laos	2009, 2012, 2016, 2018
Cameroon	2009, 2016	Malaysia	2015, 2019
Cape Verde	2009	Micronesia	2009
Central African Republic	2011	Mongolia	2009, 2013, 2019
Chad	2009, 2018	Myanmar	2014, 2016
Congo	2009	Papua New Guinea	2015
Cote d'Ivoire	2009, 2016	Philippines	2009, 2015
DRC	2006, 2010, 2013	Samoa	2009
Eritrea	2009	Solomon Islands	2015
Eswatini	2006, 2016	Thailand	2016
Ethiopia	2011, 2015	Timor-Leste	2009, 2015
Gabon	2009	Tonga	2009
Gambia	2006, 2018	Vanuatu	2009
Ghana	2007, 2013	Vietnam	2009
Guinea	2006, 2016	**Middle East & North Africa**	
Guinea Bissau	2006	**Region Gender Inequality Score = 0.585**	
Kenya	2007, 2013, 2018	Djibouti	2013
Lesotho	2009, 2016	Egypt	2013, 2016
Liberia	2009, 2017	Iraq	2011
Madagascar	2009, 2013	Israel	2013
Malawi	2009, 2014	Jordan	2013, 2019
Mali	2007, 2010, 2016	Lebanon	2013, 2019
Mauritania	2006, 2014	Malta	2019
Mauritius	2009	Morocco	2013, 2019
Mozambique	2007, 2018	Tunisia	2013
Namibia	2006, 2014	West Bank & Gaza	
Niger	2009, 2017	Yemen	2010, 2013
Nigeria	2007, 2014	**South Asia Region (SAR)**	
Rwanda	2006, 2011, 2019	**Region Gender Inequality Score = 0.598**	
Senegal	2007, 2014	Afghanistan	2008, 2014
Sierra Leone	2009, 2017	Bangladesh	2007, 2013
South Africa	2007, 2020	Bhutan	2009, 2015
South Sudan	2014	India	2014
Sudan	2014	Nepal	2009, 2013
Tanzania	2006, 2013	Pakistan	2007, 2013
Togo	2009, 2016	Sri Lanka	2011
Uganda	2006, 2013		
Zambia	2007, 2013, 2019		
Zimbabwe	2011, 2016		

Table A2: Aggregated Stratification Sector Classifications

Group	**Original**
Services	Services; Other Services; Services of Motor Vehicles; Other Services Panel; IT & IT Services
Retail & Wholesale (R&W)	Retail; Retail Panel; Wholesale; Wholesale & Retail; Wholesale of Agri Inputs & Equipament; Services of Motor Vehicles/Wholesale/Retail
Manufacturing	Manufacturing; Other Manufacturing; Garments; Wood Products; Manufacturing Panel; Leather Products; Furniture; Wood Products & Furniture; Food; Fabricated Metal Products; Textiles; Textiles & Garments; Machinery & Equipment; Rubber & Plastic Equipment; Basic Metals/Fab. Metals/Machinery & Equip.; Motor Vehicles; Wood products; Furniture; Paper & Publishing; Machinery & Equipment; Electronics & Vehicles; Motor Vehicles & Transport Equip.; Printing & Publishing; Electronics; Electronics & Communications Equip.; Metals, Machinery, Computer & Electronics
Mining & Petrochemical	Mining Related Manufacturing; Non-Metallic Mineral Products; Chemicals & Chemical Products; Chemicals, Plastics & Rubber; Petroleum products, Plastics & Rubber
Food & Hospitality	Hotels & Restaurants; Hospitality & Tourism
Logistics	Transport, Storage, & Communications; Transport.
Construction	Construction

Table A3: Covariate Groups

Group	**Covariates**	**Obs.**
Basic Controls	Age of the firm	133,913
	Log # of employees	
	Top manager experience	
	Informality of firm*	
Firm Sales	Log total sales	136,903
	Share of main product in total sales	
	% of total sales paid after delivery	
Labor	Log # of permanent, full-time employees	132,075
	Log # of temporary, full-time employees	
	Formal training programs (LFY)*	
	Log of total cost of labor	
Credit, Finance, & Assets	Firm does not have a bank account*	138,536
	Firm has credit/loan from a fin. institution*	
	Firm applied for new loans/credit (LFY)*	
	Firm purchased fixed assets (LFY)*	
	% of working capital borrowed from banks	
	% of work. cap. borr. from non-bank fin. institution	
	Personal loans used To finance firm*	
	Fin. statement certified by ext. auditor (LFY)*	
Formality & Ownership	Operated as informal business for some period*	153,036
	Firm does not have a bank account*	
	Firm is part of a multinational group*	
	Shareholding company in the stock market*	
Crime	% of value lost in transit due to theft (LFY)	140,797
	Firm pay for security (LFY)*	
	% total annual sales paid for security (LFY)	
	% sales lost due to theft, robbery, vandalism or arson (LFY)	
Business Environ. & Infrastructure	# Days for electrical connection	124,853
	Experienced power outages (LFY)*	
	# of power outages/month (LFY)	
	% of annual sales lost to power outages	
	# of days for water connection	
	Insufficient water supply for production (LFY)*	
	# of water shortages/month (LFY)	
	Avg. length of water shortages (LFY)	
Government	Government is a shareholder of the firm*	137,887
	Firm secured (or attempted) a govt. contract*	
	Loan from state-owned banks or govt. agency*	

Notes: LFY = "Last Fiscal Year"; * indicates that this is a dummy variable.

Table A3: Covariate Groups (continued)

Group	**Covariates**	**Obs.**
Tax, Regulation, & Bureaucracy	% of manag. time spent dealing with govt regulat. Inspected by tax officials in last 12 months* Freq. of inspections/meetings by tax office # of days to obtain an operating license # of days to obtain a construction permit	143,141
International Trade	# of days for exports to clear customs (LFY) # of days for imports to clear customs (LFY) # of days to obtain an import license $>$ 10% of sales are exports*	27,335
Innovation	New product/service introduc. OL3Yrs* Introduced new/major improved process OL3Yrs* Spent on R&D (excl market research) (LFY)*	156,370
Truthful Response	Perception of the Interviewer Regarding Responses* Coded as 1 if "Truthful" ; 0 if "Somewhat Truthful" or "Not Truthful"	143,174

Notes: LFY = "Last Fiscal Year", OL3Yrs = "Over Last 3 Years", a * indicates that is a dummy variable.

B Regression Results

Table B1: OLS estimations of female-run firms on corruption with alternative sets of covariates.

	Female Managers		**Female Owners**	
	% Bribes	Obstacle	% Bribes	Obstacle
Baseline	-0.079*	-0.011	0.059	0.009
Basic Controls	-0.084*	-0.009	0.065	0.007
Firm Sales	-0.092*	-0.003	0.044	0.015
Employment	-0.103*	0.000	-0.003	0.001
Credit, Finance, & Assets	-0.060	-0.003	0.069	0.012
Formality	-0.080*	-0.013	0.055	0.006
Crime	-0.112***	-0.010	0.056	0.000
Business Environment & Infrastructure	-0.068	-0.023	0.043	-0.001
Government Contract	-0.046	-0.005	0.049	0.007
Tax and Regulation	-0.032	-0.005	0.009	0.003
International Trade	-0.023	0.044*	0.026	0.044**
Innovation	-0.084*	-0.014	0.047	0.002
Truthful Response	-0.086*	-0.015	0.068	0.005

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. All regressions include firm size, sector, country, and year fixed effects (Baseline). Standard errors clustered at the country level are not reported.

Table B2: Region-Specific OLS estimations of female-managed firms on corruption with alternative sets of covariates.

% of Sales Paid in Bribes						
Baseline match *plus*:	AFR	EAP	ECA	LAC	MNA	SAR
Baseline Only	-0.141	-0.091	-0.058	-0.054	-0.573*	0.088
Basic Controls	-0.121	-0.064	-0.063	-0.082	-0.604*	0.057
Firm Sales	-0.099	-0.260	-0.068	-0.065	-0.685*	0.036
Employment	0.083	-0.084	-0.011	-0.094	-0.665	0.042
Credit, Finance, & Assets	-0.147	-0.123*	-0.059	-0.061	-0.597*	0.105
Formality	-0.132	0.050	-0.038	-0.044	-0.561*	0.104
Crime	-0.200	-0.158**	-0.094*	-0.057	-0.524*	-0.024
Bus. Env. & Infrastructure	-0.098	-0.132*	-0.069	-0.017	-0.645	0.123
Government Contract	-0.220	-0.083	-0.032	-0.124	-0.466*	0.004
Tax & Regulation	-0.121	0.089	-0.071	-0.047	-0.681	0.034
International Trade	-0.094	-0.134	0.072	0.078	-0.666**	-0.075
Innovation	-0.145	-0.138**	0.054	-0.053	-0.577	0.096
Truthful Response	-0.204	-0.047	-0.049	0.066	-0.606*	0.125
Corruption Obstacles						
Baseline match *plus*:	AFR	EAP	ECA	LAC	MNA	SAR
Baseline Only	-0.037	-0.017	-0.060*	-0.005	0.062	0.250***
Basic Controls	-0.026	-0.009	-0.062**	0.003	0.075	0.247***
Firm Sales	-0.066	0.008	-0.045*	0.001	0.028	0.278***
Employment	-0.039	-0.004	-0.056*	-0.005	0.110	0.264***
Credit, Finance, & Assets	-0.037	-0.016	-0.059*	-0.003	0.014	0.241**
Formality	-0.034	-0.009	-0.047	0.003	0.058	0.244***
Crime	-0.034	-0.015	-0.052*	-0.020	0.041	0.256**
Bus. Env. & Infrastructure	-0.057	-0.006	-0.071**	-0.014	0.080	0.269**
Government Contract	-0.017	0.010	-0.061**	0.007	0.091	0.229**
Tax & Regulation	-0.024	0.010	-0.057*	-0.002	0.058	0.205**
International Trade	0.095	-0.036	0.063	0.021	-0.034	0.122
Innovation	-0.038	-0.022	-0.058*	0.007	0.057	0.192**
Truthful Response	-0.023	-0.013	-0.058*	-0.044	0.077	0.249**

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. All regressions include firm size, sector, country, and year fixed effects (Baseline). Standard errors clustered at the country level are not reported.

Table B3: Region-Specific OLS estimations of female-owned firms on corruption with alternative sets of covariates.

% of Sales Paid in Bribes						
Baseline match *plus*:	AFR	EAP	ECA	LAC	MNA	SAR
Baseline Only	0.449**	0.308	-0.062	-0.048	-0.259	0.141*
Basic Controls	0.446**	0.321	-0.075**	-0.048	-0.175	0.137
Firm Sales	0.535**	0.180	-0.104**	-0.026	-0.274	0.076
Employment	0.315	0.123	-0.085*	-0.078	-0.248	0.084
Credit, Finance, & Assets	0.422**	0.215	-0.064	-0.045	-0.217	0.157*
Formality	0.291*	0.430	-0.070*	-0.052	-0.282	0.145*
Crime	0.398**	0.330	-0.077*	-0.045	-0.186	0.142
Bus. Env. & Infrastructure	0.307*	0.429	-0.102**	-0.007	-0.274	0.211***
Government Contract	0.266*	0.223	-0.096*	-0.080	-0.308	0.079
Tax & Regulation	0.301*	0.376	-0.055	-0.044	-0.254	0.128
International Trade	0.228	-0.175	0.119	0.011	-0.342	0.058
Innovation	0.374**	0.256	-0.068*	-0.050	-0.265	0.136
Truthful Response	0.301**	0.221	-0.037	0.018	-0.254	0.187**
Corruption Obstacles						
Baseline match *plus*:	AFR	EAP	ECA	LAC	MNA	SAR
Baseline Only	0.053*	0.048	-0.034**	0.044*	-0.063	0.095**
Basic Controls	0.050*	0.049	-0.035**	0.046*	-0.051	0.094***
Firm Sales	0.043	0.048	-0.027*	0.048**	-0.022	0.087***
Employment	0.065**	0.022	-0.043**	0.039	-0.037	0.138**
Credit, Finance, & Assets	0.052*	0.047	-0.033**	0.043*	-0.071	0.094***
Formality	0.049*	0.055	-0.031**	0.049*	-0.069	0.091**
Crime	0.034	0.051	-0.036**	0.020	-0.099**	0.106**
Bus. Env. & Infrastructure	0.025	0.065	-0.045**	0.050	-0.050	0.046
Government Contract	0.045*	0.039	-0.057***	0.043**	-0.047	0.070***
Tax & Regulation	0.056**	0.056*	-0.019	0.032	-0.067	0.068**
International Trade	0.141***	0.102	0.022	0.051	-0.051	-0.055
Innovation	0.041	0.043	-0.040**	0.042	-0.077*	0.074**
Truthful Response	0.024	0.049*	-0.036**	0.017	-0.042	0.099***

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively. All regressions include firm size, sector, country, and year fixed effects (Baseline). Standard errors clustered at the country level are not reported.

Table B4: The effect of female leadership on corruption; OLS results without country fixed effects.

	%Bribes	*Corruption Obstacle*
Female Manager	-0.130	-0.191***
	(0.099)	(0.047)
Obs.	89,492	124,673
R-squared	0.011	0.040
	%Bribes	*Corruption Obstacle*
Female Owner	-0.062	-0.096***
	(0.057)	(0.014)
Obs.	87,301	120,400
R-squared	0.010	0.043

Notes:*, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively. All regressions include firm size, sector, country, and time fixed effects. Standard errors clustered at the country level in parentheses.

C Consistency of Bribes Measure

The study of Clarke (2011) highlights that there could be some inconsistency in how bribes are reported depending on whether firms respond to this question in percentage terms or by using monetary estimates. More specifically, he finds that bribes reported as a percentage of sales tend to be larger than bribes reported in monetary terms, but then converted to percentages using reported sales. Which estimate is more accurate is unknown (see the concluding discussion in Clarke (2011)), but it is important to test the robustness of our main measure (bribes reported as a percentage of sales) with the alternative (bribes reported in monetary terms and then converted to a percentage). We discuss these various tests and show the results of these robustness checks here.

Our first test deals with comparing responses from firms that responded to the bribery question in *both* percentage and monetary terms. A key result of the Clarke (2011) study is that responses from the *same* firms tend to be inflated when corruption is reported in percentage terms using a sub-sample of firms from Tanzania. The author does this using firm fixed effects and responses from two separate surveys. The World Bank data no longer provides firm identifiers. Therefore, we cannot compare responses from the same firm across surveys. However, there is a sub-sample where a single firm answers in both forms in a given survey. This is what we study first.

Our full sample of firms, for which the gender of the owner can be identified, amounts to 147,294 firms of which only 16.26% (23,952) respond to the bribery question in monetary terms. Of this amount, only 1,262 reported a positive value for both bribes in monetary terms and bribes in percentage terms for which we can compare responses.[20] This is limited to surveys occurring in three countries: Nigeria 2007 (747 firms), Kenya 2007 (458 firms), Laos 2009 (51 firms), and Laos 2012 (5 firms). To compare values in this sub-sample of firms, we convert their self-reported bribe monetary payment into percentage terms by dividing this value by their reported sales. We then compare this value to their self-reported bribe payment in percentage terms.

Table C1 reports these raw values for male-owned firms, female-owned firms, and for for the full sample. In all three cases, like in Clarke (2011), the mean value is higher for bribes reported in percentage form relative to bribes reported as monetary values and then converted to percentages using sales data. However, the gap between these two numbers is small. Moreover, for our purposes, the most important component of this analysis is the relative ranking – not the raw values. We find a very strong correlation of 0.9931 across both measures, indicating that the relative ranking is unaffected by the measure used. Crucially, this correlation is nearly identical for firms with male (0.9938)

[20]There are 1,390 firms reporting both but we cannot identify the gender of the owner in 128 observations.

Table C1: Summary statistics of different corruption measures by owner's gender

	Male-Owned		Female-Owned		All Firms	
% Bribes	Mean	Std	Mean	Std	Mean	Std
Self-Reported in %	4.402	5.715	3.937	4.347	4.185	5.317
Imputed from $	4.385	5.717	3.894	4.371	4.063	5.345
Observations (%)	923 (73.1%)		339 (26.9%)		1,262 (100%)	

Notes: Sample of firms that respond bribe question *both* in percentage of total sales and in dollar amounts and for which we can identify the gender of owner. Imputed values are calculated by dividing the self-reported dollar amount by the self-reported total sales.

versus female (0.9897) owners.[21]

Our second test uses this same sub-sample of firms but re-estimates Table 4 for female- versus male-ownership using each measure separately. (Again, there are insufficient observations to perform the same test for female-managed versus male-managed firms.) These results are reported below in Table C2. While lacking statistical significance due to a limited number of observations, the estimated treatment effects (female-ownership) are remarkably similar regardless of whether we use the calculated or self-reported percentage measure. This suggests that regardless of the measure, the information concerning the variation in corruption across gendered-ownership is essentially the same. Note that these results are slightly different from the aggregate results in the baseline estimates presented in Table 4. This is due to the extremely limited sample here containing only three different countries and only a subset of firms within these countries that answered the bribery question in both forms.

Third, our main concern here is that even if the bribes as a percentage of sales measure is inflated as indicated in Table C1, it is inflated evenly across gendered leadership. The results of Table C2 suggest that this is the case. But to more directly test this assertion, we examine whether bribes reported as a percentage are inflated relative to bribes reported in monetary terms *differently* in women-led firms. As above, for firms that reported in monetary terms, we convert this value to a percent of sales for comparison purposes. Thus, we have a measure of percent of sales paid in bribes for all firms, regardless of how it was initially reported. We use this as our dependent variable. We then create an indicator equal to zero (=0) if the dependent variable was self-reported in percentage terms and equal to one (=1) if the variable was calculated from monetary values. We then interact this indicator with either of our female leadership indicators ($FemaleManager$ or $FemaleOwner$). If there is a bias that suggests that one gender inflates more so than the other, the coefficient on this interaction term should be statistically different from

[21] There are insufficient observations to perform the same comparison along male and female managers.

Table C2: The effect of female ownership on corruption; different bribe measures

	% of Sales Paid in Bribes			
Panel A: Propensity Score	NN1	NN2	NN3	NN4
Female Owner (Self-Reported in %)	-2.168	-1.405	-0.564	-0.467
	(0.119)	(0.126)	(0.390)	(0.462)
Female Owner (Imputed from $)	-2.181*	-1.409*	-0.576	-0.484
	(0.074)	(0.097)	(0.421)	(0.469)
Panel B: Mahalanobis	NN1	NN2	NN3	NN4
Female Owner (Self-Reported in %)	-0.186	-0.191	-0.187	-0.186
	(0.255)	(0.263)	(0.255)	(0.256)
Female Owner (Imputed from $)	-0.194	-0.201	-0.204	-0.204
	(0.236)	(0.236)	(0.212)	(0.213)

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively. We match on firm size, sector, country, and year; we force exact matches on both country and year for PSM. *P*-values given in parentheses. Sample of firms that respond bribe question *both* in percentage of total sales and in dollar amounts and for which we can identify the gender of owner. Imputed values are calculated by dividing the self-reported dollar amount by the self-reported total sales.

zero.

Table C3: Different measures of bribes, OLS results

	% of Sales Paid in Bribes	
Imputed from $	-1.486***	-1.355***
	(0.198)	(0.159)
(Female Manager × Imputed from $)	0.071	
	(0.104)	
(Female Owner × Imputed from $)		-0.013
		(0.082)
Country & Year FE	Yes	Yes
Obs.	106,860	120,069
R-squared	0.056	0.057

Notes:*, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively. All regressions include firm size, sector, country, and time fixed effects. Standard errors clustered at the country level in parentheses.

Table C3 shows the results of this estimation. Both regressions include time and country fixed effects, similar to our matching estimates. As shown in the tables, while it does seem that the calculated percentages are lower than the reported percentages overall as in Clarke (2011), this difference is constant across gendered leadership.

As a final set of robustness tests with this specific bribe measure, we also replicate Table 4 using the sample of countries that responded using monetary values. These results

are presented below in Table C4. None of these effects are statistically significant. In addition, though insignificant, the direction of the effects seem to contradict the findings of Table 4. However, a deeper analysis into the regions covered in the full sample versus this more limited subset of firms can help explain these discrepancies.

Table C4: The effect of female leadership on corruption; baseline matching with alternative bribe indicator.

	% of Sales Paid in Bribes			
Panel A: Propensity Score	NN1	NN2	NN3	NN4
Female Manager	0.071	0.069	0.033	0.047
	(0.385)	(0.471)	(0.694)	(0.531)
Female Owner	0.058	0.087	0.063	0.079
	(0.662)	(0.448)	(0.497)	(0.338)
Panel B: Mahalanobis	NN1	NN2	NN3	NN4
Female Manager	0.015	0.016	-0.005	-0.009
	(0.826)	(0.815)	(0.941)	(0.899)
Female Owner	-0.045	-0.045	-0.055	-0.036
	(0.275)	(0.269)	(0.184)	(0.344)

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively. We match on firm size, sector, country, and year; we force exact matches on both country and year for PSM. *P*-values given in parentheses.

As noted, the subset of firms that were asked to report informal payments in monetary values is much smaller than those that were asked to respond in percentages. Importantly, whether firms responded in values or percentages was determined at the survey level and therefore response formats are mostly uniform within country/year pairs. This implies that when re-examining the corruption-female leadership relationship using this alternative measure and more limited sample, we are sometimes removing *all* firm responses from a given country/year. This drastically alters the regional composition of the sample. Notably, by altering the composition of firms in this way, we see a dramatic increase in the percentage of firms coming from the Europe and Central Asia (ECA) region. This is true when looking at both female-ownership and female-management indicators. In our larger sample of data that we used for our baseline estimates, the ECA region accounted for between approximately 33-35% of firms, depending on the female leadership indicator. With this more limited sample, we see an increase in ECA representation such that approximately 42-50% of firms come from this region. This region and the Latin America and Caribbean (LAC) region were the only two that we consistently saw little to no association between female leadership and bribes paid as a percent of sales for both leadership indicators. It is therefore unsurprising that the aggregate effects using this alternative measure also show no overall association.

It is likely, then, that the apparent discrepancies are due to the change in regional representation. To explore this idea further, we additionally produce baseline estimates for each region separately. In doing do, we find little statistical significance overall, likely because the sample size is sometimes extremely limited at the regional level.This is especially true in the regions where we found strong associations in our main results. For example, the share of firms from MNA fell from 9.25% to less than 4% when looking at female management in this subset of firms and in this region we found a strong negative association between female-managed firms and bribes as a percent of sales in our baseline estimates. However, now estimates for this region are wholly insignificant, though still mostly negative. Nevertheless, we do see some statistically significant effects when looking at female-ownership. For AFR, we find limited evidence that female-owned firms pay more in bribes (as a percent of sales). We also find that female-owned firms in the MNA and ECA region pay less. These effects are consistent with what we found in Table 7 despite the limited significance overall. This suggests that if this measure were more widely available across regions, the results would support the findings from our larger sample of firms and alternative bribery question. If these estimates become more widely available in the future, we encourage researchers to re-examine the relationships presented here.

Table C5: The effect of female-managed firms on corruption; baseline matching with alternative bribe indicator for each region.

	% of Sales Paid in Bribes			
Panel A: Propensity Score	NN1	NN2	NN3	NN4
AFR	0.109	0.162	0.112	0.028
	(0.794)	(0.691)	(0.775)	(0.944)
EAP	0.117	-0.020	0.097	0.148
	(0.781)	(0.954)	(0.738)	(0.612)
ECA	0.018	0.046	0.029	0.034
	(0.770)	(0.449)	(0.588)	(0.529)
LAC	0.092	0.089	-0.160	-0.095
	(0.877)	(0.829)	(0.618)	(0.731)
MNA	-0.155	-0.080	-0.115	-0.140
	(0.602)	(0.728)	(0.620)	(0.561)
SAR	0.278	0.285	0.169	0.152
	(0.599)	(0.541)	(0.625)	(0.612)
Panel B: Mahalanobis	NN1	NN2	NN3	NN4
AFR	0.247	0.229	0.064	0.126
	(0.455)	(0.499)	(0.852)	(0.708)
EAP	0.008	-0.035	-0.136	-0.109
	(0.979)	(0.912)	(0.683)	(0.734)
ECA	0.023	0.025	0.031	0.019
	(0.653)	(0.624)	(0.542)	(0.713)
LAC	-0.015	-0.006	-0.002	-0.001
	(0.890)	(0.956)	(0.983)	(0.993)
MNA	0.030	0.024	-0.019	-0.036
	(0.862)	(0.889)	(0.916)	(0.839)
SAR	-0.104	-0.100	-0.102	-0.091
	(0.534)	(0.553)	(0.544)	(0.585)

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively. We match on firm size, sector, country, and year; we force exact matches on both country and year for PSM. *P*-values given in parentheses.

Table C6: The effect of female-owned firms on corruption; baseline matching with alternative bribe indicator for each region.

	% of Sales Paid in Bribes			
Panel A: Propensity Score	NN1	NN2	NN3	NN4
AFR	0.536	0.617	0.581	0.711*
	(0.552)	(0.303)	(0.228)	(0.093)
EAP	-0.160	-0.013	0.031	0.008
	(0.770)	(0.974)	(0.922)	(0.974)
ECA	-0.036	-0.046	-0.073	-0.063
	(0.667)	(0.421)	(0.174)	(0.155)
LAC	0.112	0.079	-0.011	-0.002
	(0.660)	(0.601)	(0.940)	(0.993)
MNA	-0.246	-0.199*	-0.154	-0.124
	(0.123)	(0.056)	(0.160)	(0.211)
SAR	0.383	0.347	0.349	0.297
	(0.224)	(0.110)	(0.162)	(0.200)
Panel B: Mahalanobis	NN1	NN2	NN3	NN4
AFR	-0.023	-0.025	-0.017	-0.018
	(0.876)	(0.864)	(0.906)	(0.902)
EAP	-0.110	-0.138	-0.172	-0.149
	(0.583)	(0.467)	(0.378)	(0.432)
ECA	-0.086*	-0.078*	-0.096**	-0.071**
	(0.055)	(0.060)	(0.033)	(0.013)
LAC	0.032	0.028	0.041	0.050
	(0.621)	(0.668)	(0.511)	(0.408)
MNA	-0.057	-0.051	-0.051	-0.080
	(0.459)	(0.496)	(0.501)	(0.350)
SAR	0.182	0.184	0.183	0.182
	(0.139)	(0.136)	(0.136)	(0.139)

Notes: *, **, and *** indicate statistical significance at the 10, 5, and 1% levels, respectively. We match on firm size, sector, country, and year; we force exact matches on both country and year for PSM. *P*-values given in parentheses.