

# An Empirical Firm-Level Analysis of Informality and Corruption. Evidence from Argentina.\*

Priscila Rebeca Stisman<sup>†</sup>

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## Abstract

Informality is a widespread phenomenon. In countries like Argentina over a third of its total output is produced in the informal sector. Effects of informality on growth are diverse and are very well documented. By testing the channels through which corruption and firm size affect the size of the informal sector, I find a reciprocal relationship between informality and corruption and a U-shape relationship between informality and firm size. I believe these results reveal important insights for the design of policies aimed at reducing the share of unreported sales.

**Keywords:** Informal Sector, Corruption, Firms Size

**JEL Codes:** D21, D22, H26, L25 , O17

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<sup>†</sup>School of Economics, National University of Tucumán, Argentina. priscilastisman@gmail.com

# 1 Introduction

A sizeable share of the economic activity, mostly in developing countries, occurs in the informal sector. There is no precise definition, however, it generally refers to economic activity that is neither taxed nor monitored by the government. Many authors have pointed out that, especially in poor countries, the heavy burden of regulation and bureaucratic hassles drive producers into the informal sector, e.g. the formal sector involves certain fixed costs such as obtaining a license, taxes and the cost of complying with certain regulatory standards (Loayza 1996); (Johnson et al. 2000); (Friedman et al. 2000). Producers in the informal sector avoid much of this burden, but they have to deal with less access to public goods and services that are merely available to producers in the formal sector (Grossman, 2002). These public goods and services include the protection of property rights by the courts as well as public utilities. The existence of an asymmetry is well known: formal firms confront higher labor and regulatory costs while informal firms face higher capital costs and lower productivity (Loayza, 2016).

Estimations suggest that, depending on the measure used, it generates between 10 and 20 percent of the aggregate output in developed countries and more than a third of aggregate output in developing countries, reaching in some countries more than 50 percent (Schneider and Enste, 2002). Unfortunately, Argentina is not an exception. Estimates for Argentina show that the informal sector generates over a third of the aggregate output.

The consequences of informality are diverse and have been empirically studied from different approaches. Concerns have been stated with regard to the effect of informality on economic growth, as well as to its impact on the erosion of the tax base with ensuing detrimental effects on the quality and quantity of publicly provided goods and services (Dabla-Norris et al. 2005). However, there are positive aspects too, such as the role of informal sector in creating jobs (Rauch, 1999).

In spite of the fact that any empirical research based on informality is seriously constrained both by the unavailability of data owing to its clandestine and unrecorded characteristics

(De Soto, 2000; Dixit, 2004) and due to the non-consensus of the general definition of informality, available evidence suggests that it has considerable impact on the performance of the economies. Henceforth, there have been several interesting attempts to explain the existence of the informal sector, its determinants and consequences.

The decision to run a business in the shadow economy has been deeply analysed in different ways. The existing literature relates the size of the informal sector to proxies such as entry costs (Auriol and Warlters, 2005), institutional quality and regulatory burden, in particular of labor (Friedman et al. , 2000, Johnson et al. , 1997), tax burden (e.g., Cebula, 1997; Giles and Tedds, 2002), and financial development. Other factors like complexity of the tax system and the high degree of regulatory burden are also mentioned as significant barriers to entry to the formal sector. Authors like Mishra and Ranjan (2013), in a cross-country exercise, noted that small firms and large firms are the ones which mainly operate in the informal sector.

Firms owners choose to run their business in the formal or informal sector by weighting the benefits of reducing operational costs at the expense of losing access to public services available to companies in the formal sector. However, in the presence of corruption, the costs and benefits of breaking the law are absolutely distorted. Companies that are able to bribe government agents find informality less expensive (Mishra et al. 2013).

In this sense, corruption arises both as an underpinning driver of informality and as an aftereffect of informality. The link between corruption, informality and firm size has been carefully analysed in prior studies, while providing mixed results (Schiffer et al. 2001; Clarke et al. 2004; Martin et al. 2007; Wu 2009; Mishra et al. 2013).

Corruption can be understood as a practice that generates distortions to firms (Bertrand et al. 2007), e.g. corruption implies fixed costs that alter relative prices. Prior studies conclude that corruption has detrimental impacts on economic growth (Mauro 1995), inequality (Dobson et al. 2011) and foreign direct investments (Wei et al. 1999) (Nguyen, 2019). From the economic viewpoint, it is usual to consider corruption as a tax over business; however, it

might be more costly due to its uncertainty. The existing literature about this topic varies with regard to corruption's consequences. Some authors recognize its advantageous effects over firms' operational performance, in a sense, that corruption may "grease the wheels" of the business (e.g. speed up the acquisition of a license; saving on taxes; reduce the time spent dealing with government regulation) however, other authors agree that, in fact, is the detrimental effect the one which dominates, and argue that corruption tends to "sand the wheels" of business (e.g. spend the firm's resources on government officers) (Nguyen 2019). The aim of this paper is to analyse the link between informality, firm size and corruption. It is widely known that small firms tend to stay completely informal or to hide part of their output due to the enormous fiscal burden and overwhelming regulations they bear when they start expanding their operations. On the other hand, large-sized firms are also known for hiding part of their sales. Nonetheless, the nature of their informality is pretty different. Firms with greater wealth may find informality more profitable by virtue of corruption; wealthier firms are able to bribe government officers and remain in the informal sector. In addition, note that the organizational structure of a large firms is such that, generally, contributes to hide part of the firms' output, e.g. crucial assistance of highly qualified lawyers and accountants.

This may have serious implications in the design of policies to tackle informality. If a vast number of firms choose informality due to corruption benefits, policy reforms aimed at reducing the cost of doing business or at removing entry barriers to the formal sector will not have the desired effect.

The interplay between fixed costs of being in the formal sector and wealth dependent corruption benefits, implies that the size of the firms is strongly linked to the decision of being or not in the shadow economy (Ranjan et al. 2013).

The relationship between informality and corruption has been evaluated in numerous empirical exercises. In a recent study, Dreher and Schneider (2010) found a positive relationship between informality and corruption in the hidden economy, in the case of low-income coun-

tries.

Several studies on informality and corruption include Argentina within the sample countries (Loayza, 2006), (Perry, Arias, Fajnzylber, Maloney, Mason, 2007), (Galiani, Weinschelbaum, 2011). Notwithstanding, there is no study carried out particularly for Argentina, nor for its provinces, which is precisely what this paper wish to analyse.

The various publications have shown that the size, causes and consequences of the “unofficial” economy vary according to the country in question and, therefore, the public policies that should be applied are diverse.

The literature on corruption and informality has grown over time, however, it has not reached an agreement on the non-linear relationship between informality, corruption and firm size. I test this conjecture using data from the World Business Enterprise Survey (WBES) reported by the World Bank for a large number of countries. Specifically, I use the available data for Argentina’s provinces, that is, Buenos Aires (capital city), Mendoza, Córdoba and Rosario. The WBES reports very rich information, not only the percentage of the firm’s output that is hidden from the books and whether the firm was asked a bribe, but also plenty data about the business environment in which the firm performs, such as labor constraints, financial regulation, corruption perception, the functioning of the court system, the efficiency of the government and any obstacle perceived to affect the enterprise. Therefore, this dataset enables me to analyse different channels through which informality and corruption undertake in Argentina.

The rest of the paper proceeds as follows. Section 2 describes the analytical framework and derives its main predictions. Section 3 then describes the data and Section 4 summary statistics. The methodology is presented in Section 5, Section 6 show the main results and Section 7 concludes.

## 2 Theoretical Model

This section outlines the structure of the baseline model of the paper. This framework has the attractive feature of allowing the analysis of the relationship between informality and corruption<sup>1</sup>.

Suppose there is a set of potential firms, differing in their income ( $A$ ) distributed according  $G(A)$ ,  $\underline{A} \leq A \leq \bar{A}$ , whose production can take place either in the formal sector (F) or in the informal sector (I). Production requires an investment  $K$  and generates output  $R_j, j = F, I; K \leq A, R_F \geq R_I$ . Operation in the formal sector involves fixed non-production cost  $C$  (costs of obtaining licenses and permits to undertake production, costs of compliance with government stipulated rules and regulations). It could also include bribe payments that the firm makes to speed up the obtaining of permits and licenses. Moreover, formal sector profits are taxed at a constant rate  $t$ . However, by locating in the informal sector the enterprise avoids incurring the fixed costs  $C$  and the payment of taxes. Nonetheless, firms in the informal sector always run the risk of being apprehended by an inspector and losing their entire profit.<sup>2</sup>

### 2.1 Informality

Each firm is inspected with probability  $\theta$  by an inspector<sup>3</sup>. An honest officer would report the non-compliant firm. Assuming risk neutrality, payoffs (expected payoffs) in the formal ( $V_F$ ) and informal ( $V_I$ ) sectors can be easily derived.

$$V_F(A) = R_F(A - C)(1 - t) \quad (1)$$

$$V_I(A) = (1 - \theta)R_I A \quad (2)$$

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<sup>1</sup>The above model was built by Mishra, A. and Ray, R. (2013). See Informality and corruption (No. 21). Bath Papers in International Development and Wellbeing. .

<sup>2</sup>In this section I will just outline the major features of the model. For further explanation see Mishra, A. and Ray, R. (2013)

<sup>3</sup> $\theta$  can be understood as the institutional quality, which must affect the probability of detection.

Since  $V_I(C) > 0$  for  $\theta < 1$ , there will always be firms in the informal sector. Note that firms with  $A \leq C$  will never be in the formal sector. The question is why some entrepreneurs who are able to join the formal sector ( $A > C$ ) prefer to stay out. It is assumed that  $(1 - t)R_F > (1 - \theta)R_I$ . It can be showed that firms with  $A > A^*$  will choose to be in the informal sector, where  $A^*$  is given by:

$$A^* = \frac{R_F(1 - t)C}{(1 - t)R_F - (1 - \theta)R_I} > C \quad (3)$$

The above expression captures the exclusion and enforcement approaches to the determinants of the informal sector. Factors like regulatory burden, taxes, licenses and bribes determine the size of the informal sector by affecting  $C$ .

## 2.2 Corruption and the informal sector

Bribery mitigates the enforcement restriction and makes informality more profitable. Suppose inspectors are corruptible and can be bribed by the firms to hide non-compliance. Note that access to corruption will vary across entrepreneurs, and therefore, will produce unequal results. Suppose inspectors are risk neutral and earn a fixed wage  $W$ . Assume that each inspector only inspects one firm and can truthfully report non-compliance of the firm or, instead, can ask for a bribe in an exchange for his silence. Bribery gets exposed with some probability  $\delta$  and following exposure, the corrupt inspector is fired and loses its wage income. The exact amount of bribe will depend on several factors, including the distribution of bargaining powers between inspector and the entrepreneur. Assume that bribe is determined using the Generalized Nash Bargaining Solution. Suppose  $0 < \alpha < 1$  is the inspector's bargaining power. Compliance means that the inspector receives  $B$  and the firm is not reported. Disagreement means that the firm is reported and forfeits all its profits ( $R_I A$ ). This implies that bribery will take place when  $R_I A \geq \delta W$ , or  $A \geq A^c$  where  $A^c = \delta W / R_I$ . This implies that the smaller and less wealthy entrepreneurs will not be able to bribe their

way out. Given risk neutrality and the assumption of Nash Bargaining Solution, bribe  $B$  will be given by

$$B(A) = \alpha R_I A + (1 - \alpha) \delta W \quad (4)$$

Now, the expected payoff in the informal sector can be shown to be

$$V_I(A) = \begin{cases} (1 - \theta) R_I A + \theta (1 - \alpha) (R_I A - \delta W) & \forall A > A^c \\ (1 - \theta) R_I A & \forall A \leq A^c \end{cases} \quad (5)$$

An entrepreneur with  $V_I > V_F$ ,  $V_I \geq V_0$ <sup>4</sup> will choose to be in the informal sector, where  $V_I$  and  $V_F$  are given by (5) and (1). The slope of  $V_I$  changes at  $A = A^c$ , reflecting the fact that corruption increases the attractiveness of the informal sector beyond this point<sup>5</sup>.

Two important propositions arise from the model:

- (1) In presence of corruption, the informal sector is bigger. The formal sector is increasing in  $\delta W$  and  $\theta$ , and decreasing in  $C$  and taxes.
- (2) Firms with low as well as high levels of  $A$  are likely to prefer informality, leaving entrepreneurs with medium levels of  $A$  in the formal sector.

### 3 Data

I use the World Bank Enterprise Survey (WBES) data to test the proposition of the above model. The WBES represents a major effort by the World Bank Group and partner institutions to implement a standard core enterprise survey to evaluate business conditions in a large, cross-regional set of member countries<sup>6</sup>.

It is a firm-level survey of a representative sample of an economy's sector. The standard Enterprise Survey topics include firm characteristics, access to finance, annual sales, bribery, licensing, trade, crime, competition, capacity utilization, taxation, informality, business-

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<sup>4</sup> $V_0$  is the payoff of an entrepreneur who chooses not to undertake production.

<sup>5</sup>This is just part of the model. For the full model consult Mishra, A. and Ray, R. (2013)

<sup>6</sup>Further details are available from the World Bank website, <http://www.enterprisesurveys.org/>.

government relations, among others. Over 90% of the questions objectively ascertain characteristics of a country's business environment. The remaining questions assess the survey respondents opinions on what are the obstacles to the firm's growth and performance.

Even though this survey has been carried out in 2006, 2010 and 2017 in Argentina, information about informality and corruption is just available for 2006. Therefore, the estimations and summary statistics of the present paper regard some Argentine cities (Buenos Aires, Rosario, Córdoba and Mendoza) in 2006. However, I trust that the results obtained might well represent Argentina in the present moment.

While the WBES data provides information about the characteristics and attitudes of the individual firms surveyed, I supplemented this information by province level indicators. These include unemployment and inequality data, both obtained from the "Encuesta Permanente de Hogares" (EPH) from The National Institute of Statistics and Censuses (INDEC)<sup>7</sup> in Argentina.

Moreover, with the aim of including information about institutional quality of Argentina's provinces, I added data from the "Provincial Performance Index" (IDP) provided by Fundación Libertad<sup>8</sup>. Based on the methodology applied by The Fraser Institute to measure economic freedom in the United States and Canada, this index is constructed for the Argentine provinces. In this way, the variables used by the aforementioned international institution are taken as a reference, adapting some of them to the reality of our country. The index focuses mainly on fiscal aspects, understanding that the greater interference of the state in economic activity, through more taxes, debt and spending, hinders genuine and sustainable development in regional economies.

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<sup>7</sup>Further details are available in the INDEC website, <http://www.indec.gob.ar/> .

<sup>8</sup>For further details, visit <https://libertad.org.ar/web/>

## 4 Summary Statistics

The WBES dataset provides information for firms located in Buenos Aires (capital city), Córdoba (province), Rosario (capital city) and Mendoza (province)<sup>9</sup>. Information about corruption and informality is just available for 2006. The latter can be retrieved from answers to the following question:

What percent of total annual sales is reported for tax purposes?

As Dabla-Norris et al. clearly explain in their paper, this variable is only a rough proxy for informality. All the firms in the survey are registered firms, which implies that they all operate in the formal economy, but many of them hide some or the total output. Therefore, the survey ignores firms that are completely unregistered, particularly small firms. This omission would likely bias the estimates of hidden activity downward for economies where there is a greater incidence of informality.

Nonetheless, there is available information about unregistered firms in Argentina<sup>10</sup>. The World Bank's Informal Enterprise Surveys (IFS) collect data on non-registered business activities in every region of the world. The survey was carried out in 2010 and comprised 376 unregistered firms of which 76% were located in Buenos Aires and 24% in Chaco<sup>11</sup>.

All of the firms are small (less than 20 workers): almost 72% of the businesses have just one worker, 18% two workers, and the remaining 10% more than two workers. The firms are divided into manufacturing (clothing, food, handcraft, furniture, among others), food and clothing sales, hairdressing, construction and remodelling, internet and computer services, among others. It is worthy of note that almost 40% of the firm's owners assert that they would like to be registered.

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<sup>9</sup>See table 1.

<sup>10</sup>For Argentina, informal firms were defined as those not registered with the Administración Federal de Ingresos Públicos (AFIP).

<sup>11</sup>The surveys were carried out in Resistencia, capital city of Chaco.

The IFS provides very interesting information about the reasons why firm's owners choose not to register their businesses and on how they would benefit from registering it. Among the reasons to choose informality are: taxes (71.1%), no benefits from being registered (39.1%), time and paperwork (35.2%), inspections and meetings with government officials (16.7%) and bribes registered businesses need to pay (15.4%). On the other hand, among the benefits from being registered, they mention: better access to financing or loans (51%), being able to issue receipts (40%), better access to government services (38.3%) and less bribes to pay (24.4%).

Concerning my estimations, the WBES reports information about informality for 941 firms. Almost half of them reported to be completely formal, 43% reported to have up to half of their sales hidden, and the remaining 7% declared having more than a 50% of unreported output, reaching in some cases the 100%<sup>12</sup>.

In regard to corruption, it can be retrieved from answers to the following question:

In any of these inspections was a gift/informal payment requested?

The vast majority of firms allege they were not requested a bribe. At first sight, this may appear to be a weak spot in the analysis, nonetheless, other empirical exercises done at cross-country level report similar values.

Tables at the end of the paper contains sample statistics of the main variables I considered, such as firms location, size and other characteristics. Over a third of the sample (40%) is made up of small firms and of medium firms (38%) and just 22% large-sized firms. In terms of firm characteristics, 86% are privately owned (domestically), almost 8% belong to private foreign individuals or companies. Firms are on average 29 years old. Concerning the industry

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<sup>12</sup>See graph at the end of the paper.

sampling sector, 38% of the firms sampled produce manufactures, while 16% food, and other 24% textiles. Just 12% of the firms offer retails and almost 10% services.

Furthermore, the survey includes information about the biggest obstacle affecting the operation of the establishment<sup>13</sup>. The firms interviewed reported labor regulations (16%), political instability (15%), access to finance (14%), tax administration (12%) and practices of competitors in the informal sector (10%) as the main obstacles. In addition to this, the dataset provides information about the nature of corruption, tax, regulatory, financing and legal constraints firms face.

With regard to the World Bank indicators about informality and corruption, Argentina is highly above the world mean concerning the percentage of firms competing against unregistered firms (72.5% vs. 52.4%)<sup>14</sup>. The average number of years firms remain without formal registration is 0.9 for Argentina, 0.7 for all the countries, 0.2 for high income countries while 1.1 for Latin American economies.

Concerning corruption indexes, bribery incidence<sup>15</sup> in Argentina for 2017 is 9.3% and bribery depth<sup>16</sup> is 7.1%, in comparison with 0.3% and 0.2% respectively for high income countries<sup>17</sup>.

## 5 Methodology

I performed an OLS regression to estimate whether corruption (bribe demand) affects informality (as % of total sales) and to test if there exist a U-shape relationship between the size of the firm and the percentage of undeclared sales.

I ran a set of regressions in which I include the following variables: bribe demand, size of the firm (measured by number of workers), size squared (to test the non-linear relationship between informality and firm size), and a set of variables to control for the firms sector,

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<sup>13</sup>See table 4.

<sup>14</sup>Firms competing against unregistered firms are the percentage of firms competing against unregistered or informal firms. For more information check out the World Development Indicators data catalog.

<sup>15</sup>Bribery incidence is the percentage of firms experiencing at least one bribe payment request across 6 public transactions dealing with utilities access, permits, licenses, and taxes.

<sup>16</sup>Bribery depth is the percentage of public transactions where a gift of informal payment was requested.

<sup>17</sup>See figures at the end of the paper.

location and operational constraints as well.

$$Informal\ Sales = \alpha + \beta_1 Bribe_i + \beta_2 Workers_i + \beta_3 Workers_i^2 + \gamma\chi_i + \varepsilon_i$$

where  $\chi_i$  refers to the controls mentioned above.

Similarly, I ran a series of Logit regressions in which the dependent variable is “Bribe”.

$$Bribe = \alpha + \beta_1 InformalSales_i + \beta_2 Workers_i + \beta_3 Workers_i^2 + \gamma\chi_i + \varepsilon_i$$

The rationale behind these estimations is the extortionary behaviour of government officers. The hypothesis is that the firms that goes illegal might be more likely to be asked a bribe.

To this extent, the positive correlation I expect between informality and bribe demand may suggest that firms that are asked to pay bribes will declare a lower share of their sales and that firms that operate informally are prone to be asked a bribe in an extortionary manner. This suggests that the variable “bribe demand” is potentially endogenous, hence, in this context, OLS estimations are biased and inconsistent. Therefore, I performed a 2SLS estimation based on the treatment of the corruption variable for possible endogeneity. The instrumental variable adopted is:

“Agreement with: it is common to pay informal payments/gifts to get things done.”

This variable has 4 possible answers: “strongly disagree”; “tends to disagree”; “tends to agree”; “strongly agree”. Due to the instrumented variable is dichotomous, I reconstructed the instrument as a dichotomous variable which takes value 1 for “tends to agree” and “strongly agree” and value 0 otherwise.

The rationale behind this instrument is the following: it is more likely for a firm that has ever been asked for a bribe, to agree that this illegal practice is common. Whereas, if the firms was never asked a bribe, it will probably disagree with the statement. In addition, I do not expect the instrument to be directly correlated with the dependent variable. The

very fact of agreeing or disagreeing with the previous statement should not be related with the decision to run the business in the formal or informal sector.

To check for the existence of endogeneity and appropriateness of the instrument I carried out two tests. Firstly, I performed a Wu-Hausman test for endogeneity, in which the null hypothesis is rejected meaning that there exists endogeneity and should be treated, and then I tested the weakness of the instrument, the null hypothesis of weak instrument is rejected.<sup>18</sup>

All regressions are carried out with robust standard errors to control for heteroskedasticity, except for the IV regressions<sup>19</sup>.

## 6 Results

The models are highly robust, the variables are significant and have the expected sign.

Firstly, I estimated the following equations: a basic model, a semi-extended model and the fully extended model. The first one includes just size and corruption variables. The second model is extended to include the firms sector and a dummy variable to capture the exporter status of the firm. The last model also takes into account different obstacles that constrain the firms performance. These models are tested with two types of fixed effects: provinces fixed effect and provinces indicators such as unemployment, inequality and development indexes<sup>20</sup>. Different tests were applied to check for the presence of heteroskedasticity<sup>21</sup>.

Two striking features emerge from the model: a positive relationship between informality and corruption and a U-shape relationship between informal sales and the firms size. This result support the initial hypothesis: small and large firms are more likely to stay completely informal or to hide part of their output. Furthermore, this result is also supported by the raw data. Using the number of workers as a proxy for firm size, the following plot between informal sales and workers does indeed reveal a distinct U-shape relationship. It is worth

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<sup>18</sup>See the appendix for more details.

<sup>19</sup>Tests for heteroskedasticity are presented in the appendix.

<sup>20</sup>See table 5 and 6.

<sup>21</sup>I implemented the White Test and the Breusch-Pagan Test. For further details see the appendix.

mentioning that the turning point occurs at, roughly, 2000 workers. This implies that the smallest and largest firms are the ones which mostly have hidden sales, not merely small and large firms.

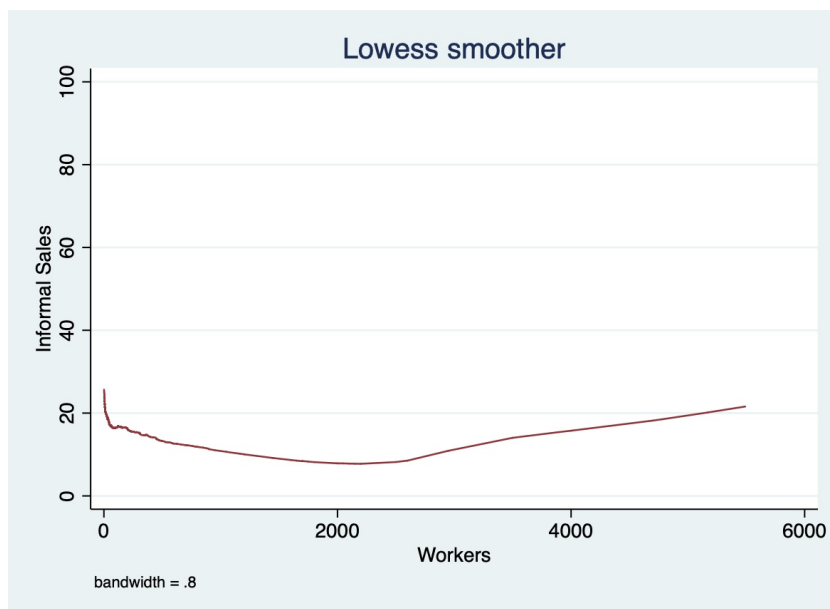


Figure 1: Lowess Smoother

Moreover, the resulting plot of the regression of informal sales on size and squared size also shows a clear U-shape dependence.

Concerning the exporter status of the firms, when trading internationally, firms' information is displayed publicly in order to comply with regulatory processes, in this context, exporters firms tend to reduce the size of the informal sector.

Regarding the firm's sector, I find that belonging to the service sector reduces the proportion of informal sales of the firm. This might seem counterintuitive, however, it is due to the fact that the service sector encompasses only IT services<sup>22</sup>. Furthermore, the textile sector has a positive effect on the percentage of informal sales. This is not trivial, since the textile sector has one of the highest percentages of labor informality. Note that the food sector also has a

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<sup>22</sup>Information technology (IT) sector is comprised of companies that produce software, hardware or semiconductor equipment, or companies that provide internet or related services

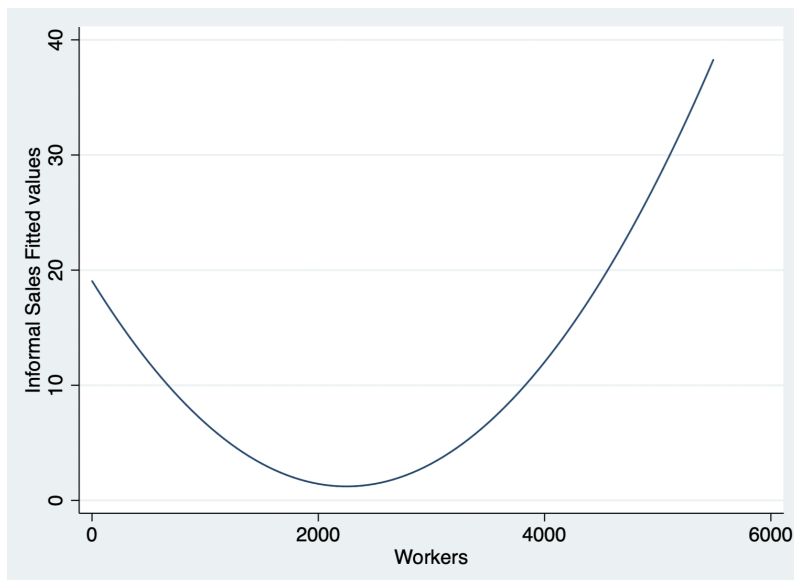


Figure 2: Predicted values of Informal Sales

positive effect<sup>23</sup>.

With regard to the obstacles included in the regressions, the only one which has a detrimental effect over formality is “practices of competitors in the informal sector”. Competitive pressure from informal firms is a powerful threat to the formal enterprise. This is consistent with what the World Bank indexes show: Argentina has one of the highest percentages of firms competing against unregistered firms in the world, it is among Sub-Saharan and Caribbean countries.

In addition to these regressions, I performed a Logit model for a set of equations similar to the first ones, with a difference: the dependent variable is bribe. As mentioned earlier, I expect a positive correlation between informality and corruption. To allow for this joint dependence and examine robustness of the results to the possible endogeneity of the bribe demand variable, I perform a Logit model to test whether informal firms are more likely to be asked a bribe in an extortionary manner. Results are striking and support one of the initial assumptions: informal sales positively affect corruption<sup>24</sup>.

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<sup>23</sup>Note that the base sector is retail.

<sup>24</sup>See table 7 and 8 for the results.

Moreover, it is interesting to note the existence of an inverted U-shape relationship between firm size and corruption. The inflection point is at, roughly, 3100 workers. This means that for the vast majority of the large-sized firms comprised in the sample, the chances of being asked a bribe increases with the firms size up to, approximately, 3100 workers.

Given the results of the Logit estimation, to control the endogeneity of the bribe demand variable, I carried out a 2SLS regression using the instrumental variable mentioned in the section above. Results are concluding. The bribe demand instrumented variable has a positive effect on informality, and there is support to the U-shape relationship between informality and corruption as well<sup>25</sup>.

Policy implications emerge from these results. The complementarity between informality and corruption should be deeply explored. If a vast number of firms choose informality due to corruption benefits, policy reforms aimed at reducing the cost of doing business or at removing entry barriers to the formal sector will not have the desired effect.

A more rigorous analysis of policies implications is beyond the scope of this paper. A broader theoretical framework should be incorporated for future research.

## 7 Conclusion

Informality is a widespread phenomenon. There is no precise definition, however, it generally describes the collection of firms that operate outside the legal and regulatory systems. Many authors have pointed out that, especially in underdeveloped countries, the heavy burden of regulation and bureaucratic hassles drives many producers into the informal sector. The effects of informality on growth are diverse and are well documented. In countries like Argentina over a third of its total output is produced in the informal sector.

This paper relies on the WBES dataset, a firm-level survey that provides a detailed description about the firms' characteristics, performance and environment. This survey allows me to analyse various factors that incise on informality. Among these, I focused on corruption

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<sup>25</sup>See table 9.

and firm size. Corruption is expected to dilute enforcement efforts and distort firms owners' incentives, furthermore, it might have an unequal effect over firms. It is more likely for large firms to pay bribes in comparison to small and medium sized firms.

To this extent, firms size arises as a key determinant to understand the link between informality and corruption. As discussed before, the heavy burden of regulation and bureaucratic costs force entrepreneurs to produce in the shadow economy, mainly small producers. In the case of large companies, the channel through which informality arises is expected to be quite different. Firms that are able to bribe government agents find informality more attractive. If this hypothesis is fulfilled, we should expect a U-shape relationship between informality and firm size. Small and large firms are more prone to have a bigger amount of unreported sales.

When a new business starts developing, it is expected to operate completely informal since it cannot face the fixed costs of the formal sector. As the firm expands its business, the obstacles it faces diminish, such as obtaining a license, complying with taxes and regulatory standards, and so does the scale of its informal operations. However, there is an inflection point. Beyond this point, there is a tendency for large firms to return to the informal sector. Nonetheless, the reason for a large firm to hide sales is not its inability to incur in the fixed costs of the formal sector, but its ability to bribe officers. Note that the organizational structure of a large firms is such that, generally, contributes to hide part of the firms' output, e.g. the crucial assistance of highly qualified lawyers and accountants.

The possibility that corruption and informality complement each other is absolutely important from a political perspective. If a vast number of firms choose informality due to corruption benefits, policy reforms aimed at reducing the cost of doing business or at removing entry barriers to the formal sector will not have the desired effect. This does not seek to discredit such policies, it simply attempts to explain that given the ignorance of policy-makers of the non-linear relationship between informality and firm size and of the reciprocal relationship between informality and corruption, public policies aimed at reducing the size

of the informal sector may not be the right ones.

The theoretical and empirical analysis proposed in this paper explores the complementarity between both variables, however, for a deeper political implications analysis is necessary to incorporate a richer framework e.g. political economy, game theory.

## Graphs and Tables

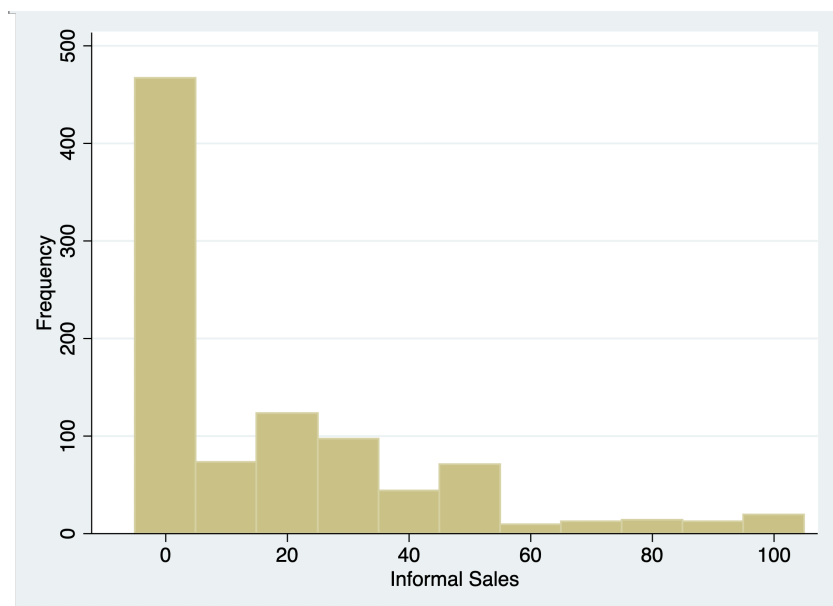


Figure 3: Informal Sales Histogram

| Region of the establishment | Frequency | Percent |
|-----------------------------|-----------|---------|
| Buenos Aires                | 594       | 63.12   |
| Rosario                     | 113       | 12.01   |
| Mendoza                     | 126       | 13.39   |
| Córdoba                     | 108       | 11.48   |
| Total                       | 941       | 100     |

Table 1: Firms Location

| Size   | Frequency | Percent |
|--------|-----------|---------|
| Small  | 378       | 40.17   |
| Medium | 360       | 38.26   |
| Large  | 293       | 21.57   |
| Total  | 941       | 100     |

Table 2: Firms Size

| Industry Sampling Sector | Frequency | Percent |
|--------------------------|-----------|---------|
| Food                     | 154       | 16.40   |
| Textiles and Garment     | 223       | 23.84   |
| Other manufacturing      | 359       | 38.08   |
| Services                 | 92        | 9.71    |
| Retails                  | 113       | 11.97   |
| Total                    | 941       | 100     |

Table 3: Industry Sampling Sector

| Biggest obstacle affecting the operation of this establishment | Frequency | Percent |
|----------------------------------------------------------------|-----------|---------|
| Labor regulations                                              | 153       | 16.29   |
| Political instability                                          | 144       | 15.21   |
| Access to finance                                              | 131       | 14.02   |
| Tax administration                                             | 118       | 12.41   |
| Transport                                                      | 109       | 11.76   |
| Practices of competitors in the informality                    | 91        | 9.49    |
| Inadequately educated workforce                                | 47        | 5.07    |
| Tax rates                                                      | 34        | 3.56    |
| Corruption                                                     | 23        | 2.48    |
| Courts                                                         | 22        | 2.37    |
| Electricity                                                    | 22        | 2.37    |
| Crime, theft and disorder                                      | 20        | 2.05    |
| Business licensing and permits                                 | 9         | 0.97    |
| Customs and trade regulations                                  | 8         | 0.86    |
| Does not apply                                                 | 10        | 1.08    |
| Total                                                          | 941       | 100     |

Table 4: Biggest obstacle firms face

|                      | (1)                      | (2)                      | (3)                      |
|----------------------|--------------------------|--------------------------|--------------------------|
| VARIABLES            | Informal Sales           | Informal Sales           | Informal Sales           |
| Bribe                | 6.711*<br>(3.672)        | 7.309**<br>(3.628)       | 6.663*<br>(3.529)        |
| Workers              | -0.00866***<br>(0.00255) | -0.00703***<br>(0.00247) | -0.00799***<br>(0.00250) |
| Workers^2            | 1.13e-05**<br>(4.94e-07) | 9.75e-05**<br>(4.40e-07) | 1.14e-05**<br>(4.47e-07) |
| Age                  | -0.223***<br>(0.0854)    | -0.282***<br>(0.0877)    | -0.299***<br>(0.0880)    |
| Age^2                | 0.00222**<br>(0.000913)  | 0.00261***<br>(0.000904) | 0.00272***<br>(0.000910) |
| Exporter             |                          | -5.403***<br>(1.536)     | -5.088***<br>(1.546)     |
| Food                 |                          | 5.766**<br>(2.906)       | 4.840*<br>(2.891)        |
| Textil               |                          | 8.342***<br>(2.885)      | 7.480***<br>(2.854)      |
| Manufacture          |                          | 0.308<br>(2.516)         | 0.512<br>(2.473)         |
| Services             |                          | -10.95***<br>(2.784)     | -10.30***<br>(2.754)     |
| Obstacle Finance     |                          |                          | -2.098<br>(1.997)        |
| Obstacle Labor       |                          |                          | 1.898<br>(2.823)         |
| Obstacle Tax Rates   |                          |                          | -0.564<br>(4.046)        |
| Obstacle Informality |                          |                          | 6.173***<br>(1.746)      |
| Constant             | 15.37***<br>(2.421)      | 15.73***<br>(2.812)      | 12.13**<br>(5.128)       |
| FE Provinces         | Yes                      | Yes                      | Yes                      |
| Observations         | 941                      | 941                      | 941                      |
| R-squared            | 0.049                    | 0.115                    | 0.127                    |

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5: OLS estimations with robust errors.

| VARIABLES                  | (4)                      | (5)                      | (6)                      |
|----------------------------|--------------------------|--------------------------|--------------------------|
|                            | Informal Sales           | Informal Sales           | Informal Sales           |
| Bribe                      | 6.711*<br>(3.672)        | 7.309**<br>(3.628)       | 6.663*<br>(3.529)        |
| Workers                    | -0.00866***<br>(0.00255) | -0.00703***<br>(0.00247) | -0.00799***<br>(0.00250) |
| Workers^2                  | 1.13e-05**<br>(4.94e-07) | 9.75e-05**<br>(4.40e-07) | 1.14e-05**<br>(4.47e-07) |
| Age                        | -0.223***<br>(0.0854)    | -0.282***<br>(0.0877)    | -0.299***<br>(0.0880)    |
| Age^2                      | 0.00222**<br>(0.000913)  | 0.00261***<br>(0.000904) | 0.00272***<br>(0.000910) |
| Exporter                   |                          | -5.403***<br>(1.536)     | -5.088***<br>(1.546)     |
| Food                       |                          | 5.766**<br>(2.906)       | 4.840*<br>(2.891)        |
| Textil                     |                          | 8.342***<br>(2.885)      | 7.480***<br>(2.854)      |
| Manufacture                |                          | 0.308<br>(2.516)         | 0.512<br>(2.473)         |
| Services                   |                          | -10.95***<br>(2.784)     | -10.30***<br>(2.754)     |
| Obstacle Finance           |                          |                          | -2.098<br>(1.997)        |
| Obstacle Labor             |                          |                          | 1.898<br>(2.823)         |
| Obstacle Tax Rates         |                          |                          | -0.564<br>(4.046)        |
| Obstacle Informality       |                          |                          | 6.173***<br>(1.746)      |
| Constant                   | 1,257<br>(1,848)         | 1,037<br>(1,813)         | 1,232<br>(1,804)         |
| FE Socieconomic Indicators | Yes                      | Yes                      | Yes                      |
| Observations               | 941                      | 941                      | 941                      |
| R-squared                  | 0.049                    | 0.115                    | 0.127                    |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6: OLS estimations with robust errors

|                      | (7)                      | (8)                      | (9)                     |
|----------------------|--------------------------|--------------------------|-------------------------|
| VARIABLES            | <b>Bribe</b>             | <b>Bribe</b>             | <b>Bribe</b>            |
| Informal Sales       | 0.0124**<br>(0.00535)    | 0.0143***<br>(0.00549)   | 0.0137**<br>(0.00566)   |
| Workers              | 0.00170**<br>(0.000799)  | 0.00152*<br>(0.000804)   | 0.00140<br>(0.000853)   |
| Workers^2            | -5.61e-07*<br>(3.01e-07) | -4.81e-07*<br>(2.62e-07) | -4.56e-07<br>(2.89e-07) |
| Age                  | 0.0401<br>(0.0290)       | 0.0438<br>(0.0317)       | 0.0427<br>(0.0314)      |
| Age^2                | -0.000630<br>(0.000399)  | -0.000681<br>(0.000422)  | -0.000676<br>(0.000419) |
| Exporter             |                          | 0.332<br>(0.327)         | 0.301<br>(0.331)        |
| Food                 |                          | 0.102<br>(0.678)         | 0.00898<br>(0.666)      |
| Textil               |                          | -0.0343<br>(0.602)       | -0.101<br>(0.598)       |
| Manufacture          |                          | 0.250<br>(0.546)         | 0.223<br>(0.562)        |
| Services             |                          | 0.417<br>(0.789)         | 0.449<br>(0.816)        |
| Obstacle Finance     |                          |                          | -0.0393<br>(0.378)      |
| Obstacle Labor       |                          |                          | 1.350<br>(1.067)        |
| Obstacle Tax Rates   |                          |                          | 0.600<br>(1.047)        |
| Obstacle Informality |                          |                          | 0.580<br>(0.470)        |
| Constant             | -4.821***<br>(0.837)     | -5.155***<br>(1.000)     | -7.307***<br>(1.642)    |
| FE Provinces         | Yes                      | Yes                      | Yes                     |
| Observations         | 941                      | 941                      | 941                     |
| Pseudo Loglikelihood | -171.00394               | -169.89266               | -167.24266              |
| Pseudo R2            | 0.0538                   | 0.0599                   | 0.0746                  |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 7: Logit model with robust standard erros.

|                            | (10)                     | (11)                     | (12)                    |
|----------------------------|--------------------------|--------------------------|-------------------------|
| VARIABLES                  | <b>Bribe</b>             | <b>Bribe</b>             | <b>Bribe</b>            |
| Informal Sales             | 0.0124**<br>(0.00535)    | 0.0143***<br>(0.00549)   | 0.0137**<br>(0.00566)   |
| Workers                    | 0.00170**<br>(0.000799)  | 0.00152*<br>(0.000804)   | 0.00140<br>(0.000853)   |
| Workers^2                  | -5.61e-07*<br>(3.01e-07) | -4.81e-07*<br>(2.62e-07) | -4.56e-07<br>(2.89e-07) |
| Age                        | 0.0401<br>(0.0290)       | 0.0438<br>(0.0317)       | 0.0427<br>(0.0314)      |
| Age^2                      | -0.000630<br>(0.000399)  | -0.000681<br>(0.000422)  | -0.000676<br>(0.000419) |
| Exporter                   |                          | 0.332<br>(0.327)         | 0.301<br>(0.331)        |
| Food                       |                          | 0.102<br>(0.678)         | 0.00898<br>(0.666)      |
| Textil                     |                          | -0.0343<br>(0.602)       | -0.101<br>(0.598)       |
| Manufacture                |                          | 0.250<br>(0.546)         | 0.223<br>(0.562)        |
| Services                   |                          | 0.417<br>(0.789)         | 0.449<br>(0.816)        |
| Obstacle Finance           |                          |                          | -0.0393<br>(0.378)      |
| Obstacle Labor             |                          |                          | 1.350<br>(1.067)        |
| Obstacle Tax Rates         |                          |                          | 0.600<br>(1.047)        |
| Obstacle Informality       |                          |                          | 0.580<br>(0.470)        |
| Constant                   | 516.9<br>(468.6)         | 525.8<br>(467.9)         | 562.1<br>(460.2)        |
| FE Socieconomic Indicators | Yes                      | Yes                      | Yes                     |
| Observations               | 941                      | 941                      | 941                     |
| Pseudo Loglikelihood       | -171.00394               | -169.89266               | -167.24266              |
| Pseudo R2                  | 0.0538                   | 0.0599                   | 0.0746                  |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 8: Logit model with robust standard errors.

|                      | (13)                     | (14)                     | (15)                     |
|----------------------|--------------------------|--------------------------|--------------------------|
| VARIABLES            | Informal Sales           | Informal Sales           | Informal Sales           |
| Bribe                | 66.71***<br>(19.31)      | 64.53***<br>(18.61)      | 61.63***<br>(19.04)      |
| Workers              | -0.00991***<br>(0.00306) | -0.00808***<br>(0.00300) | -0.00874***<br>(0.00297) |
| Workers^2            | 1.33e-05**<br>(5.40e-07) | 1.15e-05**<br>(5.26e-07) | 1.26e-05**<br>(5.20e-07) |
| Age                  | -0.252***<br>(0.0890)    | -0.307***<br>(0.0883)    | -0.316***<br>(0.0872)    |
| Age^2                | 0.00268***<br>(0.000850) | 0.00304***<br>(0.000830) | 0.00309***<br>(0.000818) |
| Exporter             |                          | -6.167***<br>(1.810)     | -5.802***<br>(1.797)     |
| Food                 |                          | 5.390*<br>(3.240)        | 4.830<br>(3.214)         |
| Textil               |                          | 8.187***<br>(3.143)      | 7.587**<br>(3.115)       |
| Manufacture          |                          | -0.248<br>(2.873)        | 0.0708<br>(2.846)        |
| Services             |                          | -11.33***<br>(3.863)     | -10.65***<br>(3.832)     |
| Obstacle Finance     |                          |                          | -1.757<br>(2.046)        |
| Obstacle Labor       |                          |                          | 0.0380<br>(2.990)        |
| Obstacle Tax Rates   |                          |                          | -1.420<br>(3.901)        |
| Obstacle Informality |                          |                          | 4.836**<br>(2.143)       |
| Constant             | 14.67***<br>(2.812)      | 15.60***<br>(3.428)      | 14.81***<br>(5.120)      |
| FE                   | Yes                      | Yes                      | Yes                      |
| Observations         | 941                      | 941                      | 941                      |

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 9: 2SLS estimation.

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## Appendix

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White's test for H0: homoskedasticity  
against Ha: unrestricted heteroskedasticity

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Cameron & Trivedi's decompositions of IM-test

| Source             | chi2   | df  | p      |
|--------------------|--------|-----|--------|
| Heteroskedasticity | 252.48 | 146 | 0.0000 |
| Skewness           | 97.04  | 17  | 0.0000 |
| Kurtosis           | 24.67  | 1   | 0.0000 |
| Total              | 374.18 | 164 | 0.0000 |

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Breusch - Pagan / Cook-Weisberg test for heteroskedasticity

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H0: constant variance

Variables: fitted values for Informal Sales

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chi2(1) = 75.88

Prob >chi2 = 0.0000

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Tests of endogeneity

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Ho: variables are exogenous

Durbin (score) chi2(1) = 13.1495 (p = 0.0003)

Wu-Hausman F(1,931) = 13.1941 (p = 0.0003)

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First-Stage regression summary statistics

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| Variable | R-sq.  | Ajusted R-sq | Partial R-sq | F(1,775) | Prob>F |
|----------|--------|--------------|--------------|----------|--------|
| Bribe.IV | 0.0550 | 0.0469       | 0.0443       | 43.242   | 0.000  |

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Minimum eigenvalue statistic: 43.242

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|                          |                               |
|--------------------------|-------------------------------|
| Critical values          | # of endogenous regressors: 1 |
| H0: Instruments are weak | # of excluded instruments: 1  |

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|                    |                 |     |     |     |
|--------------------|-----------------|-----|-----|-----|
|                    | 5%              | 10% | 20% | 30% |
| 2SLS relative bias | (not available) |     |     |     |

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|  |     |     |     |     |
|--|-----|-----|-----|-----|
|  | 10% | 15% | 20% | 25% |
|--|-----|-----|-----|-----|

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2SLS Size of nominal 5% Wald test 16.38 8.96 6.66 5.53

LIM Size of nominal 5% Wald tes 16.38 8.96 6.66 5.53

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