We develop an equilibrium model to analyze the influence of economic and cultural factors on the level of corruption that can be found in different countries. We focus our attention on the level of achievement motivation and the importance of social networks for trade in the informal economy, both of which increase the willingness of agents to participate in corrupt activities. These variables together with productivity in the formal economy and the ability of authorities to punish corruption determine the level of corruption that prevails in equilibrium. There are multiple equilibria, and societies may get trapped in a steady state equilibrium of generalized corruption. We test the predictions of the theoretical model using empirical evidence from a variety of sources for a large cross-section of countries and use two-stage least squares methods to assess the direction of causality.

\textit{Keywords:} Corruption; Informal Economy; Rule of Law; Social Values

\textit{JEL classification:} A13; D73; K42; O17

\section{Introduction}

We develop an equilibrium model to study the influence of cultural and economic factors in the level of corruption that prevails in different countries. Our model considers a specific type of corruption: the misallocation of resources by corrupt
bureaucrats who try to favour other agents in their social group. All the agents in our model choose how to allocate their time between economic activities and leisure, and also decide whether to produce in the formal sector or to trade in the informal sector of the economy. Agents compare the relative gains in both sectors and select the one in which they prefer to perform economic activities. Then, the interaction between agents in both sectors determine the level of corruption that obtains in equilibrium. There are multiple equilibria, and societies may get trapped in a steady state equilibrium of generalized corruption. The results of our model show that corruption increases with the level of achievement motivation and with the prominence of social networks. We consider that a high level of achievement motivation makes agents in the informal sector more willing to look for alternative or illegal ways of obtaining the economic success that they desire. At the same time, trade in the informal sector is based on the constant use of social networks and the exchange of favours, which normally produce a sense of obligation towards other members of the group and make agents more willing to participate in corrupt activities. Also, we find a non-monotonic relationship between corruption and productivity in the formal sector. Initially corruption increases with productivity in the formal sector, but once a threshold is reached, corruption decreases with further increases in productivity. The same relationship exists between corruption and the ability of authorities to punish corruption.

In this paper, we build on ideas from different approaches for the study of corruption that can be found in the literature. Firstly, we provide a microeconomic analysis that interprets corruption as the result of the rational decisions of agents. This tradition started with Rose-Ackerman (1975) and provides an opportunity to evaluate the different tools available for the fight against corruption. Secondly, we consider that cultural factors may affect the level of corruption that exists in different countries\(^1\). Thirdly, for our empirical analysis we use data at the national level from both economic indicators and surveys to understand the possible determinants of the level of corruption\(^2\). Finally, we consider that it is important not only to verify correlations between corruption and multiple explanatory variables, but also to verify causality through the use of instrumental variables for the cultural and economic factors considered in the model\(^3\).

Our theoretical model provides the first representation of two sociological theories about the influence of culture on corruption\(^4\). The first theory, the mean-ends

\(^{1}\) Other examples of cultural factors used to explain corruption can be found in Licht, Goldschmidt, and Schwartz (2007), Lipset and Lenz (2000), and Paldam (2002).

\(^{2}\) Jong-Sung and Khagram (2005), Treisman (2000), and Uslaner (2004), are based on similar data.

\(^{3}\) For similar analyses and an explanation of linguistic instrumental variables see Alesina and Giuliano (2008), Guido, Sapienza, and Zingales (2007), and Kashima and Kashima (1998).

\(^{4}\) Lipset and Lenz (2000) consider both theories as alternative explanations of the influence of
schema, was developed by Merton (1957) and implies that agents seek cultural goals that are set by the social system in which they live. Societies also determine which means are generally accepted as ways to attain the chosen cultural goals. Among those goals, economic success has important implications for the level of corruption that exists in different countries and cultures. A high level of social pressure to obtain economic success can make agents willing to follow alternative illegal ways to be successful. This is specially true for the cases in which not all agents have access to the same opportunities. As a result, we may expect to find that developing countries with a high level of achievement motivation have the highest levels of corruption.

The second framework, developed by Banfield (1958), considers that particularism promotes corruption. Particularism is the obligation that individuals feel to support, favour, and provide resources to their families and close friends. In his study of southern Italy Banfield found a society in which familial ties were stronger than communitarian values. Amoral familism implies that individuals are concerned about the well-being of those that are close to them in the social structure, but not about the general well-being of the society. An emphasis on group obligation may then result in the allocation of resources based on favoritism rather than efficiency, and may hinder the development of egalitarian structures and of the basic norms that are required for the functioning of anonymous markets.

However, in contrast to Lipset and Lenz (2000), who run separated OLS regressions to assess the influence of social networks and achievement motivation on corruption, we consider the combined effects of these two cultural variables and we develop a theoretical model that is supported by empirical evidence. We also include two economic variables in our analysis, the degree of development of the formal economy and the ability of authorities to punish corruption. The two cultural traits considered in our model promote corruption through social pressures that influence the decision of agents. The first type of social pressure comes from the obligation that agents feel towards their family and close friends, which affects agents for whom social networks are important in the informal sector. These agents normally suffer a strong pressure from other members of their group to obtain resources and repay past favours. If an agent is in a position in which he can misallocate resources, it may be very difficult and costly for him to decide to be honest and deny those resources to other members of his social group. The second type of social pressure applies to all the agents in the economy in the form of the economic success that they are expected to attain. As a result, a culture that considers economic success as very important has high levels of participation in both the formal and the informal sectors. Hence, achievement motivation leads to a high level of investment to obtain valuable abilities in the formal economy.

culture on corruption and mention the results of a first empirical analysis.
and a high level of investment in the creation of relationships in the informal economy. An increase in investment results in more resources to be misallocated and a higher desire by agents in the informal economy to take advantage of this opportunity. Combining the effects of the two cultural variables, we would expect that a traditional society where social networks are important for economic activity, where there is no fully developed formal sector, and where economic success is considered an important goal, would suffer the highest levels of corruption. However, the final component of our theoretical model is the ability of authorities to punish corruption. In countries in which punishment is high and corruption easily detected, the informal sector may represent only a small proportion of the whole economy, even if it provides high returns relative to the formal sector. Hence a strong judicial system is a useful tool to alleviate the problem of corruption.

An important element in our model is the negative externality that corrupt agents create in productive agents. For a larger size of the informal economy, productive agents decide to invest and produce less in equilibrium. We find that there are multiple equilibria and that economies may get trapped in steady states of generalized corruption. In this sense, our model is close to Acemoglu (1995), where the allocation of talent between entrepreneurship and rent-seeking is determined by the reward structure of the society. However, in our model, both sectors are productive and agents in the informal sector undertake corrupt activities only when they interact with agents in the formal sector.

Even when there is a vast literature on corruption, we consider that there is a lack of studies that present theoretical models supported by empirical evidence. Therefore, in this paper, we test the predictions of the theoretical model using empirical evidence from a variety of sources for a large cross-section of countries. For the cultural variables we use data from the World Values Survey, and to assess causality we use two-stage least squares methods with instrumental variables for the main elements of our model. We control for the conventionally accepted causes of corruption and the results indicate a significant influence of the strength of social networks and achievement motivation on the level of corruption. Moreover, we present evidence that confirms the functional form of the influence that each of our variables has in the level of corruption. In order to deal with the subjective nature of the data included in our analysis we use the following methodologies: we maximize the number of countries considered by using list-wise deletion individually for each variable, we use average values for long periods of time, we use first main components analysis to combine the information from different cultural considerations, and we use economic and linguistic instrumental variables to test

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5For alternative analyses of the allocation of talent see Murphy et al. (1991, 1993), Baumol (1993), and Acemoglu and Verdier (1998).

6For surveys of the literature on corruption see Aidt (2003), Bardhan (1997), and Jain (2001).
the direction of causality.

The rest of the paper is organized as follows. Section 2 presents our theoretical model. Section 3 discusses our empirical analysis. Finally, Section 4 concludes.

2 The Model

2.1 Basic Elements and General Structure

We consider a continuum of identical agents that is normalized to 1. A proportion $\mu$ of the population produce valuable goods and services and focus their efforts on obtaining the abilities and qualifications that are more valued in the market. The remaining $1 - \mu$ are traders that interact among themselves using social networks. Agents that participate in networks focus their efforts in the creation of relationships that allow them to trade even if they lack of the abilities that are valued in the market.

The economy is divided in two sectors, the informal and the formal sectors. On the one hand, the informal sector is formed by the interaction of traders that belong to social networks. On the other hand, all the resources in the formal sector are allocated by the government in the form of procurement contracts. In order to allocate these contracts, the government hires bureaucrats. Each bureaucrat is in charge of finding a competent producer that can provide the government with the services or goods specified by a specific contract. All the productive and qualified agents always participate in the formal economy either working directly for the government, as bureaucrats, or as independent producers trying to get procurement contracts. Even when traders do not have the ability to perform production activities and complete the contracts awarded by the government, they try to get a position in the formal sector as bureaucrats. Such a position would allow them to perform corrupt activities that may provide gains for themselves and other agents in their social group. The specific type of corruption that we analyse in this model is the misallocation of resources. This involves an unqualified agent working as a bureaucrat, awarding a contract to another unqualified agent in his social group and then certifying, untruthfully, that the contract was completed successfully with the standards required by the government.

Independently of the sector of the economy to which each agent belongs, all the agents in the population share a specific cultural trait, the value that they assign to leisure, $\gamma > 0$. Therefore, $\gamma$ can be interpreted as the lack of achievement motivation. A low value of $\gamma$ represents a society that emphasizes economic success and in which agents have a high level of achievement motivation.

\footnote{We can also think of firms awarding contracts to suppliers, distributors, etc.}
Economic activity should be performed by pairs of agents, and agents are brought together by a random matching process. Before matching takes place, each agent is entitled to one unit of time that should be allocated between leisure and economic activities. Therefore, every agent should decide ex ante on his time investment, which results in costs and gains that are specific to producers and traders. Once investments are determined, each agent is randomly matched with another agent.

There are four possible types of matches. Firstly, when two producers are matched, one of them provides the goods or services stipulated in the contract and the other agent acts as a bureaucrat that certifies that the terms of the contract where fulfilled. In this case the gains for the former come from the value of the contract awarded and the later receives a salary from the government. Secondly, when two agents that trade through networks are matched, they trade and obtain gains that are lower than the gains enjoyed by producers in the formal economy. In the third place, when a match is formed by a productive agent that acts as a bureaucrat and a trader trying to get a contract, they both obtain zero gains. This comes from the fact that the trader is unable to complete the activities required by the contract and, as a result, the government considers that the bureaucrat was unable to find a suitable agent to be awarded with the contract. Finally, a match can be formed by an unqualified trader acting as a bureaucrat and a producer trying to get a contract. In this case, the bureaucrat becomes corrupt and awards the contract to an unqualified agent in his social group, who is unable to fulfill the terms of the contract, but the corrupt bureaucrat still reports that the expected goods and services were successfully provided to the government. The productive agent that does not receive the contract reports this situation to the authorities, and with some probability the authorities are able to punish the corrupt agent and reassign the contract to the productive agent.

2.2 Expected Utilities

As mentioned in the previous section, before matching takes place every agent is endowed with a unit of time and determines the level of investment that maximises his expected utility. For a productive an qualified agent the ex ante optimal investment is equal to $e_M$. The time invested in production activities involves a cost $c(e_M)$, where $c(0) = 0$, $c'(e_M) > 0$, and $c''(e_M) > 0$. In order to keep the algebra as simple as possible, we assume that $c(e_M) = \frac{(e_M)^2}{2}$. With probability $\mu$ a productive agent is matched with another producer. Since both agents are productive, this match involves activities in the formal economy, in which resources are allocated by the government. Therefore, with probability $\frac{1}{2}$ the agent under analysis is hired as a bureaucrat and with probability $\frac{1}{2}$ he produces the goods and services for the
government. We assume that any productive agent is capable of performing any of these jobs and also that the potential gains are the same in both cases. Specifically, each of these agents receives gains equal to his investment multiplied by a factor $\beta > 1$. That is, both the value of any project and the payment received by any bureaucrat is equal to $\beta e_M$. A high $\beta$ represents a developed economy in which the productivity of agents is highly valued and capable agents are compensated accordingly. Each agent consumes the proportion of time that is not invested, and assigns it a value $\gamma (1 - e_M)$. Then, the utility obtained by each of the productive agents in this match is equal to $\beta e_M - \frac{(e_M)^2}{2} + \gamma (1 - e_M)$.

On the other hand, the agents that trade through networks are not concerned with productivity. Any of these agents invest ex ante a proportion $e_N$ of his time in the creation of personal relationships. We assume that this investment results in a cost $c(e_N) = \frac{(e_N)^2}{2}$. With probability $1 - \mu$, an agent that trades in networks is matched with another trader. If that is the case, they exchange goods and each trader receives gains equal to $\alpha e_N$, where $\alpha$ represents the potential gains that can be obtained in the informal economy. These gains depend on cultural factors related to the social structure and a high value of $\alpha$ represents an economy in which social networks are important for economic activity. As is shown by the literature on cooperation$^8$, a society in which social networks are prominent is characterised by repeated interaction, long term relationships, reciprocity, the exchange of favours, and collective punishment, all of which facilitate trade and enhance efficiency. Therefore, $\alpha$ represents the productivity of trading activities in the informal sector, which is directly related to the strength of social networks. We consider that $\alpha < \beta$ because even when trade increases the utility of the agents involved, the gains are not as high as in a productive activity that increases the market value of the investments. For the rest of this section we normalize $\alpha = 1$, and consider that $\beta > 1$ represents the productivity differential between producers and traders$^9$. The proportion of time that is not invested is consumed and provides the agent with gains equal to $\gamma (1 - e_N)$. Therefore, each trader that is matched with a similar agent gets an expected utility equal to $e_N - \frac{(e_N)^2}{2} + \gamma (1 - e_N)$.

It is important to remark that in an economy in which agents have high levels of achievement motivation, it would be normal to find that $\beta > 1 > \gamma$. In this case, agents invest most of their time in economic activities, either by being as productive as possible or by forming personal relationships that allow them to obtain gains from trading. On the other hand, in an economy in which economic


$^9$The results of the model are maintained if we consider $\alpha > 1$. In section 2.4 we allow $\alpha$ to vary in order to analyse its effect on the level of corruption, and in section 3.2.1 we analyse the empirical evidence that supports our theoretical results.
success is not considered important, agents would prefer to consume their time without getting involved in any economic activity.

When agents of different types are matched, two cases arise. Firstly, with probability $\frac{1}{2}$ the productive agent is hired as a bureaucrat and the unqualified trader tries to get the procurement contract. Since the trader is unable to complete the terms of the contract and the bureaucrat is unable to assign the contract to a productive agent, both receive gains equal to zero. This match represents the inefficiency that agents used to the exchange of favours bring to the formal economy when they try to undertake activities for which they are not qualified. On the other hand, with probability $\frac{1}{2}$ the unproductive trader is hired as a bureaucrat and the productive agent tries to get the procurement contract. Even when the producer is able to complete the activities determined by the contract, it is individually optimal for the bureaucrat to become corrupt and misallocate the contract. The corrupt bureaucrat assigns the contract to an unqualified agent in his social group and reports to the government that the goods or services were provided and the terms of the contract fulfilled. Here we can think of cases in which cheap materials or inadequate building processes are used in infrastructure projects or in which low quality goods are provided to the government. The bureaucrat gets gains both from the salary that is paid to him by the government and also from the misallocated resources that will be eventually repaid to him in the form of favours. Hence, the gains for the corrupt bureaucrat are equal to $2\beta e_M$ and the productive agent gets gains equal to zero. However, the productive agent denounces the corrupt act to the authorities, and with probability $0 \leq p \leq 1$, the authorities are able to punish the corrupt agent, impose him a fine or penalty equal to $f > 0$, and reassign the project to the productive agent. Therefore, $p$ represents the ability of authorities to punish corruption. Since the investment decisions are made before the result of the random matching is known, a matching in which the bureaucrat is an unqualified trader gives the productive agent an utility equal to

$$p \left[ \beta e_M - \frac{(e_M)^2}{2} \right] - (1 - p) \frac{(e_M)^2}{2} + \gamma (1 - e_M),$$

and the corrupt trader receives an utility equal to

$$-pf + (1 - p)2\beta e_M - \frac{(e_N)^2}{2} + \gamma (1 - e_N)$$

According to the structure described above and considering the three types of matches in which a productive agent may be involved, his expected utility is equal to

$$V_M = \mu \beta e_M + (1 - \mu) \left[ \frac{1}{2} p \beta e_M + \frac{1}{2} \cdot 0 \right] - \frac{(e_M)^2}{2} + \gamma (1 - e_M)$$
With this information in hand, any qualified producer selects the optimal proportion of time devoted to productive activities, \(e_M\), according to the first order condition \(\frac{\partial V_M}{\partial e_M} = \frac{1}{2} p \beta - e_M - \gamma + \beta \mu - \frac{1}{2} p \beta \mu = 0\). Therefore, the maximum expected utility for a productive agent is obtained when he selects \(e_M^* = \frac{1}{2} p \beta - \gamma + \beta \mu - \frac{1}{2} p \beta \mu\), and is equal to

\[
V_M^*(\mu) = \frac{1}{8} \beta (-p - 2 \mu + p \mu) (4 \gamma - \beta (p - 2 \mu + p \mu)) + \frac{1}{2} \gamma^2 + \gamma
\]  

(1)

Similarly, an agent that trades through networks selects \(e_N\) to maximize his expected utility, which is equal to

\[
V_N = \mu \left[ \frac{1}{2} (-p f + (1 - p)2 \beta e_M) + \frac{1}{2} \cdot 0 \right] + (1 - \mu) e_N - \frac{(e_N)^2}{2} + (1 - e_N) \gamma
\]

The corresponding first order condition is \(\frac{\partial V_N}{\partial e_N} = 1 - \gamma - e_N - \mu = 0\). Therefore, the optimal investment of time in the development of relationships is equal to \(e_N^* = 1 - \gamma - \mu\), which provides any corrupt agent with the following expected utility

\[
V_N^*(\mu) = \frac{1}{2} [\beta \mu (p - 1)(2 \gamma - p \beta - 2 \beta \mu + p \beta \mu) + (\gamma + \mu)^2 - f p \mu + 1] - \mu
\]

(2)

### 2.3 Equilibria

In equilibrium all the agents in the economy, which are assumed to be identical, should obtain the same expected utility independently of the type of economic activity they perform. This means that in equilibrium

\[
V(\mu) = V_M^*(\mu) - V_N^*(\mu) = 0
\]

(3)

Using the information contained in equations (1) and (2), it is possible to represent \(V(\mu)\) as

\[
V(\mu) = \mu^2 \left[ -\frac{3}{8} p^2 \beta^2 + p \beta^2 - \frac{1}{2} \beta^2 \right] + \mu \left[ \frac{1}{4} p^2 \beta^2 - \frac{1}{2} \gamma p \beta + \frac{1}{2} f p + 1 - \gamma \right]
\]

\[
+ \left[ \frac{1}{8} p^2 \beta^2 - \frac{1}{2} \gamma p \beta - \frac{1}{2} + \gamma \right]
\]

(4)

When \(V(\mu) > 0\), the returns obtained by productive agents are higher than the returns obtained by traders that use social networks, and the opposite happens when \(V(\mu) < 0\).
As is evident from equation (4), \( V(\mu) \) is a quadratic function of the size of the formal sector, \( \mu \). If \( p < \frac{1}{3\beta} \left( 4\beta - 2\sqrt{\beta^2 - 3} \right) \) or \( p > \frac{1}{3\beta} \left( 4\beta + 2\sqrt{\beta^2 - 3} \right) \), then \(-\frac{3}{\beta} p^2 \beta^2 + p\beta^2 - \frac{1}{2} - \frac{1}{3}\beta^2 < 0\), and \( V(\mu) \) represents a parabola that opens downwards\(^{10}\). Therefore, it is possible to analyse the five different type of equilibria that exist in the economy by verifying whether the values \( V(0) \) and \( V(1) \) are positive or negative. These values are determined by the three conditions detailed below.

**Condition 1** \( \gamma < \frac{1}{6} p \beta + \frac{1}{2} \)

This condition would be fulfilled in an economy with a high level of achievement motivation. Any individual in the population would prefer to invest his time either in productive activities or in the development of personal relationships rather than just consuming it in the form of leisure activities. High potential gains in both sectors of the economy and a high value of \( p \) make this condition easier to sustain.

**Condition 2** \( p \beta > 2 \)

This condition would be satisfied in an economy in which the efficiency of the authorities to punish corruption and/or the potential gains that can be obtained by producers in the formal sector are sufficiently high compared to the gains that can be obtained by traders in the informal sector. This description correspond to the case of a modern economy with a strong and efficient legal system, a fully developed anonymous market, and no dependence on social networks for economic activity.

**Condition 3** \( p \geq \frac{\beta^2}{f + 2\beta(\beta - \gamma)} \)

Finally, this condition would be fulfilled in an economy in which the authorities are sufficiently effective at punishing corrupt activities. Notice that the condition is more easily sustained as the penalty imposed increases and the value of leisure decreases.

**Proposition 1** If either Conditions 1 and 2 are both satisfied, or alternatively none of them is satisfied, then \( V(0) > 0 \) and \( \mu = 0 \) is not an equilibrium.

The two scenarios described in Proposition 1 guarantee that the economy will not reach an equilibrium in which all agents decide to trade in the informal economy. In the first scenario, agents are highly motivated and avoid spending all their

\(^{10}\)Alternatively, if \( \beta < 2 \) then \(-\frac{3}{\beta} p^2 \beta^2 + p\beta^2 - \frac{1}{2} - \frac{1}{3}\beta^2 < 0\) for any value of \( p \)
time in leisure activities, so that Condition 1 is satisfied. Since Condition 2 is also satisfied, agents are better off participating in the formal sector of the economy due to higher potential returns, or because of a high probability of being punished by the authorities if they get involved in corrupt activities, or both. Therefore, agents are willing to invest and they have a preference for the formal sector. As a result, a state in which all agents trade through networks and are willing to participate in corrupt activities is not an equilibrium.

The second scenario considered in Proposition 1 corresponds to an economy in which agents assign a high value to leisure, so that Condition 1 is not satisfied. In this situation, it is optimal for productive agents to select a small $e_M$. Moreover, since Condition 2 is not satisfied, the agents in social networks have even less incentives to participate in corrupt activities due to the low potential gains they can steal from productive agents. This represents a society in which economic success is not important, agents decide to spend most of their time in the form of leisure, and economic activity is low in general. Again, a state in which all agents trade in networks and are willing to be corrupt is not an equilibrium.

**Proposition 2** If $V(0) > 0$, then there is a unique equilibrium. Moreover,

i) if Condition 3 is satisfied, then $V(1) \geq 0$ and the unique equilibrium is $\mu = 1$.

ii) if Condition 3 is not satisfied, then $V(1) < 0$ and the unique equilibrium is $\mu \in (0, 1)$, such that $V(\mu) = 0$.

Figure 1. Case 1 - differential in expected utilities vs size of the formal economy

Proposition 2 assumes that one of the two scenarios considered in Proposition 1 takes place in the economy. That is, the state in which all agents trade using social networks is not an equilibrium. Then, whether Condition 3 is satisfied or
not determines the unique equilibrium. In scenario (i) Condition 3 is fulfilled and a sufficiently high risk of being punished by the authorities deters any agent from engaging in corrupt activities. Therefore, in equilibrium all agents choose to be productive and the economy is free of corruption. Scenario (i) is represented in Figure 1, this is the first of the five cases that can be found in equilibrium. On the other hand, in Scenario (ii) the authorities are not able to deter all agents from engaging in corrupt activities, but their ability to punish corruption combined with the potential gains for productive agents are enough to make $V(0) > 0$. Therefore, in equilibrium the population is distributed between the two sectors of the economy and there is a proportion $\hat{\mu} \in (0, 1)$ of productive agents. In this case, the value of $\hat{\mu}$ and the interaction between agents in the formal and the informal sector determines the level of corruption as explained at the end of this section. Case 2 is depicted in Figure 2.

![Figure 2. Case 2 - differential in expected utilities vs size of the formal economy](image)

**Proposition 3** If $V(0) < 0$, then $\mu = 0$ is an equilibrium. Moreover,

i) if Condition 3 is satisfied, then $V(1) \geq 0$ and there is a second equilibrium at $\mu = 1$.

ii) if Condition 3 is not satisfied and there is no $\hat{\mu} \in (0, 1)$ such that $V(\hat{\mu}) > 0$, then $V(\mu) < 0$ for all $\mu \in [0, 1]$ and $\mu = 0$ is the unique equilibrium.

iii) if Condition 3 is not satisfied and $V(\mu) > 0$ for some interval $(\underline{\mu}, \overline{\mu}) \subset (0, 1)$, then there is a second equilibrium at $\overline{\mu}$. 

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An economy in which the returns from trading and exchanging favours is sufficiently high is always in danger of reaching an equilibrium where no agent decides to join the formal economy. However, the ability of the authorities to punish corruption combined with the penalties imposed and the level of motivation may result in the existence of multiple equilibria. Which of the alternative equilibria persists in the economy may be determined by historical factors or by other elements not considered in this model\textsuperscript{11}. Scenario (i) is represented in Figure 3, and corresponds to efficient authorities operating in an economy with high potential gains from trading and participating in corrupt activities. This case involves the two extreme equilibria where either everyone decides to be productive or a formal sector is not developed at all and everyone trades through networks. In both equilibria the economy is free of corruption. Figure 4 depicts scenario (ii), in this situation there is no formal sector in the economy and everyone trades in the informal economy. However, since there are no productive agents from whom to take advantage, this case represents an economy that is free of corruption.

\textsuperscript{11}For examples of how history dependence can be induced by reputation and expectations about the reward structure see Tirole (1993) and Acemoglu (1995), respectively.
Finally, Figure 5 represents Scenario (iii). In this situation, even when networks offer high returns and the authorities are not able to deter corrupt activities, there are still some individuals that decide to be productive and join the formal economy. This situation may arise as a result of high penalties being imposed. In that case, only a small proportion of corrupt agents is punished, but the penalty is extremely high. The same equilibrium would be reached with an intermediate level of motivation that is high enough to make all agents invest either in productive activities or in the development of relationships, but is not high enough to motivate all the agents to take the improbable but expensive risk of being punished.

It is important to emphasize that the level of corruption $\kappa$ is determined by $\mu$. 
Since $\mu$ represents the proportion of qualified producers, $\mu = 1$ represents an economy where there exists no informal sector, in which there is no interaction between producers and traders, and in which there is no corruption. This would be the case for a fully developed country in which the informal sector and corruption are almost non-existent. On the other hand, an economy in which $\mu = 0$ represents an economy in which every agent uses social networks to trade in the informal sector. In this case, there is no formal sector, no bureaucrats that allocate resources, and no interaction between producers and traders; therefore, there economy is again free of corruption. Taken to the extreme, this would represent a small community or tribe, in which economic activity is reduced to simple barter and some essential activities such as agriculture. In such an economy, productivity would be very low, but social networks would enforce cooperation, agents would not try to take advantage of one another, and there would be no corruption. Finally, when $\mu \in (0, 1)$, agents are distributed between the formal and the informal sectors of the economy, the interaction between agents from both sectors results in corrupt activities, and the level of corruption in the economy is equal to $\kappa = \frac{1}{2} \mu (1 - \mu)$. That is, the probability of a match between a producer and a trader in which the unqualified trader is hired as a bureaucrat. In fact, the maximum level of corruption would be found in an economy with $\mu = \frac{1}{2}$, in which the proportion of matches between productive agents and traders is maximised. This situation would represent the case of a transition economy or a developing country in which a competitive market is not fully developed, institutions are not strong enough to enforce property rights, there is an important informal sector, and the economy is plagued by corruption.

![Figure 6. Simulation of Corruption vs $\mu$](image)

Figure 6 presents a simulation of the level of corruption as a function of the size
of the formal sector and Figure 7 shows the scatter plot of the level of perceived corruption versus the share of the informal sector for 137 countries. These figures confirm the relationship predicted by our model. The data used to represent corruption is the Corruption Perception Index described in Section 3.1, and for the share of the informal economy we use the data reported by Schneider (2004).

Figure 7. \[ \text{Corruption} = -0.61 + 34.16 \times \text{Formal Sector} - 35.47 \times \text{Formal Sector}^2 \]

### 2.4 Determinants of the Level of Corruption

The goal of our model is to analyse the role that economic and cultural factors play in the determination of the level of corruption. Therefore, it is important to understand how the level of corruption varies with the main parameters of our model.

When the proportion of productive agents in equilibrium is different from zero and one, \( \mu \neq 0 = 1 \), the value of \( \mu \) that is reached in equilibrium can be obtained by making Equation (4) equal to zero and solving for \( \mu \). Then the level of corruption is equal to \( \kappa = \frac{1}{2} \mu (1 - \mu) \).

Below we present simulations of the level of corruption that exists in the economy as a function of the main parameters of our model. This relationships are tested in Section 3.2.1 where we present empirical evidence of the level of corruption in different countries. The simulations consider the following values for the parameters: \( \beta = 1.9, p = 0.35, \gamma = 0.7, f = 5 \), and \( \alpha = 1 \). These values lead to a case 2 equilibrium, as described in Section 2.3. This case is represented in Figure 2 and correspond to an interior solution for the proportion of productive agents in the economy and the share of the formal sector.
Figure 8 shows the level of corruption that obtains in equilibrium, $\kappa = \frac{1}{2} \mu (1 - \mu)$, as a function of the ability of authorities to punish corrupt activities. The level of corruption is initially increasing in $p$ and then at $p = 0.66$ it becomes decreasing in $p$. The intuition is that at $p = 0$ property rights are not protected and, as a result, there are no productive agents in the economy, there is no interaction between producers and traders, and there is no corruption. Then, as $p$ increases, the potential gains from being productive increase and as more agents become productive the interaction between agents in the two sectors of the economy increases and there is more corruption. Finally, as $p$ becomes larger, most agents prefer to be productive and eventually the level of corruption and the interaction between traders and producers decrease. This functional form coincides with the scatter plot of perceived corruption versus the rule of law presented in Figure A.1 in the appendix.\(^{12}\)

\(^{12}\)The data used in the figures presented in the appendix is described in section 3.1.1.
Figure 9. Simulation of Corruption vs $\beta$

Figure 9 presents corruption as a function of $\beta$, the productivity in the formal sector or the potential gains for productive agents$^{13}$. As $\beta$ increases from 1 to higher values, corruption initially increases and then, after the threshold $\beta = 3.9$ is reached, corruption decreases with $\beta$. The intuition is similar to the one for $p$: initially, for low values of $\beta$ it is not attractive to be a productive agent and all agents decide to trade through networks. However, as $\beta$ increases more agents decide to be productive, which results in more interaction between producers and traders. However, $\beta$ eventually becomes high enough to significantly reduce the proportion of agents that trade through networks and the level of corruption in the economy. This result corresponds to the scatter plot of perceived corruption versus GDP per capita presented in Figure A.2 in the appendix.

$^{13}$In Figure 9 we include an interval of negative values of corruption only to emphasize the convexity of the curve and its similitude to Figure A.2 in the appendix. The convexity of the curve is only evident for values of $\beta \geq 5.3$ and we comment about this fact in section 3.2.1.
Figure 10 shows how the level of corruption varies with $1 - \gamma$, the level of achievement motivation. Corruption is a concave and increasing function of $1 - \gamma$. As achievement motivation increases, all agents in the economy increase their investments in economic activity, both in trade and production, and general economic activity is increased together with the quantity of misallocated resources in the economy. This result supports the mean-ends schema developed by Merton (1957), and shows that a higher level of achievement motivation results in a higher level of corruption. The corresponding scatter plot of perceived corruption versus achievement motivation is showed in Figure A.3 in the appendix.

Finally, in Figure 11 we present the variation of the level of corruption with $\alpha$, which represents the strength of social networks and the productivity of trade in
the informal economy. Even when we normalize $\alpha = 1$ in our theoretical model, it is important to analyse the effects of $\alpha$ in the level of corruption. In this way, we verify that our results support the amoral familism framework developed by Banfield (1958), which claims that economies with stronger amoral familism suffer from higher levels of corruption. The figure shows that the level of corruption is an increasing function of $\alpha$, as expected from the scatter plot of perceived corruption versus social networks that is presented in Figure A.4 in the appendix.

Section 3.2.1 presents empirical evidence that verifies the results analysed above.

2.5 Discussion

Our theoretical model considers that the relative values of three main parameters determine the level of corruption that prevails in equilibrium: the lack of achievement motivation in the population, the differential in productivity between producers in the formal sector and traders that use social networks in the informal sector, and the ability of authorities to punish corrupt activities.

Firstly, the preferences of agents toward the allocation of time between leisure and hard work is a cultural factor. Even when the preferences vary from one individual to another, the evidence presented in the next section shows that, on average, the attitudes towards hard work vary from country to country. The government is unable to have an important influence on this variable or to use it as a tool to reduce the level of corruption. In any case, an increase in achievement motivation influences all agents in the economy, both producers and traders. Therefore, the level of achievement motivation has an effect in the level of corruption only through its interaction with the relative gains that can be obtained in each type of economic activity. Therefore, the economic factor that can direct the efforts of agents towards productive activities in the formal sector is our next variable, the relative gains in both sectors of the economy.

Secondly, the relative gains obtained by productive agents compared to the gains obtained by traders that belong to social networks depend on the degree of development of the economy. In general, a capable and motivated individual receives a better compensation for his productivity in a developed economy rather than in a developing economy with an inefficient anonymous market. It is clear from empirical evidence that there is a negative correlation between corruption and economic development. However, economic development is a major goal that involves many complex processes including the creation of reliable institutions and cannot be interpreted simply as a tool to reduce corruption. Moreover, it takes a few generations to move from a traditional economy to a modern and productive one. Therefore, even when the government can adopt measures that promote growth and development, there are many factors involved in the process,
and relevant improvements can only be obtained in the long term. In our model, corruption is not affected by the absolute level of economic or market development, but rather by the relative gains that can be obtained in the two sectors of the economy. These relative gains are in turn determined by productivity in the formal sector and the strength of social networks in the informal sector.

Therefore, the only variable that the government may be able to use as a tool to reduce corruption is its ability to punish corrupt activities. This is a factor that can be modified in the short term by specific investments in detection technology, training, etc. There are of course budget limitations for each country, but the investment required would be small compared to those required to significantly increase economic development or to change the cultural perceptions of the whole population. In our model, the variable \( p \) can also be interpreted as the ability required from authorities to avoid an equilibrium in which no formal sector is developed. This value of \( p \) can be obtained from Conditions 1 and 2. The different equilibria obtained in our model show how the ability of authorities to punish corruption can save the economy from reaching equilibria in which all agents join the informal sector. An efficient legal system, high \( p \), can avoid the equilibria presented in Figures 3 and 4, and make the economy reach instead the equilibria in Figures 1 and 2, respectively. In the same way, the imposition of high penalties can avoid the equilibrium in Figure 4 and make the economy reach the case represented in Figure 5. Therefore, the size of the penalty imposed to an agent charged with corruption is important. The level of corruption is always decreasing in \( f \), and changing \( f \) involves a small cost. As a result, the government can reduce the level of corruption by a simultaneous increase in both \( p \) and \( f \).

Finally, we would like to comment about the role of the strength of social networks, which determines the potential gains in the informal sector and, therefore, the relative gains in the two sectors of the economy. The potential gains from trading through networks are mainly determined by social and cultural factors. The success of trading and other activities in the informal economy is based in the use of social networks and personal relationships that foment trust and cooperation. It has been recognised that social networks are useful to facilitate business activities, reduce transaction costs, and deal with problems of information in the absence of reliable institutions\(^{14}\). However, at the same time, social networks may have negative effects in the economy, such as the creation of exclusive groups that alienate some productive agents and fragment markets\(^{15}\). Moreover, the existence of an informal sector that uses social networks extensively, may complicate the creation and development of an anonymous market and of formal institutions\(^{16}\).

\(^{14}\) For examples of the positive economic effects of social networks see Arnott and Stiglitz (1991), Greif (1993), and McMillan and Woodruff (1999), among others.

\(^{15}\) See Kranton (1996b), Taylor (2000), and Lovett, Simmons, and Kali (2001).

\(^{16}\) See Kali (1999), Ghatak and Kali (2000), and Rauch (2001).
Normally, the existence of strong and long term relationships among members of the same social group results in deep feelings of obligation towards one another. We consider that a strong desire to reciprocate and favour individuals that belong to the same group may be an important motivation for individuals to engage in corrupt activities and the misallocation of resources. In terms of our model, an agent that receives a favour would normally be willing to take advantage of the opportunity to misallocate resources that allow him to repay some favours he owes from the past or to get other agents to reciprocate to him in the future. On the other hand, this would not be the case for a productive agent who is able to obtain contracts and resources based on his own abilities without the need to exchange favours with other agents. Since the gains obtained in the informal economy are influenced by the social structure and by cultural values related to familism and community interaction, there is no much that can be done by the government to modify the incentives of agents to become traders and make extensive use of social networks.

Some authors have mentioned the case of Singapore as a successful example in which the government has been able to reduce corruption. The government of Singapore imposed strict and strongly enforced anti corruption laws that have been applied during the last 40 years. However, the experiments performed by Cameroon et al. (2005) showed that even when corruption has been reduced, the population in Singapore continues to exhibit a high tolerance towards corruption compared with other countries with the same level of perceived corruption. This is an example in which the government has increased his ability to punish and reduce corruption, but has not been able to change the cultural attitudes towards corruption. This case coincides with the above considerations.

3 Empirical Evidence

3.1 Data and Methods

To test the implication of our model we performed regressions on data from multiple sources that are detailed below. In order to increase the robustness of our results, we maximize the number of countries considered by using list-wise deletion individually for each variable, we use first principal components to analyze data reported by the World Values Survey, and we use averages over long periods of time for all the variables considered. Also, following Jong-sung and Khagram (2005), and in order to remark the direction of causality, we consider data corresponding to 2004 and previous years for our explanatory variables, and from 2004 onwards for the level of corruption. Finally, we use two-stage least squares methods with instrumental variables to verify the direction of causality for the main variables of
3.1.1 Main Explanatory Variables of the Model

Level of corruption, the main variable of this analysis is the Corruption Perception Index (CPI) reported by Transparency International. We use the average value for the index during the period 2004-2008. This index represents a ‘poll of polls’ and is the most frequently used index in empirical studies of corruption\textsuperscript{17}. The value of the CPI index is normally reported ranging from 0 for a completely corrupt country to 10 for a completely honest country. We adjusted the index, and in our regressions the level of corruption increases from 0 to 10. We use this variable as a proxy for the level of corruption represented by $\kappa = \frac{1}{2} \mu (1 - \mu)$ in our theoretical model.

For the two cultural variables that appear in our model, we use data from the four waves of the cross-national 1999-2004 World Values Survey. Three of the four questions that we selected to represent achievement motivation and the prominence of social networks are related to the qualities that parents consider the most important for children to learn at home. For each country we use the proportion of respondents that mention (do not mention) the relevant quality.

Social Networks, we consider that strong relationships, familism, and feelings of obligation toward members of the same group are all elements that increase the effectiveness of favour exchange and the productivity of trade in social networks. We selected two qualities from the World Values Survey questions: the proportion of respondents that do not consider that children should learn to be independent, and the proportion that do not mention that children should learn to be tolerant and to respect different people. We consider that tolerance towards people that belongs to a different social group, race, or religion reduces particularism and the exclusive concern for members of the same group that normally involves indifference or dislike for the rest of the society. In our analysis, we obtain averages of the data available for the different waves. Then, we construct the first principal component of the answers to the two questions selected. Therefore, the first main component, which we call social networks, increases for societies where networks play a prominent role. That is, a high value of our variable represents economies where individuals lack independence from the parents and have low tolerance and respect for people that do not belong to their main social group. This results in a high level of familism that sets an ideal environment for the flourishing of social networks and trade in the informal economy. According to Banfield’s (1958) theory of amoral familism and to our theoretical model, an increase in the strength of

\textsuperscript{17}See Treisman (2000), Paldam (2002), and Jong-Sung and Khagram (2005), among others.
social networks and the productivity of trade through networks, \( \alpha \), should result in an increase in the level of corruption.

*Achievement motivation*, we repeat the process described above and create a new variable using the first main component of two questions from the World Values Survey. The answers to the first question correspond the proportion of respondents that mention hard work as an important quality that children must learn at home. The answers to the second question correspond to the proportion of respondents that do not mention that hard work should become less important for their society in the future. Therefore, the first principal components of this variables increases for societies with a high level of achievement motivation. In our theoretic model, this factor is considered from the opposite point of view, that is, as the value that agents give to leisure time or as the lack of achievement motivation, \( \gamma \). According to our model and to Merton’s (1957) means-ends schema, corruption should increase with achievement motivation.

*GDP*, we use economic development as a proxy for productivity in the formal sector. We use data for GDP per capita reported for the period 1994-2003 by the Summers and Heston Penn World Tables to represent the parameter \( \beta \) in our model. According to our theoretical results, it is expected that the level of corruption should increase for low values of GDP and then, after reaching a threshold, decrease with the value of GDP.

*Rule of law*, we use the scores for Property Rights reported as one of the ten elements considered by The Heritage Foundation and the Wall Street Journal for the computation of the Index of Economic Freedom. We use the average of the values reported for the period 1999-2003. The score for Property Rights represents the effectiveness of the judicial system to secure the private property of citizens from expropriation or theft. Therefore, it is a good representation of the ability of authorities to punish corruption. An important advantage of this index, as opposed to other alternatives, is the fact that its calculation does not involve any of the polls used in the calculation of the CPI index, which would otherwise result in an important correlation problem. According to our model corruption should increase for low values of \( \rho \) and decrease with further increases in the rule of law.

3.1.2 Control Variables

In our analysis, we control for the variables that are normally accepted as causes of corruption.

*Proportion of Protestants*, different studies have shown that this variable has an important influence on the level of corruption and there are alternative explanations that have been proposed. Firstly, Protestantism may reduce corruption because of its association with individualistic and non-familistic relationships (Lipset and Lenz, 2000). Secondly, according to Weber, the Protestant work ethic
makes agents less willing to be corrupt. However, it seems that many effects of
the Protestant work ethic reverse once a country is completely developed and the
basic needs of agents have been covered. Finally, non Protestant Churches such
as the Catholic, Anglican and Orthodox Churches tend to be more hierarchical.
Therefore, it seems that Protestants are more willing to denounce corrupt activities
performed by authorities and office-holders (Treisman, 2000). The data on reli-
gious affiliation that we use comes from La Porta et al. (1999). We ran regressions
for the different religions reported by La Porta: Protestants, Catholics, Muslims,
and others. However, only the proportion of Protestants remained relevant once
we controlled for other variables. We expect corruption to be lower in countries
with a high proportion of Protestants.

*Ethnic Fractionalization*, since corrupt deals cannot be enforced by courts, eth-
nic communities can provide information and collective punishment to agents that
betray other members of the group, which enhances the credibility of corruption
partners’ commitments (Fearon and Laitin, 1996). Therefore, it is considered that
fractionalized societies are more likely to suffer from high levels of corruption.
We use the values reported by Alesina et al. (2003). A value of 0 represents an
homogeneous society while a value of 1 represents a society that is completely
fractionalized.

Finally, for our last two variables we use data published in the Human Devel-
opment Reports for the United Nations Development Programme.

*Literacy rate*, we use the proportion of literate adults (age 15 and above) in
the different countries and obtain the average for the values reported during the
period 1999-2003. It is assumed that a higher literacy rate results in lower levels
of corruption.

*Gini coefficient*, this index of inequality ranges from 0 to 1 and we consider the
average of data reported during 2001-2003. According to Jong-sung and Khagram
(2005), inequality makes it easier for wealthy individuals to engage in corruption
while it makes the poor more vulnerable to extortion and it decreases their abil-
ity to monitor powerful individuals. They also argue that inequality affects the
perception about the legitimacy of institution and makes people more tolerant to
corruption. Therefore, it would be expected that more inequality results in higher
levels of corruption.

### 3.1.3 Instrumental Variables

Our theoretical model present a plausible explanation for the level of corruption
based on three main variables: productivity in the formal sector, the ability of
authorities to punish corruption, and achievement motivation. Additionally, we
incorporate in our analysis the strength of social networks that determines pro-
ductivity in the informal sector. Therefore, we use instruments for each of these
variables to provide evidence of the direction of causality.

*Latitude*, following Treisman (2000) and Jong-Sung and Khagram (2005), we use the absolute value of latitude as an instrument for economic development. We use the data reported by La Porta et al. (1999). There is no causality from corruption to the latitude of any country, and at the same time climates and diseases associated with the distance from the equator influence the level of economic development. Therefore, this can be expected to be a good instrument.

*Legal origin*, we use this historical variable, which represents the origin of the legal system used in each country, as an instrument for the ability of authorities to punish corruption. There are five possible origins considered: English, Socialist, French, German, and Scandinavian. We consider that the structure of the legal system used in each country has an influence on its efficiency, while at the same time, the current level of corruption has no influence on the historical reasons for the implementation of a specific legal system in each country. The data comes from La Porta et al. (1999).

*Pronoun drop licence*, we use it as an instrument for our two cultural variables. The same variable has been used in different studies as an instrument for cultural qualities such as embeddedness, autonomy, the strength of family ties, trust, and respect (Licht, Goldschmidt, and Schwartz, 2007; Alesina and Giuliano, 2007; Tabellini, 2008). The data comes from Kashima and Kashima (1998), where they report rules related to pronoun use for 39 dominant languages. They argue that languages that forbid dropping the first-person pronoun, emphasize the role of the speaker as an individual against his social context. Therefore the variable is highly correlated with the level of individualism that exist in different countries and cultures. It would be expected that amoral familism, particularism, and other phenomena that results from the existence of strong social networks, would be found more frequently in countries that allow the first-person pronoun to be dropped.

### 3.2 Results and Interpretations

#### 3.2.1 Simple Non-linear OLS Regressions

In order to verify the relationship between corruption and the main variables of our theoretical model, we begin with simple OLS regressions of the form

\[
\kappa = \phi_1 + \phi_2 x + \phi_3 x^2 + \varepsilon
\]

Table 1 presents the regressions for the four determinants of corruption analysed in Section 2.4. Firstly, in column 3, the regression for the rule of law shows that corruption is a concave function that increases for low values of \( p \) and decreases
for high values of $p$. This result confirms the functional form obtained in the simulation presented in Figure 8. Secondly, the regression for GDP appears in column 6 and shows that corruption is a convex function that decreases with the level of development of the economy. This result coincides with the behaviour of corruption for high values of $\beta$, specifically for $\beta > 5.3$ in Figure 9. This is due to fact that low values of $\beta$ represent economies in which the productivity in the formal and informal sector is very similar, that is, highly underdeveloped economies. This cases may appear, for example, in small communities and traditional tribes. However, since the data we analyse corresponds to national level, all the economies we consider correspond to at least an intermediate level of development that is interpreted in our model as a relatively high level of $\beta$. Next, column 9 shows that corruption is a concave function that increases with achievement motivation as shown by the simulation presented in Figure 10. Finally, the regressions in columns 10 and 12 show that corruption is increasing in the strength of social networks. Column 12 shows that there is a quadratic component that is not statistically significant ($p = 0.11$). However, this component becomes significant in the multivariate regressions presented in the next section. This result confirms the functional form presented in Figure 11, which presents a simulation of corruption as an increasing concave function of $\alpha$.

Figures A.1 to A.4 in the appendix provide scatter plots of the level of perceived corruption versus the rule of law, GDP per capita, achievement motivation, and social networks. All the figures include a quadratic fitted curve that corresponds to the regressions in columns 3, 6, 9, and 12 in Table 1\textsuperscript{18} and to Figures 8 to 11 in Section 2.4.

\textsuperscript{18}In order to include the constant term obtained in the regressions, we do not use beta coefficients in these figures and the values reported differ from those presented in table 1.
Table 1: Simple OLS Regression Results

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Notes: Standardized beta coefficients are presented. Heteroskedasticity-robust standard errors are presented in parentheses.

* p<.10, **p<.05, ***p<.01
3.2.2 Multivariate Non-linear OLS Regressions

In this section we present non-linear OLS regressions for different combinations of the main explanatory and control variables mentioned in Section 2.4. In all our tables we report standardized beta coefficients, which allows us to assess by direct comparison which regressor has the greatest influence on the level of corruption. All the control variables are significant at the 1% level and have coefficients with the expected sign when considered in bivariate linear regressions for the level of corruption. However, as the variables are paired with GDP or the rule of law, the proportion of Protestants, literacy, and the Gini coefficient stop being statistically significant, and the sign of the coefficient for ethnic fractionalization changes.

Table 2 presents results from multivariate regression for different combinations of the regressors under study. The main variables of the theoretical model and their quadratic terms are included in the regressions, with the exception of the linear term for the Rule of Law, which is not statistically significant in the multivariate regressions. Columns 1 to 5 include some commonly accepted causes of corruption as control variables and the results show that these variables are not statistically significant once our cultural variables are included in the regression. These columns include the proportion of Protestants in the economy, ethnic fractionalization, literacy, and the Gini coefficient as control variables. Column 1 includes all the control variables, and Columns 2 to 5 present the results when each of the control variables is eliminated from the set of regressors. In all these columns the same results can be observed: on the one hand Protestantism, literacy rate, and the Gini coefficient are not statistically significant and, on the other hand, the coefficients for ethnic fractionalization have the wrong sign. Finally, column 6 presents the regression in which the cultural and economic variables of our theoretical model are considered without any control variable. This regressions emphasize the relevance of both social networks and achievement motivation. Both variables have a higher level of significance than GDP, which most studies mention among the most important factors in the determination of corruption (Treisman, 2000; Paldam, 2002; Licht, Goldschmidt and Schwartz, 2007). Even when some studies mention that the proportion of Protestants, ethnic fractionalization, literacy rate, and the Gini coefficient are relevant determinants of the level of corruption (Jongsung and Khagram, 2005; Paldam 2002; Treisman, 2000), they are not significant in our regressions. This does not mean that these variables are not important for understanding corruption, but rather that the cultural variables may be even more relevant.

As can be seen in Table 2, countries in which social networks are important for economic activity and countries with a high level of achievement motivation will tend to have higher levels of corruption. At the same time, the coefficients for the economic variables of the theoretical model also have the expected sign in all the
### Table 2: Multiple OLS Regression Results

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<th>(6)</th>
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<td><strong>Rule of Law</strong></td>
<td>-0.337***</td>
<td>-0.338***</td>
<td>-0.336***</td>
<td>-0.335***</td>
<td>0.332***</td>
<td>-0.336***</td>
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<tr>
<td></td>
<td>(-0.553)</td>
<td>(0.551)</td>
<td>(0.599)</td>
<td>(0.539)</td>
<td>(0.534)</td>
<td>(0.567)</td>
</tr>
<tr>
<td><strong>GDP</strong></td>
<td>-0.363**</td>
<td>-0.365**</td>
<td>-0.306*</td>
<td>-0.392**</td>
<td>-0.391**</td>
<td>-0.342**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td><strong>GDP</strong>&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.237**</td>
<td>0.243**</td>
<td>0.180</td>
<td>0.255**</td>
<td>0.248**</td>
<td>0.205*</td>
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<tr>
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<td>(0.000)</td>
<td>(0.000)</td>
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</tr>
<tr>
<td><strong>Achievement M.</strong></td>
<td>0.224***</td>
<td>0.214***</td>
<td>0.210***</td>
<td>0.221***</td>
<td>0.210***</td>
<td>0.194***</td>
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<tr>
<td></td>
<td>(0.114)</td>
<td>(0.113)</td>
<td>(0.143)</td>
<td>(0.113)</td>
<td>(0.110)</td>
<td>(0.116)</td>
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<tr>
<td><strong>Achievement M.&lt;sup&gt;2&lt;/sup&gt;</strong></td>
<td>0.083**</td>
<td>0.084***</td>
<td>0.070*</td>
<td>0.081*</td>
<td>0.078*</td>
<td>0.069*</td>
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<tr>
<td></td>
<td>(0.054)</td>
<td>(0.053)</td>
<td>(0.055)</td>
<td>(0.053)</td>
<td>(0.055)</td>
<td>(0.052)</td>
</tr>
<tr>
<td><strong>Social Networks</strong></td>
<td>0.318***</td>
<td>0.342***</td>
<td>0.309***</td>
<td>0.317***</td>
<td>0.321***</td>
<td>0.337***</td>
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<tr>
<td></td>
<td>(0.131)</td>
<td>(0.117)</td>
<td>(0.143)</td>
<td>(0.131)</td>
<td>(0.124)</td>
<td>(0.121)</td>
</tr>
<tr>
<td><strong>Social Networks</strong>&lt;sup&gt;2&lt;/sup&gt;</td>
<td>-0.087*</td>
<td>-0.102***</td>
<td>-0.797*</td>
<td>-0.083*</td>
<td>-0.089**</td>
<td>-0.094***</td>
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<td></td>
<td>(0.055)</td>
<td>(0.046)</td>
<td>(0.058)</td>
<td>(0.053)</td>
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<td>(0.040)</td>
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**Control Variables:**

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<tr>
<td>Protestants</td>
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<td>-0.037</td>
<td>-0.037</td>
<td>-0.031</td>
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<td></td>
<td>(0.430 )</td>
<td>(0.478 )</td>
<td>(0.428 )</td>
<td>(0.420 )</td>
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<td>Ethnic Frac.</td>
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<td>-0.067*</td>
<td>-0.065*</td>
<td>-0.059*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.343 )</td>
<td>(0.351 )</td>
<td>(0.346 )</td>
<td>(0.329 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literacy Rate</td>
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<td>-0.018</td>
<td>-0.013</td>
<td>-0.015</td>
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<tr>
<td></td>
<td>(0.534 )</td>
<td>(0.529 )</td>
<td>(0.628 )</td>
<td>(0.521 )</td>
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</tr>
<tr>
<td>Gini Coefficient</td>
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<td>0.021</td>
<td>0.006</td>
<td>0.022</td>
<td></td>
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<tr>
<td></td>
<td>(0.781 )</td>
<td>(0.773 )</td>
<td>(0.817 )</td>
<td>(0.778 )</td>
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<tr>
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<td>68</td>
</tr>
<tr>
<td>R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Notes: Standardized beta coefficients are presented. Heteroskedasticity-robust standard errors are presented in parentheses. * p<.10, **p<.05, ***p<.01
### Table 3: IV 2SLS second stage regression results for the Rule of Law regressions.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule of Law</td>
<td>2.545***</td>
<td>1.690**</td>
<td>2.419***</td>
<td></td>
<td></td>
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<tr>
<td>IV: Legal origin</td>
<td>(8.466)</td>
<td>(8.018)</td>
<td>(7.785)</td>
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<td></td>
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<tr>
<td>Rule of Law^2</td>
<td>-3.321***</td>
<td>-2.331***</td>
<td>-3.077***</td>
<td>-0.446*</td>
<td>-0.729***</td>
</tr>
<tr>
<td>IV: Legal origin^2</td>
<td>(7.248)</td>
<td>(8.078)</td>
<td>(6.708)</td>
<td>(2.255)</td>
<td>(1.492)</td>
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<td>Control variables:</td>
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<td>GDP</td>
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</tr>
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<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>GDP^2</td>
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<td></td>
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<tr>
<td>Protestants</td>
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<td>-0.111**</td>
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<td></td>
<td></td>
<td>(0.609)</td>
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<tr>
<td>Social Networks</td>
<td></td>
<td>0.416***</td>
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<td></td>
<td></td>
<td>(0.226)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Social Networks^2</td>
<td></td>
<td>-0.080**</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(0.046)</td>
<td></td>
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</tr>
<tr>
<td>Achievement Mot.</td>
<td></td>
<td>0.279*</td>
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<tr>
<td></td>
<td></td>
<td>(0.263)</td>
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<tr>
<td>Achievement Mot.^2</td>
<td></td>
<td>-0.082**</td>
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<tr>
<td></td>
<td></td>
<td>(0.045)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>N</td>
<td>154</td>
<td>154</td>
<td>154</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>R^2</td>
<td>0.65</td>
<td>0.80</td>
<td>0.65</td>
<td>0.94</td>
<td>0.92</td>
</tr>
</tbody>
</table>

Notes: Standardized beta coefficients are presented. Heteroskedasticity-robust standard errors are presented in parentheses. * p < .10, ** p < .05, *** p < .01.

3.2.3 Identifying causality

We use instrumental variables in two-stage least squares (2SLS) regressions to assess causality for the main explanatory variables of our theoretical model. In each case we use as instrument a variable that is related to our regressor but not directly to the level of corruption (other than through our explanatory variable). We also verified that our instruments satisfied the required statistical properties for the first stage of the 2SLS with F-statistics larger than 10 for all regressions and individual t-statistics larger than 3.3 for the bivariate regressions. Finally, the control variables considered in Section 3.2.2 where included in the 2SLS regression and the only statistically significant control variable is the proportion of Protestants,
but only when the cultural variables are not included in the same regression. Just as we did in previous sections, we report standardized beta coefficients in all the tables.

Table 3 presents the second stage results for the Rule of Law. Since we do not include data from the World Value Survey in columns 1 to 3 we are able to use observations for 154 countries. These columns show regressions for the linear and quadratic terms of the rule of law instrumented by the five possible legal origins described in Section 3.1.3. The signs of the coefficients for both terms coincide with those in column 3 of Table 1, and all terms are significant at the 1% level, except for the linear term in column 2, which is significant at the 5% level. Column 2 controls for GDP and GDP$^2$, and column 3 controls for the proportion of Protestants. When the cultural variables are included in columns 4 and 5, only the quadratic term for the rule of law is significant and its sign agrees with the one in column 2 of Table 1. Column 4 controls for GDP, Social Networks, and Social Networks$^2$, and column 5 controls for the linear and quadratic terms for Achievement Motivation. The coefficients for all the control variables used in Table 3 have the expected sign. These results show a significant influence of the rule of law in the level of corruption.

### Table 4: IV 2SLS second stage regression results for GDP

<table>
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<th>Level of Corruption</th>
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<th>(4)</th>
<th>(5)</th>
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<tbody>
<tr>
<td>GDP</td>
<td>-1.019***</td>
<td>-0.837***</td>
<td>-0.800***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP$^2$</td>
<td>-1.213***</td>
<td></td>
<td>-1.047***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td></td>
<td></td>
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<td>Control variables:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule of Law</td>
<td>-0.142</td>
<td>-0.75</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(1.204)</td>
<td>(1.765)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule of Law$^2$</td>
<td></td>
<td>-0.174</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.352)</td>
<td>(1.865)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protestants</td>
<td>-0.148***</td>
<td>-0.142***</td>
<td>-0.118</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.495)</td>
<td>(0.563)</td>
<td>(0.858)</td>
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<tr>
<td>N</td>
<td>154</td>
<td>154</td>
<td>154</td>
<td>154</td>
<td>154</td>
</tr>
<tr>
<td>R$^2$</td>
<td>0.74</td>
<td>0.45</td>
<td>0.81</td>
<td>0.83</td>
<td>0.59</td>
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Notes: Standardized beta coefficients are presented. Heteroskedasticity-robust standard errors are presented in parentheses. * p<.10, ** p<0.05, *** p<.01
<table>
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<tr>
<th></th>
<th>(1)</th>
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<th>(6)</th>
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<td>Achievement Mot.</td>
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<tr>
<td>IV: Pronoun drop</td>
<td>(0.144)</td>
<td></td>
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<tr>
<td>Achievement Mot.²</td>
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<td>-0.384*</td>
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<tr>
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<td>Social Networks</td>
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<tr>
<td>IV: Pronoun drop</td>
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<td>(0.291)</td>
<td>(0.326)</td>
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<td>-0.245**</td>
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<td>Rule of Law²</td>
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<tr>
<td>GDP</td>
<td>-0.383***</td>
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<td>-0.440*</td>
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<td>(0.000)</td>
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<td>GDP²</td>
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<tr>
<td>Achievement Mot.</td>
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<td>0.281***</td>
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<td>(0.168)</td>
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<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>R²</td>
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<td>0.87</td>
<td>0.89</td>
<td>0.91</td>
<td>0.91</td>
<td>0.91</td>
<td>0.94</td>
</tr>
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</table>

Notes: Standardized beta coefficients are presented. Heteroskedasticity-robust standard errors are presented in parentheses. * p<.10, **p<.05, ***p<.01

Table 5: IV 2SLS second stage regression results for cultural variables
Table 4 contains the 2SLS second stage regressions for GDP. The linear and quadratic terms for GDP are significant only when considered in separated regressions. Columns 1, 3, and 4 instrument GDP with the absolute value of latitude, and columns 2 and 5 instrument GDP$^2$ with the squared value of latitude. All the coefficients for GDP are significant at the 1% level in the expected direction as presented in columns 4 and 5 of Table 1. Additionally, columns 3 and 5 control for the rule of law and the proportion of Protestants, and column 4 controls for rule of law squared and Protestants. All the control variables have coefficients with the expected sign.

Table 5 presents the 2SLS second stage regression results for the two cultural variables of our theoretical model. Since we only have a single instrument, the pronoun drop rule that always takes integer values, we are unable to instrument the linear and quadratic terms simultaneously due to collinearity problems. Column 1 instruments achievement motivation with the first-person pronoun drop licence rule, and columns 2 and 3 instrument achievement motivation squared with the corresponding squared values for the pronoun drop rule. The coefficients for the instrumented variables are statistically significant in the expected direction, as shown in columns 7 and 8 in Table 1. Column 3 controls for rule of law and GDP, both of which are significant at the 1% level in the expected direction. Then, columns 4, 6 and 7 use the pronoun drop rule as an instrument for Social Networks and column 5 instruments Social Networks squared with the pronoun drop rule squared. Column 6 shows that social networks continue to be significant when we control for GDP and GDP$^2$. Column 7 includes a cultural and a non-cultural control variables: the rule of law and achievement motivation. Instrumented social networks are significant at the 1% level for regressions 4 to 7 in the expected direction as shown in columns 10 and 11 of Table 1. These regressions confirm the statistically significant causal effect that runs from cultural qualities to corruption.

Finally, Table 6 presents the results for the second stage of the 2SLS regressions in which we consider more than one instrumented variable at a time. Column 1 instruments rule of law, rule of law squared, and GDP in the same regression and shows that the signs of the coefficients agree with our hypotheses. Columns 2 to 4 present the regressions for instrumented rule of law squared and social networks, with and without controlling for GDP$^2$ and achievement motivation. All the instrumented variables in columns 2 to 4 are significant at the 1% level, except for the rule of law squared in Column 3, which is significant at the 5% level. This last set of regressions is evidence of the robustness of our results and the strong influence that the variables considered in our model have on the determination of the level of perceived corruption in different countries.
<table>
<thead>
<tr>
<th>Level of Corruption</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule of Law</td>
<td>1.443</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: Legal origin</td>
<td>(8.795)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule of Law²</td>
<td>-1.878*</td>
<td>-0.438***</td>
<td>-0.396**</td>
<td>-0.399***</td>
</tr>
<tr>
<td>IV: Legal origin²</td>
<td>(9.146)</td>
<td>(1.295)</td>
<td>(1.818)</td>
<td>(1.159)</td>
</tr>
<tr>
<td>GDP</td>
<td>-0.508*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: Latitude</td>
<td>(0.000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Networks</td>
<td>0.584***</td>
<td>0.566***</td>
<td>0.473***</td>
<td></td>
</tr>
<tr>
<td>IV: Pronoun drop</td>
<td>(0.231)</td>
<td>(0.215)</td>
<td>(0.230)</td>
<td></td>
</tr>
<tr>
<td>Social Networks²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: Pronoun drop²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Variables:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP²</td>
<td></td>
<td>-0.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievement Motiv.</td>
<td></td>
<td></td>
<td>0.175*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.180)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>154</td>
<td>56</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>R²</td>
<td>0.78</td>
<td>0.93</td>
<td>0.93</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Notes: Standardized beta coefficients are presented. Heteroskedasticity-robust standard errors are presented in parentheses. * p < .10, ** p < .05, *** p < .01

Table 6: IV 2SLS second stage regression results for multiple instrumented variables
4 Conclusion

We study the influence of cultural and economic factors in the level of corruption that prevails in different countries. Our model provides the first theoretical representation of the means-ends schema (Merton, 1957) and the amoral familism framework (Banfield, 1958), two important alternative approaches used to analyse the influence of culture on corruption. The former argues that achievement motivation promotes corruption and the later proposes particularism as one of the main reasons for the appearance of corruption. We integrate the main ideas from both theories in a single framework, and we also include in the analysis the level of economic development and the ability of authorities to punish corruption.

We develop an equilibrium model in which agents choose how to allocate their time between productive activities and leisure, and also decide whether to trade in the formal or in the informal sector of the economy. Based in the main variables of our model, we characterize the different equilibria that can be obtained. Our results imply, as expected, that traditional countries with high levels of achievement motivation, economic activity based on personal relationships, and an underdeveloped market provide the conditions for high levels of corruption. At the same time, due to the nature of the factors considered in our model, the only tools available for authorities to lower the level of corruption, are their ability to detect and punish corrupt activities and the penalty imposed for corrupt agents.

The second part of our paper presents an empirical analysis in which we use data from both economic indicators and surveys to verify the effects that the variables considered in our model have on the level of corruption. Our regression estimates coincide with the main theoretic results. On the one hand, for sufficiently high levels of economic development and of the ability of the authorities to punish corruption, the level of corruption decreases with both variables. On the other hand, countries with strong achievement motivation and countries in which social networks play a prominent role are the ones that suffer from higher levels of corruption. After presenting the evidence from non-linear regressions, we use instrumental variables in two-stage least squares regressions to verify causality from our main explanatory variables to corruption. The results for causality confirm our hypotheses.

5 Appendix

Proof of Proposition 1. Let \( \mu = 0 \), if \( V(0) = V_M(0) - V_N(0) > 0 \), then not all agents choose to trade in the network economy. From equation (4), \( V(0) = \frac{1}{2}p^2\beta^2 - \frac{1}{2}p\beta\gamma + \frac{1}{2}\gamma^2 + \gamma \), which is positive if
\[ \frac{1}{8}b^2 \beta^2 - \frac{1}{2} \gamma p \beta + \gamma - \frac{1}{2} > 0 \]  \hspace{1cm} (5)

Which can be written as \( \frac{1}{8} (p \beta - 2) (-4 \gamma + p \beta + 2) > 0 \).

a) If both \( p \beta > 2 \) and \( \gamma < \frac{1}{4} p \beta + \frac{1}{2} \), which correspond to Conditions 1 and 2, are satisfied, then \( V(0) > 0 \).

b) If neither Condition 1 nor Condition 2 are satisfied, such that \( p \beta < 2 \) and \( \gamma > \frac{1}{4} p \beta + \frac{1}{2} \), then \( V(0) > 0 \). ■

**Proof of Proposition 2.** Let \( \mu = 1 \), then from equation (4) \( V(1) = V_M(1) - V_N(1) = p \beta^2 - \frac{1}{2} \beta^2 + \frac{1}{2} fp - p \beta \gamma > 0 \) if

\[ p \geq \frac{\beta^2}{f + 2 \beta (\beta - \gamma)} \]  \hspace{1cm} (6)

Now, let \( V(0) > 0 \) due to any of the two cases considered in Proposition 4. Two cases arise:

i) If equation (6) is satisfied, then \( V(\mu) > 0 \) for all \( \mu \in [0, 1] \) and the only equilibrium is \( \mu = 1 \).

ii) If equation (6) is not satisfied, then there is a \( \hat{\mu} \in (0, 1) \) such that \( V(\hat{\mu}) = 0 \).

As a result, \( V(\mu) > 0 \) for \( \mu \in [0, \hat{\mu}) \) and \( V(\mu) < 0 \) for \( \mu \in (\hat{\mu}, 1) \). The unique equilibrium is \( \mu = \hat{\mu} \). ■

**Proof of Proposition 3.** Let \( V(0) < 0 \) due to any of the two cases considered in Proposition 4. Then at \( \mu = 0 \) the utility obtained from trading in the network economy is higher than the utility obtained in the market, every agent chooses to trade in the network economy, and \( \mu = 0 \) is an equilibrium. Three cases arise:

i) If equation (6) is satisfied, then there is a \( \bar{\mu} \in (0, 1) \) such that \( V(\bar{\mu}) = 0 \).

As a result, \( V(\mu) < 0 \) for \( \mu \in [0, \bar{\mu}) \) and \( V(\mu) > 0 \) for \( \mu \in (\bar{\mu}, 1) \). The second equilibrium is \( \mu = \bar{\mu} \).

ii) If Condition (3) is not satisfied, then \( V(0) < 0 \) and \( V(1) < 0 \). If additionally, there is no \( \bar{\mu} \in (0, 1) \) such that \( V(\bar{\mu}) > 0 \), then \( V(\mu) < 0 \) for all \( \mu \in [0, 1] \), and \( \mu = 0 \) is the only equilibrium.

iii) If Condition (3) is not satisfied, then \( V(0) < 0 \) and \( V(1) < 0 \). From equation (4), \( V(\mu) \) is a quadratic function of the form \( V(\mu) = a \mu^2 + b \mu + c \).

Therefore, it is possible to obtain the roots of the equation \( a \mu^2 + b \mu + c = 0 \) as \( \frac{-b \pm \sqrt{b^2 - 4ac}}{2} \). If \( b^2 - 4ac \leq 0 \), then there is at most one solution to \( a \mu^2 + b \mu + c = 0 \), \( V(\mu) < 0 \) for all \( \mu \in [0, 1] \), and \( \mu = 0 \) is the unique equilibrium as determined in case (ii) above. However, if \( b^2 - 4ac > 0 \), then equation \( a \mu^2 + b \mu + c = 0 \) has two solutions, \( \underline{\mu} \) and \( \overline{\mu} \). If \( \underline{\mu}, \overline{\mu} \in (0, 1) \), then \( V(\mu) < 0 \) for \( \mu \in [0, \underline{\mu}) \cup (\overline{\mu}, 1] \), \( V(\mu) > 0 \) for \( \mu \in (\underline{\mu}, \overline{\mu}) \), and there are two equilibria, \( \mu = 0 \) and \( \mu = \overline{\mu} \). ■
Figure A.1 $\text{Corruption} = 7.04 + 5.46 \text{ Rule of Law} - 12.62 \text{ Rule of Law}^2$

Figure A.2 $\text{Corruption} = 7.95 - (2.82e-04) \text{ GDP} + (2.70e-09) \text{ GDP}^2$
Figure A.3 \( \text{Corruption} = 5.33 + 1.52 \, \text{Motivation} - 0.15 \, \text{Motivation}^2 \)

Figure A.4 \( \text{Corruption} = 5.24 + 1.56 \, \text{Social Networks} - 0.12 \, \text{Social Networks}^2 \)

References


