Corruption and the Effects of Economic Freedom

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Abstract

The predictions that economic freedom is beneficial in reducing corruption have not been found to be universally robust in empirical studies. The present work reviews this relationship by using firms' data in a cross-country survey and argues that approaches using aggregated data have not been able to explain it appropriately. Our purpose is, first to model cross-country variations of the micro-founded economic freedom-corruption relationship using multilevel models. Additionally, we analyze this relationship by disentangling the determinants for several components of economic freedom because not all areas affect corruption equally. The results show that the extent of the macro-effects on the measures of (micro)economic freedom for corruption, identified by the degree of economic and institutional development of a country, can explain why a lack of competition policies and government regulations may yield more corruption. Our conjectures are confirmed by estimations for Africa and transition economy subsamples.

JEL : H10; H11; H50; K20; O5

Keywords: Corruption, economic freedom, multilevel models

1. Introduction

The failure of markets is a classic justification for government intervention in the economy. In reality, governments often intervene in markets that are not at all affected by failure or imperfections. Misguided government policies interfering with efficient markets have been a central concern to economists for a long time and great efforts have been made to document that the effects of the excess of regulation may cause seeking of privileges, hampering of free private entrepreneurial activity, and dejection in international exchanges. This signifies that diminishing these effects could be sufficient to reduce government intervention.

This perspective has also been extended for corruption phenomena. As argued by Acemoglu and Verdier (2000), government intervention transfers resources to the private sphere creating room for corruption. This view also sustains "that extensions of privatization and market competition are an effective cure for a corrupt state". However, as noted by Hodgson and Jiang (2007), corruption may be the reason why market failure exists. Interests of powerful sectoral lobbies can lead policy makers into inefficient actions or make them unresponsive to specific requests to regulate sectors.

In this line of research, much attention has been recently devoted to testing the relationship between economic freedom and corruption under the predictions that economic freedom is beneficial in reducing corruption. However, as corruption data are largely available at the aggregate (country) level, existing research has focused on explaining economic relationships in a cross-country context. Empirical tests have been found in line with the theoretical hypothesis (Chafuen and Guzmàn, 2000; Paldam, 2002; Graeff and Mehlkop, 2003; Shen and Williamson, 2005; Carden and Verdon, 2010).

We have motivated this empirical paper by recording conflicting evidence that more economic freedom reduces corruption when economic freedom is regressed on the entire distribution of corruption, subdivided by its components or when the relationship is tested for subsamples of countries[1]. For example, Billger and Goel (2009) show that among the most corrupt nations, greater economic freedom does not appear to cut corruption. Rather, it may exacerbate corruption issues indicating that nations respond differently to different levels of economic freedom because their dimension is associated with the country's developing conditions. On the other hand, Graeff and Mehlkop (2003), arguing against the use of an aggregate indicator of economic freedom to evaluate their effects, provided support for a counter-intuitive effect of the size of government, as a specific component of economic freedom, on corruption. There is also an institutional dimension to explain some unexpected results. Lambsdorff (2007) argued that the need of government interventions may not be larger than how sustained for retaining some state interventions to deal with market failures such as "good"government regulations become relevant in cutting corruption. This implies that the impact of economic freedom or its com-

[1] See Lambsdorff (2007) for a discussion on the works where the relationship between economic freedom and corruption is non-significant or where the impact of economic freedom increases corruption

ponents on corruption may depend on the variability of the government intervention efficiency across "regulated"and "freedom"countries.

In this paper, we have consider a broadest class of random effect models to investigate the relationship between economic freedom and corruption, and propose a selective strategy in which nested and non-nested multilevel models are tested. We have followed the suggestions originally developed with microdata (firms) in mind by Milgrom and Roberts (2008), and proposed, as explanatory keys, firms' indices of economic freedom assumed to be linked with corruption. We have extracted data from the World Business Environment Survey (WBES) and contributed to the literature by estimating economic freedom determinants of corruption with a model that identifies and tests cross-countries differences in corruption. We have justified our empirical choice because some components of economic freedom have a natural micro-founded relationship with bribe phenomena in economic activities. However, following the theoretical arguments put forth by Treisman (2000), the relationships of corruption with the components of economic freedom may also be explained by a number of country characteristics. Our contribution is to model the variability across countries by a multilevel specification with the double aim to keep the micro-founded relationships robust and identify socio-economic and institutional indicators at the country level responsible for the unexpected theoretical relationships.

Our research is related to a number of empirical papers testing whether more freedom lowers corruption (Chafuen and Guzmàn, 2000; Paldam, 2002), although we have focused on Graeff and Mehlkop (2003) framework that considers how specific components of economic freedom affect corruption. We also find inspiration from a large literature on corruption that undermines the strength of public institutions and hampers economic growth and development (and vice-versa). Some classical references include Shleifer and Vishny (1993), Mauro (1995), Bardhan (1997), and Méon and Sekkat (2005). Our work is also related to the empirical analyses that use microdata to investigate corruption and its determinants (Swamy et al., 2001; Svensson, 2005; Mocan, 2008). Finally, we refer to the works by Hodgson (2006) and Hodgson and Jiang (2007) that extend the role of corruption to the private sphere.

We begin our work by documenting the basic facts regarding the key variables of our empirical specification. We then present a multilevel model, a more realistic framework to test the hypotheses of our work. The remainder of the paper estimates the parameters of the selected models obtained by the sequential test strategy. Although the results in the full sample are almost all in line with the predictions of the standard economic predictions, attention to the firms' heterogeneous responses and cross-country effects is crucial for explaining the puzzle of heterogeneous outcomes when the sample changes. The results highlight that government regulation interventions in African countries and transition economies may cut corruption, while the large variability across countries is identified not only by the differences in the economic prosperity, but also by the country's efficiency in applying institution rules.

2. Economic freedom and Corruption linkages

2.1. Basic facts

In empirical studies, many difficulties lie in obtaining proper measures of corruption, which identify and describe its linkage with the components of economic freedom. By using survey data, Trasparency International measures the known corruption perception index (CPI), highly used to describe the dynamics of corruption. As also argued by Gorodnichenko and Sabirianova Peter (2007), the perception-based indices of corruption do not provide a robust estimation of bribery within countries. However, these indicators may remain informative for dynamics or aggregate comparison across countries.

The index published in Economic Freedom of the World (EFW) is designed to measure the consistency of a nations institutions and policies with economic freedom. The key ingredients of economic freedom are based on personal choices, voluntary exchange coordinated by markets, freedom to enter and compete in markets, and protection of persons and their property from aggression by others. The methodological outline of the index is focused on two important principles. First, objective components are always preferred to those that involve surveys or value judgments. Second, the data used to construct the index ratings are from external sources, such as the International Monetary Fund, World Bank, and World Economic Forum. Although economic theory suggest the main links among the five components of economic freedom, there is no consensus about their relative weights in determining the degree of economic freedom.

On the other hand, economic freedom is designed to represent the degree to which the policies and institutions of countries intervene in a society (Gwartney and Lawson, 2000). Their magnitude can affect individual incentives, productive effort, and effectiveness of resource allocation (de Haan and Sturm, 2003; North and Thomas, 1973). The official statistics have recorded that in recent periods, economic freedom has improved. As measured by the index of Economic Freedom of the World (EFW), the average level increased to 6.6 in 2000 from 5.8 in 1990, and it has been rising in this first decade of the 21^{st} century as well[2].

In Figure 1, the EFW (for 2000) index is displayed as a rough prediction of its effects on cross-country corruption based on the Transparency International measure. As expected, it does not show surprising results. As the EFW rises (less) corruption increases linearly.

[Figure 1 about here.]

Figure 2 shows the same relationship for a sub-sample of African countries. We found that a nonlinear hump-shaped relationship fits the data very well. Although using cross-country regressions with country-level variables of economic freedom and corruption, the expected relationship in subsample should be in line with the prevalent literature (e.g. see Graeff and

[2]The final score of EFW, available for about 140 countries, is obtained as a weighted mean of five main components or areas, which are: i) the size of government; ii) legal structure and security of property rights; iii) access to finances and sound money; iv) freedom to trade internationally, and v) regulation of credit, labor, and business.

Mehlkop (2003) for subsample estimations) and a prominent role may be played by sectoral differences of government interventions. In fact, corruption may also arise from sectors with large economic freedom. As argued by Lambsdorff (2007), not all aspects of economic freedom deter corruption, because some regulations may increase the transaction costs of corruption deals. In these cases, irrespective of whether policy-makers are unresponsive to the demand for regulation, "free"competition and lack of government regulations should be considered as a fallacy of policy formulation. When this behavior is associated with a weak legal apparatus of recognition and enforcement of the state, as recognized in less developed countries, corruption may strongly emerge because spontaneous mechanisms of economic freedom are conditioned by local rules that allow imposes on private bribes, frequently as taxation, to improve business.

[Figure 2 about here.]

This leads to another source of issues regarding the use of an economic freedom indicator in the empirical literature. As shown in Graeff and Mehlkop (2003), the summary index score of economic freedom competes against its multidimensional representation of freedom. The existence of ambiguous correlations between components of economic freedom and its aggregate measure as well as the weight of the suppression effects in aggregate may produce biases in explaining corruption effects. As an extension of Figure 2, it is possible to predict that the composition effects may be emphasized if we collect data only for developing economies. We have presented the discussion on these aspects following the next sub-section.

2.2. The components of economic freedom and corruption

We have focused on descriptive statistics of economic freedom and corruption obtained by the WBES, presenting the description of the dataset in Section 4. Furthermore, we have presented an exercise by aggregating the firms' indicators of economic freedom and corruption at the country level for some components of economic freedom. We have preserved the macro-level of the data for comparison with the empirical analyses observed in the economic literature[3]. We have chosen our variables to be adaptable to the areas of the database "economic freedom of the world"(Gwartney and Lawson, 2000). Furthermore, we have singled out five principal areas: (I) market competition; (II) government regulation of private entrepreneurial activity; (III) ability of the financial system to support private firms; (IV) property rights and the protection of contracts, and (V) regulation of export[4]. Within these economic freedom areas, we have extracted indicators of interest described in Table 1. Figure 3 highlights the results of the descriptive analysis. Contrary to the scale of the Transparency International index, corruption

[3]We remark that our aim is to give some descriptive insights to the relation to be tested. This is statistically equivalent to aggregating all individual level variables to the group level and carrying out ordinary least squares, e.g. by doing regression over group means. A problem with this technique is that within-group information variation is lost (Kreft and de Leeuw, 1998).

[4]With respect to Graeff and Mehlkop (2003) the use of WBES micro-data do not allow us to directly include the size of government that is a variable recorded at aggregate level. We will include it in estimating the multilevel model

increases in the y-axis, while economic freedom decreases moving to the right of the x-axis. As shown in panels a-e, it is not possible to delineate a clear picture concerning the statistical co-movements between these economic-freedom indices and corruption. Both for market competition (panel a) and government regulation components (panels b-e), the graph dispersions are not able to confirm the expected relationships suggested by standard theory. Furthermore, these graphs clearly highlight the existence of grouped countries in the data because the effects of the components of economic freedom on corruption have not occurred everywhere in the same way. That is, it emerges that part of the variation of these relationships can be interpreted in terms of unobserved differences between the countries.

A way to account for the magnitude of these differences across countries is to estimate the aforementioned relationships by a multilevel framework. As we use the individual firms' observations in line with the theoretical micro-founded relationships, we showed that on an average the economic responses of firms are differentiated across the countries. It is assumed that micro-data are not completely independent, i.e. the results are affected by these clustered structures of the underlying data. In other words, the perception of corruption and economic freedom of firms in the same country is more homogeneous that firms in different countries. In line with the above classification, we have modeled property rights and protections of contracts at the microlevel as a condition for firms to legitimate contracts and exchanges, and, in general, the quality of institutions[5].

Without losing generality, a random intercept model was extended to the remaining economic-freedom components (panel f-h), although they consistently showed that more freedom in the financial system, export regulation and property right protection lowered corruption. Therefore, the objective of making general statements about phenomena for a larger set of groups suggest of assuming a specification in which the intercept varies randomly across country units (Snijders and Bosker, 1999).

[Figure 3 about here.]

3. Econometric specification

In this section we have provided a comprehensive description of the multilevel probit model. The interest in these models is a natural improvement to the basic econometric framework when micro-data contain clusters resulting from non-independent observations. First, if the observations within clusters are more correlated, then it is more likely that ignoring clustering would result in biases in estimations and inference. Second, the absence of a behavioral model of economic freedom components on corruption makes the analysis essentially descriptive addressing the use of latent class models.

[5] A criticism to model the quality of institutions on corruption at the microlevel might be based on the low variability of preferences and expectations in face to firms. Mocan (2008) developed a model in which it is assumed that an increase in the quality of the institutions in a country, which would increase the probability of apprehension, would in turn reduce the propensity to ask for a bribe.

Let us consider a general formulation of a two-level model. We observed y_{ij}, a binary response for corruption propensity within firms i and related to country j and x_{ij}, a set of explanatory variables at the firm level. We assumed that a latent continuous variable $y_{ij}*$ exists underlying y_{ij}. We observed our binary response variable y_{ij} directly, but not $y_{ij}*$. We knew that $y_{ij} = 1$ if $y_{ij}* > 0$ and $y_{ij} = 0$ if $y_{ij}* \leq 0$ **.** Thus, we can write the multilevel model for $y_{ij}*$ as

$$y_{ij}* = \beta_{0j} + \beta_1 x_{ij} + \sum_{h=1}^{H} \beta_h x_{i0} + e_{ij} \qquad where \quad e_{ij}|x_{ij} \sim N(0, \pi) \tag{1}$$

where β_{0j} are country-specific intercepts and β_1 is the regression coefficient of each economic-freedom component. As we wehere interested in assessing the impact of the different typologies of economic freedom separately, (1) can be considered as a companion matrix that includes the nine indicators, x_{ij}, in the diagonal and otherwise zero. Furthermore, in (1), we also included the firms' fixed effects, x_{i0}, evaluated by the parameters β_h, while e_{ij} are the first-level residual terms. Under the hypothesis of a random-effect model, we can explicit β_{oj} as

$$\beta_{0j} = \gamma_{00} + \gamma_{01} w_{0j}^1 + u_{0j} \qquad where \quad u_{0j}|x_{ij} \sim N(0, \psi) \tag{2}$$

where γ_{00} is the intercept and γ_{01} are the coefficients of the vector of the observed macro-covariates of the second stage to allow us to identify cross-country variation, w_{0j}^1. u_{0j} is the random effect of level two related to the country-specific intercept β_{0j}. The assumption that a part of the variability of the fit model can be identified by the between-country covariates, w_{0j}^1, does not prevent that the unobserved variability of the country effects may generate dependence between the firms' economic-freedom components, x_{ij}. Subsequently, we turn to the specification of an extended model that contains parameters associated with issues of endogeneity and to the implementation of nested restriction tests.

Conditioned to the random effect u_{0j}, a probit model is specified by assuming that e_{ij} has a standard normal distribution. It can be commonly observed in this literature that clusters j are assumed to be independent, the covariance between different firms, $Cov(e_{ij}e_{i'j}) = 0$, and the two-level error terms are not correlated, $Cov(u_{0j}, e_{ij}) = 0$, such that we can write the reduced form of the model as[6]

$$y_{ij}* = \gamma_{00} + \gamma_{01} w_{0j}^1 + \beta_1 x_{ij} + \sum_{h=1}^{H} \beta_h x_{i0} + u_{0j} + e_{ij} \tag{3}$$

By assuming that u_{0j} is normally distributed, the strategy for estimating the model parameters is to integrate the unobserved random effect, u_{0j},

$$f(y_j|x_j, w_j^1) = \int f(y_j|x_j, w_j^1, u_{0j}) g(u_{0j}) du_{0j}, \tag{4}$$

[6]The assumption that unobserved country characteristics are uncorrelated with unobserved firm characteristics excludes non-frequent cases in which firms are very successful in operating in corrupt countries.

where $g(.)$ represents the normal density function[7]. As a result, the unconditional estimation does not determine a closed expression. Maximum likelihood estimation has to resort to approximation procedures, such as numerical integration. RabeHesketh et al. (2002) proposed an algorithm by using the posterior mean and variance of the random effects, which are calculated by building on the work by Naylor and Smith (1982)[8]. If the assumed distribution is normal, the numerical quadrature approach yields a deviance (Υ) that can be readily used for likelihood-ratio tests. This statistic is given as $\Upsilon = 2(\ln f(y|\widetilde{\vartheta}) - \ln f(y|\widehat{\vartheta})$, where $\ln f(y \mid \widetilde{\vartheta})$is the loglikelihood for the saturated model and $\ln f(y \mid \widehat{\vartheta})$ is the loglikelihood for the model of interest. Some nested specifications can be obtained by the imposition of parameter restrictions calling for a simple likelihood ratio test on the parameter(s) restrictions,

$$LR = 2\left(\ln\ f_{full}(y_{ij}|\theta \neq 0) - \ln\ f_{restr}\ (y_{ij}|\theta = 0)\right) \tag{5}$$

which has an approximate χ^2 distribution with a number of degrees of freedoms equal to the imposed restrictions on the parameters.

From the multilevel model, there is no insurance that the unexplained variability among different countries' corruption propensity does not include the effect of omitted macro-variables related to institutions rules and economic growth indicators, which, in turn, is correlated with x_{ij}. Hence, we modeled an extended specification of (3) that includes endogeneity issues. Following Snijders and Berkhof (2004), the aforementioned dependence can be expressed as a regression,

$$w_{0j}^2 = \alpha_{00} + \alpha_{01}\bar{x}._{j} + \varepsilon_{0j} \tag{6}$$

where $\bar{x}._{j}$ is the cluster mean of x_{ij}. By inserting (6) into (3), the random intercept model depends on $\bar{x}._{j}$, while the reduced form of the model is given as

$$y_{ij}* = \gamma_{00}^* + \gamma_{01}w_{0j}^1 + \alpha_{01}\bar{x}._{j} + \beta_1 x_{ij} + \sum_{h=1}^{H}\beta_h x_{i0} + u_{0j}^* + e_{ij} \tag{7}$$

where $\gamma_{00}^* = \gamma_{00} + \alpha_{00}$ and $u_{0j}^* = u_{0j} + \varepsilon_{0j}$. The exclusion from the analysis of the cluster mean, $\bar{x}._{j}$, when $\alpha_{01} \neq 0$, yields a biased estimator of β_1.

It is worth noting that control variables for political, economic, and institutional characteristics of the country, which may also be those correlated with both corruption and economic-freedom components, reduce the endogeneity yielded by the unobserved components of the random effect model. As a restriction of the model in (7), we assessed the macro-variables effects by imposing the vector $\gamma_{01} = 0$. Formally,

$$y_{ij}* = \gamma_{00}^* + \alpha_{01}\bar{x}._{j} + \beta_1 x_{ij} + \sum_{h=1}^{H}\beta_h x_{i0} + u_{0j}^* + e_{ij} \tag{8}$$

[7]For the sake of simplicity, we included the fixed effects of the first level in the intercept parameter (γ_{00}).

[8]Although marginal quasi-likelihood (MQL) and penalized quasi-likelihood (PQL) are largely used in statistical literature, these are found to generate downwardly biased estimates (Hedeker, 2001).

Figure 4 summarizes the nested relationships among models, showing the relevant restrictions on the likelihood function of (7). A sequential strategy of the model selection process can be implemented reasonably by partitioning the observed and unobserved macro-variates, $W_{0j} = \left[w_{0j}^1; w_{0j}^2\right]$. A double route for testing nested models arises with respect to our focus, because it is not determined *a priori* if fixed macro-indicators are able to cut endogeneity significantly. By assuming that the restrictions of the vector of parameters $\theta_1 = \theta|\gamma_{01} = 0$ and $\theta_2 = \theta|\alpha_{01} = 0$ are not rejected separately, before passing to the next step and by testing the restricted models against the benchmark random intercept model, i.e. a model without fixed effects and random coefficients, we have to decide if a best model exists by identifying the cross-country variation in the data. By defining the conditional function density for the restricted models, $f(y|x,\theta_1)$ and $g(y|x,\theta_2)$, conventional and adjusted (Vuong, 1989) LR tests were used for these non-nested specifications (step 2, Figure 4). The null hypothesis of model equivalence, $H_0 : E\left[\log\frac{f(y|x,\theta_1)}{g(y|x,\theta_2)}\right] = 0$, was tested against competing model, $H_1 : E\left[\log\frac{f(y|x,\theta_1)}{g(y|x,\theta_2)}\right] > 0$ or $H_1 : E\left[\log\frac{f(y|x,\theta_1)}{g(y|x,\theta_2)}\right] < 0$. If H_0 is rejected, in the first case, we prefer $f(.)$ to $g(.)$, and vice-versa if the result is in line with the second hypothesis. Finally, the best model is tested against the basic "random effect"model by adding, $\sum_{h=1}^{H}\beta_h x_{i0} = 0$, if the restricted a model with $\gamma_{01} = 0$ or $\alpha_{01} = 0$ was found.

[Figure 4 about here.]

4. Estimations

4.1. Data and empirical models

The data used in the empirical analysis were taken from the Voices of the Firms 2000 of the WBES, a cross-sectional survey of industrial and service enterprises conducted in mid-1999 by the World Bank and some other agencies. This survey represents the most comprehensive source of micro-data for analyzing both corruption and economic freedom by firms' perception responses. The WBES survey covers 67 countries in which, on an average, more than 100 firms were interviewed. Appendix 1 reports the list of countries by macro-regions and the specific number of firms interviewed. This survey provides detailed information on private viewpoints regarding taxation, government regulation, and financial sector, as well as on perceived corruption raised from business experience. On the contrary, there is a lack of information concerning controlled and participated enterprises. Although some information on assets, sales, ownership, employees, and enterprise growth were collected, it is not adequate to fill up detailed balance-sheet information and profit and loss statements, reducing the possibility to control firm heterogeneity by economic performances.

In the subsequent empirical analysis, we have used the discrete variable of perceived corruption as a dependent variable. This index measures "how usual it is for firms to have to pay some irregular additional payments to obtain a service from the public administration". This variable

(from 1 to 6) indicates the increase in corruption perception in the line of business in which it operates. Response to corruption items offers an interpretation not only concerning the direct experience, but is assumed to include the behavior of the closest firms in the same environment. This index also endorses the operational definition of corruption that includes the private sector and stands in clear contrast with the characterizations of corruption that focus solely on the public sector. According to Hodgson and Jiang (2007), the role of corruptive phenomena in the private sector conceptually extends the interactions between the private and public sectors (and their institutions) and provides different implications of the state intervention on corruption.

In line with the econometric specification discussed earlier, we collapsed this self-reported categorial indicator to generate a binary variable by grouping the modalities for low corruption (1-3) and 1 for high corruption in 0 and 1, respectively, to better focus on the highest rank corruption group[9]. Thus, the corruption index is assumed to be expressible as a (non)linear combination of each economic-freedom component and variables that account for the firm's fixed effects as well as for a set of macro-variables that are able to identify the level (or differences) of the economic development of the countries.

[Table 1 about here.]

Table 1 reports the description of the covariates selected. The foregoing discussions and the implementation of tests to choose the adequate model rest on suggestions taken from the empirical literature, and are intended to break up the determinants of the summary index score described in Section 2.

Ades and Di Tella (1999) and Svensson (2005) argue that a positive degree of competitiveness in a country (AREA I, Table 1) reduces the probability of corruption. In this approach, a non-competitive market serves to feed corruption, by a rent channel, that consolidates a non-market system of the bureaucrats' behavior and constrains the flow of information from a competition environment out of the firms' control. Emerson (2006) has presented a model of the interaction between corrupt government officials and industrial firms to show that corruption is antithetical to competition. As discussed by Lambsdorff (2007), the empirical results are sensitive from which measure of competition is used.

Subsequently, we tested the hypothesis of a negative correlation between competition and corruption by using the number of firms as a proxy of competition, because the survey does not contain an explicit indicator of entry barriers of new firms, except for foreign firms. The limits of implementing this index are known, specifically in developing countries, where entry barriers ca be addressed to avoid the entry of foreign firms. As a result, local firms competing with quality rather than prices are forced to establish myopic behavior, without a specific worldly wisdom for high-quality reputation. Under these hypotheses, competition may even increase rather than decrease corruption.

[9]For a comprehensive review of the aggregate corruption perception indexes, see Kaufmann et al. (1999).

Among the components of economic freedom, corruption is assumed to be influenced by government regulation components (AREA II). As some specific effects strictly depend on the structure and efficiency of the market, it would be wrong to perceive corruption as the consequence of excessive regulation, or to assume that complete laissez-faire will always be the answer (Bliss and Di Tella, 1997). The perspective that government regulation hampers productive effort encourages rent-seeking, and increases the discretionary power of a few public officers, still reigns throughout government institutions and scholars (Graeff and Mehlkop, 2003; Paldam, 2002), though it is largely recognized that when government regulation is weak or almost absent, an increase in market rules is crucial to develop a solid productive sector (Hodgson, 2003)[10].

These features have at least two important implications when examining corruption practices in developing country economies. First, results from developed countries should not be directly extended to developing countries' settings without a serious reflection upon their differences. In fact, to the trade-off between benefits and disbenefits of state intervention leading to market failures (Acemoglu and Verdier, 2000), we have to add the different impacts of negative externalities of corruption in any context. Second and foremost, empirical research has tended to focus on the impact of the overall size of the government budget relative to GDP, often ignoring the interactions of each government regulation component. The test that the size of the government is positively correlated with the level of corruption is weak. In fact, Elliot (1997) and Adsera (2003) obtained contrasting findings, while Graeff and Mehlkop (2003) and Billger and Goel (2009) reported ambiguous results that can only be slightly disentangled by observing the relation in a subsample of countries or conditioning the distribution of corruption variable across the countries, respectively. These evidences also suggest another avenue, i.e. particular types of government expenditure might have a different potential, and perhaps more importantly, to cause corruption with respect to the size of the government. Heterogeneity of goods and services supplied in free market are an important source of transaction costs that may be reduced by government regulations, though planning these interventions may bring large problems of corruption. In our empirical analyses, we differentiated the components of government regulation and control for the levels of development of a country and size of government in assessing their impact on corruption. The sign and magnitude of the government regulation indicators on corruption, i.e. government interventions on investments, employment, sales, and prices become an empirical issue.

It has been postulated that the ability of the formal financial system to provide financing to the private sector reduces the corruption effects (AREA III). This relationship is unquestionably mitigated by a different degree (or quality) of financial institutions of the countries. As a result,

[10]Developing countries are often characterized by weak law enforcement, a large informal sector, underdeveloped capital markets, and informal credit and insurance networks. For example, informal arrangements, such as family networks of credit and insurance, have been found to very much influence the impact of interventions, limiting the beginning of corruption.

low levels of the country's quality of financial institutions may yield a reverse causation of the estimated relationship. Safavian et al. (2001), investigating the data from small businesses in Russia, reported that the enterprises, more harried by corruption, also apply more often for external finance. However, Brunetti et al. (1997), ranking the levels of corruption found that the second most significant impediment to doing business without corruption is the lack of financing. We include the effects of financial constraints on corruption that is expected to be in their pathological or inefficient expression in the developing or transition countries. It is worth noting that liquidity constraints often emerge in the transition economies, although the financial system may be able to provide financing for the private sector. A feature of these economies is that a high level of investment projects, associated with a potentially inefficient financial system, requires a higher level of intermediation costs. As argued in Ahlin and Pang (2008), these costs related to the magnitude of investment are directly associated with corrupt payments. On the other hand, if corruption is costly for firms, it may feed demand for corruption as taxation and keep these financial constraints in the supply of financing.

The legal system's ability to protect property right contracts (AREA IV) is widely suggested as being a policy intervention to reduce corruption in the world economies. Failure of the legal system to provide for the enforcement of contracts undermines the operation of the free market, and, in turn, reduces the incentives for agents to participate in productive activities Acemoglu and Verdier (1998). This implies that corruption increases. In contrast to the current literature, we have specified a micro-founded relationship because firms are able to account for failures in operation of the free market and in line with an extended definition of corruption for private spheres.

Finally, government regulation on export and international trade (AREA V) is assumed to increase the level of corruption. There are at least three reasons for explaining the hypothesized empirical evidences. First, this effect is linked with the relation between firm rents in a noncompetitive market and import licensing. Krueger (1974) argued that when the number of licenses is fixed, the firm is encouraged to compete to obtain the largest amount of trade licensing. A rational firm may shift productive plans to rent intensive activities and could turn to bribing transactions to win trade licensing. Second, trade barriers may be in favor of inefficient local firms than foreign competitors, and forms of corruption may easily arise. Finally, import barriers create an artificial scarcity of specific commodities, channelling a part of the non-competitive higher prices towards corrupt bureaucrats that, in developing countries or transition economies, may lead to underground economies. The empirical evidence has provided questionable support of a negative sign in the relation between the extension of international trade and corruption (Treisman, 2000; Torrez, 2002).

In empirical applications, the first level of (3), (7), and (8) is usually assumed to be a function of firms' factors affecting corruption rather than the specific economic-freedom components. As largely discussed by Beck et al. (2002), the extent of corruption effects depends on the firm's

size, as well as on its legal organization and the sector in which it operates. These variables are included in all model specifications as fixed effects within the countries.

Thus, we have justified the specification of multilevel (economic) models because the corruption perception of firms and its relation with economic-freedom components depends on country's economic conditions and is also constrained and molded by institutions' (in Hodgson sense) self-reinforcing and self-perpetuating characteristics. It is assumed that the random intercept model is determined by (macro) country factors, leaving to the statistical significance of the means of the economic-freedom indicators to check mutual interaction and interdependence (endogeneity)[11]. A set of these indicators in this work are assumed to explain an unobserved variability induced by the differences across country development. Traditional macroeconomic indicators are the gross domestic product per-capita (GDP)[12], the private investment share in GDP (INV), and the Gini-coefficient of distribution of income $(GINI)$. In the multilevel model, we also included the share of government spending in GDP (GOV). As shown by La Porta et al. (1999), the size of the state and its quality represent a key variable to explain the differences across countries of good governance.

In addition, we included the civil liberties index $(CIVIL)$ as a proxy of the level of democracy in a country (Bliss and Di Tella, 1997). It is known that a strong democratic regime enforces the reliability of public action, decreasing the firms' market power and reducing illegal profit gains[13]. The relevance of including this indicator for our analysis is justified because the rise of democracy is found to decrease corruption (Emerson, 2006), and, in general, economic growth (Bardhan, 1997; Dreher and Herzfeld, 2005). This leads to assume that as democracy increases, corruption seems to fall, irrespective of the level of corruption of a country. However, the significant impacts of democracy on economic-freedom components are well known (Lundstrom, 2005). It is worth noting that as the quality of the institutions has a direct impact on corruption, the very low level of the civil liberties index in developing countries decreases the possibility of controlling for the legal system's ability to protect property rights and prevent corruption. It is not difficult, in turn, to predict a reduction in the certainty of property rights (Acemoglu and Verdier, 1998), though endogeneity issues may consequently arise in estimations.

4.2. Results

The choice of the most appropriate specification consists of testing, for each equation, the models presented in Section 3 and summarized in Figure 4. Parsimonious models are obtained by placing the relevant restrictions on the likelihood function and are interpreted as special

[11] This assumption makes the investigated statistical relationships symmetric. However, as sustained by Archer (1995), these relationships may be asymmetric because institutions typically precede the activities of individuals.

[12] We have used capital letters to distinguish the macro-variables.

[13] Treisman (2000) suggests, among other things, that more developed and more long-standing democratic countries are less corrupt.

cases of endogenous multilevel probit model (7). Conventional and adjusted likelihood ratio formulation is reported in Table 2.

[Table 2 about here.]

In the first row, model (7) is tested against model (8) in which macro-effect restrictions are imposed (i.e. $\gamma_{01} = 0$). The results of the LR test for the nine econometric specifications corresponding to each economic-freedom variable clearly reject the hypotheses tested and indicate that these variables are relevant in identifying corruption differences across countries. On the contrary, as shown in the second row, we never rejected the endogeneity restriction, $\alpha_{01} = 0$, because the empirical LR test is always lower than the critical value at the usual percentile. To complete the analysis, we tested model specification (3) against the basic random effect model, in which fixed micro-effects and country identifying variables are restricted to zero ($\beta_h = 0$ and $\gamma_{01} = 0$). The LR test rejects the restricted basic model confirming that (3) is the best model to rationalize the data. The Voung test (1989) completes the selection strategy by testing exogenous random effect model (3) against non-nested random effect model with endogeneity (8). The Vuong test statistic leads to the rejection of models equivalence for each specification and to favoring the model in (3). If we evaluate the restrictions from the endogenous random effect model, with firm-fixed effects restricted, the test provides further support to the model chosen (Table 2, row five).

[Table 3 about here.]

The maximum-likelihood estimates are presented in Table 3. We remark that the use of a multilevel approach instead of a normal logit regression insures that we avoid misleading significance effects due to violations of the assumption of independent errors with a constant variance. This effect has been confirmed in our regression results, in which the multilevel regressions display lower levels of significance when compared with the logit regression with the same model specification[14]. To support this result, we reported the intra-class correlation (ρ) for each estimated specification. For each equation, about 30 percent of the total variability of corruption is attributable to the countries' heterogeneity. We identified this source of variability in the relationship by the indicators of the second level discussed in the previous section. Although there were considerable differences in the magnitude of the coefficients, both significance and direction of the influence were in conformation with the majority of cases. Accordingly, the degree of economic prosperity is capable of explaining gains in the efficiency of the economic and social system and controlling for corruption (Mauro, 1995). The hypothesis that high-income inequality corresponds to perceptions of unfair state operations and makes the incidence of corruption more likely (Smelser, 1971) seems yo be confirmed. Furthermore, the importance of civil liberty index in reducing corruption is in line with theoretical expectations,

[14]Estimation results obtained on these subsamples are available from the authors.

while an oversized state affects the efficiency of expenditure and corruption seems to increase irrespective of its level.

Analogous to the country characteristics, we found very consistent patterns at the firm level, except the legal organization of the firm. The probability of corruptive practices in bigger firms is pervasively found to be 12-13 percent lower, independent of the economic freedom equation used. Contrary to that, the industrial sector is found to have a higher (on an average, 5 percent) propensity to experiment corruption, possibly reflecting better market independence of services to cope with smaller businessmen on starting and/or developing economic activities.

Government regulations on investment, employment, sales, and prices increase corruption (Table 3, columns 2-5). Inefficiencies caused by an over-regulated economic system seem to be able to distort private productive activity and influence corruptive behaviors. Because of the critical role that the labour market plays in the process of economic development (Caballero and Hammour, 2000; Foster et al., 2002; Bartelsman et al., 2004), understanding whether labour market regulations actually help or hinder corruption phenomena stands out as an important task. Although very similar effects are found across countries when looking at individual components of government regulations, we register that protection of employment has the highest propensity (0.131) in affecting corruption. As expected, where labour market institutions are developed, adding government employment regulations can weigh down the processes of agreement and facilitate corruption practices obtained while mediating among firms, workers and unions. Similarly, the other government regulation indicators significantly affect the reduction of corruption.

In columns 6 and 7, we present the estimated outcomes related to financial market constraints. As expected, according to the compositional effects of countries with different degrees of financial development, we found that constraints in private and public financing projects increase the probability of corruption, while quite surprisingly, financial systems' efficiency do not seem to affect it. Our estimations also comply with the general knowledge on the importance of trade regulation in increasing corruption found by the works of (Ades and Di Tella, 1997, 1999), Sung and Chu (2003), and Gerring and Thacker (2005).

So far, the largest and most significant effect on corruption is exerted by the legal system to protect property rights and contracts (-0.218). We found that limiting the possibility to confiscate private property or repudiating contracts produces positive externalities, and seems to determine general improvements in the quality of institutions. However, as discussed in Glaeser et al. (2001) this result strictly depends on the difficulty in enforcing complex private contracts and on the potential advantages of a parallel developed framework for organizing private transactions.

In contrast, we found no significance in the degree of competition. As discussed earlier, the effects on corruption of the competition level among firms is uncertain. Heavy competition could incite them to pay commissions to make up for their weak negotiating power and get

market shares, as well as a lower competition incites them to anticipate significant rents and pay bribes to acquire new markets. We anticipate that for the subsamples of countries, heavy competition, when associated with restrictions on trade, may determine an increase in corruption.

We test the robustness of our results considering two subsamples, Africa and a sample of transition economies of the Eastern Europe. We justify this strategy because comparing the level of corruption of African economies with the rest of the world is traditionally argued base on the fact that these shortfalls of "good" behavior are the result of differences in infrastructures, macroeconomic mismanagement and, weak administrations that affect the micro-founded relationships investigated. For example, following Transparency International for the years around 2000, the corruption index for the African region is about $3.35/10$, while the world mean is about $4.00/10$. Furthermore, the transition countries are an interesting case study because of their choice to pass to a freer market economy and democratic regimes during the 90s (i.e. transition economies). As reported in the work by Graeff and Mehlkop (2003), with the exception of Estonia, Transparency International rates the most former communist countries as being highly corrupt. On the other hand, although the liberalization policies in transition countries have been extremely relevant during last decade, the same source of data records lesser economic-freedom ($5.5/10$) with respect to the world mean ($6.23/10$). A specific determinant has been linked with the reforms in public-sector activities, namely privatization, which did not achieve one of their objectives (in 2000 and even after that year) to reduce corruption[15].

[Table 4 about here.]

[Table 5 about here.]

We again ran the selection strategy reported in Figure 4. We could confirm an exogenous multilevel specification for almost all the corruption equations of these subsamples, except in cases where endogeneity is relevant. In these cases, the need of including the mean of the firms' variables to account for these issues is suggested (Tables 4-5, row 2).

Tables 6 and 7 present the maximum-likelihood estimates. Quite surprisingly, we found that significant residual variance of the second level exceeds 20 percent in many equations of Africa, showing that country's variability plays a relevant role in explaining corruption. This is also the case of transition countries, although the significant variation of the intercept of country level is on an average slightly more than 10 percent. Covariates at country level have the

[15]The main cause of this failure is clearly discussed by Hodgson and Jiang (2007) who indicated that "under the communist regimes, informal economic networks often spanned and surpassed ethnic divisions. But political crises and economic recessions.....have inhibited the establishment of a market system with clear and general rules .... affecting economic legality ". Specifically, the privatization process in the former USSR, characterized by the sale of state assets, was marked by an increase in corruption because many ideas of traditionalism were upheld and not included in the decisional process criteria of rationality and effectiveness. This offered an opportunity to accumulate illegal fortunes (Sachs, 2005).

expected significant effects in most cases, with some exceptions. Neither *GDP* and *CIVIL* for African countries nor *INV* for transition economies have been found to exert a relevant impact on corruption, while large differences of the size of the government appear to explain most of the country's variability. Its positive impact emphasizes the thesis that inefficiencies generated by a wide expenditure feed corruptive practices as a misuse of recurrent government budget. Additionally, we anticipate that the inclusion of the country mean of the explicative variables (i.e. employment regulation and property right protection for Africa and sales regulation and financial constraints for transition economies) can generate loss of their significance.

The estimated relationships for these subsamples point out changes in government regulation components, suggesting that these government interventions are more likely to hinder corruption. In line with Elliott's (1997) argumentations, these results confirm that the types of government activities provided can directly affect corruption and indirectly control for the size of the state expenditure.

Not surprisingly, we found a positive impact of the degree of competition on corruption. This result is affected by the latent presence of trade barriers that are able to favor local firms and activities, and yield a greater propensity to corrupt bureaucrats. In sum and in line with the findings of Gupta et al. (2001), more competition among prevalent local firms, which also share similar norms and rules, incites them to pay commissions to enhance their profitability.

The negative sign of property rights strengthens the perception that institutional rules help to sustain economic activities and reduce corruptive phenomena in African countries. As expected, the control for endogeneity produces insignificant estimated coefficients for *GOV* and *CIVIL*. This implies that not only properly functioning property right rules, but also sustained political interventions are necessary to improve the issue related to corruption and defend the structure of institutional rules, because they do not guarantee the absence of large social costs.

However, in the model regressions that include endogeneity, the micro-founded relationships can also show an opposite sign in the estimated coefficient, with respect to those of the country-mean. This is evident for government regulation on employment for Africa as well as sales in transition economies. While the costs of corruption for Africa are difficult to be reduced by micro-regulation of employment (as shown by the insignificant value of the coefficient), minimization of corruption will depend on the effectiveness of institutional labour designs and net of the development level of a country. On the contrary, transition economies may internalize advantages of sales regulation on corruption by applying policies that do not give incentives for an efficient regulation on sales assignments that cuts the costs of corruption.

As suggested by the strategy tests, the financial system's financial constraints in transition countries are estimated with the additional country-mean regress. The significance of this parameter, together with that at the firm level, strengthens the idea that better financial systems are beneficial for combating corruption and enhancing economic growth. Although this result is generally accepted, when we analyzed corruption outcomes for economies in transition,

they were more complex for the existence of interaction with investments in the private sector. For example, the lack of institutional rules for the financial system in the former communist economies, soon after the period of reform, has been grounds for the increasing phenomena of corruption in growing investments. Thus, the significance of the parameter of private investments (INV) confirms the hypothesis of detrimental financial system effects on corruption, at least in the short run.

[Table 6 about here.]

[Table 7 about here.]

5. Concluding remarks

The standard economic model predicts that government intervention transfers resources from the private sector and generates room for corruption. If the economic freedom increases sufficiently, then the level of corruption tends to fall and keeps falling as the quality of institutions continues to increase. This mechanism received support from conventional estimates of the aggregate economic-freedom indicators though the work by Graeff and Mehlkop (2003) documenting that the response of corruption to the components of economic freedom appears to be contradictory. Furthermore, the recent corruption literature has emphasized the importance of micro-founding relationships as an explanation for its determinants (Mocan, 2008).

The purpose of this paper has been to complement previous approaches by estimating cross-country economic freedom and corruption relationships based on multilevel models. In terms of the topic that we investigated, our contribution is to simultaneously incorporate the empirical facts presented in Section 2.2 and to test the the impact of the components of economic freedom on corruption using the vast sample of firms' data in developing and developed countries. We estimated these relationships correcting them for the unobserved cross-country variability. By identifying indicators of economic prosperity, income distribution and democracy at the country level, we were able to explain why some countries have higher level of corruption. We estimated the micro-founded relationships and captured unobserved cross-country variability by removing the empirical issues linked with aggregate data. At the microeconomic level, we could explain when government regulation interventions are incentives and when they are discouragements. Thus, we found that competition may be bad for corruption when entry barriers are high and will be so in less developed countries.

If combating corruption is one of the main objectives of the incumbent government, this paper notably suggests that a lack of competition policies and government regulations may actually yield more corruption in less developed countries, while standard receipts of greater freedom may be applied in developed countries.

Our model links financial systems or property rights to corruption, which are considered positive mechanisms for growth. We have answered the question whether these components of

economic freedom lead to reduce corruption and found that, in general, this hypothesis holds. Our model also shows a high and significant variability across countries and the inclusion of identifying country effects makes the relationship more robust and confirms that civil liberties and the macroeconomic indicators determine greater efficiency in combating corruption.

The line for policy makers' intervention in less developed countries and transition economies appears to be clear, although powerful interests, also distant from theoretical discussions concerning the trade-off between government intervention, have influenced the governments to take no action at all, making them almost unresponsive to answer the need to regulate some sectors. According to the empirical analysis, outside the developed countries, policies should be addressed to implement complementary strategy to reduce corruption and costs of the economic growth, selecting (or not) government interventions within appropriate sectors.

APPENDIX 1

[Table 8 about here.]

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Tables

Table 1. Data and variable descriptions

VARIABLES		DESCRIPTION	RANGE	AREA	SOURCE
Dependent variable					
		Corruption perception index	Polycotomous variable from 1 to 6 (1 lowest corruption, 6 highest corruption). This variable is summarized as a dichotomous variable from 0 to 1, where 0 (no corruption) 1 (corruption)		WBES2000
Economic freedom components					
		The degree of competitivness in the country (number of enterprises in the market)	From 0 to 3. 0 (no competitors) until 3 (more than 3 competitors)	Area I	WBES2000
		Government intervention on investments	From 0 to 3. 0 (no government intervention) until 3 (full government intervention)	Area II	WBES2000
		Government intervention on employment	From 0 to 3. 0 (no government intervention) until 3 (full government intervention)	Area II	WBES2000
		Government intervention on sales	From 0 to 3. 0 (no government intervention) until 3 (full government intervention)	Area II	WBES2000
		Government intervention on prices	From 0 to 3. 0 (no government intervention) until 3 (full government intervention)	Area II	WBES2000
		Financial system ability to provide financing to the private sector	From 0 to 1. 0(financing), 1 (no financing)	Area III	WBES2000
		Presence of financial constraints	From 0 to 4. 0 (no financial constraints) until 4 (financial constraints)	Area III	WBES2000
		Government regulation on trade	From 0 to 3. 0 (no government intervention) until 3 (full government intervention)	Area V	WBES2000
		Legal system ability to protect property rights and contracts	From 1 to 4. 1 (inefficient legal system) to 4 (efficient legal system)	Area IV	WBES2000
Micro fixed effects					
		Number of workers in the firm			WBES2000
		Legal organization of the firm	0 (individual owner) 1 (family) 2 (group) 3 (bank) 4 (supervisory board) 5 managers 6 (government)		WBES2000
	No-entry barriers	Availability of informations on laws and regulations	0 (no availability) 1 until 6 (fully availability)		WBES2000
Macro variables					
	GDP	Gross domestic product per-capita			WDI
	INV	Private investments as share of GDP			WDI
	GOV	Government spending as share of GDP			WDI
	GINI	Gini coefficient of distribution of income			WDI
	CIVIL	Civil liberty index	From 1 to 6. 1 (no civil liberties) until 6 (full civil liberties)		WAO

Note: "WBES2000" stands for World Business Environment Survey, published by the world Bank in 2000, "WDI" stands for World Development indicators and "WAO" stands for World Audit Organization.

Table 2. Specification tests, full sample

		Competitors	Private investment regulation	Employment regulation	Sales regulation	Prices regulation	Financial ability	Financial efficiency	Property right protection	Export regulation
Extended model (equation 7)	LRtest	905.56	811.83	821.0637	809.92	813.35	904.48	932.81	836.65	896.28
vs. Endogenous model (equation 8)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Extended model (equation 7)	LRtest	0.70	1.33	2.21	1.62	2.14	0.04	1.75	2.70	2.20
vs. Exogenous model (equation 3)		(0.40)	(024)	(0.13)	(0.20)	(0.14)	(0.83)	(0.18)	(0.10)	(0.13)
Endogenous model (equation 8)	LRtest	905.56	3326.89	3495.53	3467.49	3514.36	3603.52	2880.63	3753.51	3295.41
vs. Basic model		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exogenous model (equation 3)	LRtest	4450.37	4137.39	4314.38	4275.79	4325.57	4507.96	3715.54	4683.63	4189.50
vs. Basic model		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exogenous model (equation 3)	Vuong	7.93	17.67	18.00	15.47	11.47	8.47	8.05	-3.74	10.17
vs. Endogenous model (equation 8)	test	(0.00)	(0.00)	(0.00)	(4.20)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: We have reported the $p-values$ in parenthesis. The Vuong test (1989) for non-nested models is carried out under standard normal distribution. The extended model (Equation 7) includes endogeneity, macro- and firm-fixed effects. The endogenous model (Equation 8) includes endogeneity and firm-fixed effects. The exogenous model (Equation 3) includes macro- and firm-fixed effects.

Table 3. Corruption and Economic freedom components, full sample

	Competitors		Private investment regulation		Employment regulation		Sales regulation		Prices regulation		Financial ability		Financial efficiency		Property right protection		Export regulation	
Competitors	0.012																	
	(0.044)																	
Private investments regulation			0.084	**														
			(0.038)															
Employment regulation					0.131	**												
					(0.038)													
Sales regulation							0.081	**										
							(0.039)											
Prices regulation									0.122	**								
									(0.037)									
Financial efficiency											-0.018							
											(0.063)							
Financial constraints													-0.113	**				
													(0.024)					
Property right protection															-0.218	**		
															(0.035)			
Export regulation																	0.082	**
																	(0.025)	
firm size	-0.109	**	-0.144	**	-0.140	**	-0.135	**	-0.139	**	-0.139	**	-0.113	**	-0.123	**	-0.125	**
	(0.035)		(0.037)		(0.036)		(0.037)		(0.036)		(0.036)		(0.036)		(0.034)		(0.035)	
firm sector	-0.043		-0.056	**	-0.057	**	-0.053	*	-0.054	**	-0.051	*	-0.045		-0.048	*	-0.058	**
	(0.027)		(0.028)		(0.027)		(0.028)		(0.028)		(0.027)		(0.027)		(0.026)		(0.027)	
Legal organization of the firm	-0.015		-0.017		-0.020		-0.017		-0.016		-0.010		-0.014		-0.015		-0.016	
	(0.016)		(0.016)		(0.016)		(0.016)		(0.016)		(0.017)		(0.016)		(0.016)		(0.016)	
GDP	-0.000	**	-0.000	**	-0.000	**	-0.000	**	-0.000	**	-0.000	**	-0.000	**	-0.000	**	-0.000	**
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
GINI	-0.026	**	-0.020	**	-0.019	**	-0.020	**	-0.018	**	-0.024	**	-0.025	**	-0.025	**	-0.023	**
	(0.008)		(0.009)		(0.009)		(0.009)		(0.009)		(0.007)		(0.008)		(0.007)		(0.008)	
INV	-0.051	**	-0.037	**	-0.035	**	-0.036	**	-0.035	**	-0.050	**	-0.050	**	-0.048	**	-0.055	**
	(0.015)		(0.018)		(0.017)		(0.018)		(0.017)		(0.015)		(0.016)		(0.015)		(0.015)	
GOV	0.173	**	0.173	**	0.172	**	0.174	**	0.170	**	0.182	**	0.174	**	0.165	**	0.184	**
	(0.043)		(0.044)		(0.043)		(0.044)		(0.043)		(0.043)		(0.045)		(0.042)		(0.044)	
CIVIL	-0.104	**	-0.123	**	-0.119	**	-0.124	**	-0.121	**	-0.095	*	-0.086		-0.098	*	-0.092	*
	(0.053)		(0.058)		(0.057)		(0.058)		(0.057)		(0.052)		(0.055)		(0.051)		(0.054)	
Constant	1.811	**	0.928		0.753		0.901		0.735		1.363	**	1.691	**	1.952	**	1.210	*
	(0.667)		(0.764)		(0.753)		(0.769)		(0.753)		(0.641)		(0.671)		(0.633)		(0.667)	
$\rho_{benchmark}$	0.328	**	0.286	**	0.289	**	0.288	**	0.282	**	0.328	**	0.315	**	0.311	**	0.317	**
ρ_{id_macro}	0.091	**	0.093	**	0.090	**	0.093	**	0.091	**	0.088	**	0.098	**	0.087	**	0.098	**
N	3372		2959		2989		2962		2974		3132		3128		3410		3192	

Note: Dependent variable is the dichotomous index of corruption. We have reported in parenthesis the standard errors, while the asterisks stand for the p-value significance levels. We have that $* \ p < 0.1$, $** \ p < 0.05$. We have presented two measures of intraclass correlation corresponding to the benchmark model without the micro-fixed effects and macro variables $\rho_{benchmark}$ and to model without macro variables ρ_{id_macro}

Table 4. Specification tests, sub-sample of the African countries

		Competitors	Private investment regulation	Employment regulation	Sales regulation	Prices regulation	Financial efficiency	Financial constraints	Property right protection	Export regulation
Extended model (equation 7)	LRtest	516.08	520.87	517.44	516.18	522.39	527.15	472.14	515.48	499.57
vs. Endogenous model (equation 8)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Extended model (equation 7)	LRtest	8.90	0.37	6.58	1.23	0.42	2.80	3.21	6.53	1.61
vs. Exogenous model (equation 3)		(0.40)	(0.54)	(0.01)	(0.26)	(0.51)	(0.09)	(0.07)	(0.01)	(0.20)
Endogenous model (equation 8)	LRtest	144.46	355.28	365.61	349.49	347.02	342.25	351.47	395.47	336.40
vs. Basic model		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exogenous model (equation 3)	LRtest	651.63	875.78	876.47	864.45	868.99	866.60	820.41	904.43	834.36
vs. Basic model		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exogenous model (equation 3)	Vuong	43.01	6.61	94.35	75.23	33.69	40.38	23.37	12.93	27.73
vs. Endogenous model (equation 8)	test	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: We have reported the $p-values$ in parenthesis. The Vuong test (1989) for non-nested models is carried out under standard normal distribution. The extended model (Equation 7) includes endogeneity, macro- and firm-fixed effects. The endogenous model (Equation 8) includes endogeneity and firm-fixed effects. The exogenous model (Equation 3) includes macro- and firm-fixed effects.

Table 5. Specification tests, sub-sample of the Transition economies

		Competitors	Private investment regulation	Employment regulation	Sales regulation	Prices regulation	Financial ability	Financial efficiency	Property right protection	Export regulation
Extended model (equation 7)	LRtest	259.13	230.42	239.79	244.58	247.68	257.20	241.48	255.47	235.25
vs. Endogenous model (equation 8)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Extended model (equation 7)	LRtest	0.00	0.09	0.15	3.58	3.00	0.97	6.20	0.36	1.87
vs. Exogenous model (equation 3)		(1.00)	(0.76)	(0.69)	(0.05)	(0.08)	(0.32)	(0.01)	(0.54)	(0.17)
Endogenous model (equation 8)	LRtest	289.90	294.99	298.15	285.59	295.65	294.71	251.08	290.79	271.98
vs. Basic model		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exogenous model (equation 3)	LRtest	549.03	525.32	537.78	526.60	540.33	550.95	486.35	545.90	505.36
vs. Basic model		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exogenous model (equation 3)	Vuong	49.99	84.77	85.76	7642	103.51	24.88	18.72	-39.25	31.44
vs. Endogenous model (equation 8)	test	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: We have reported the $p-values$ in parenthesis. The Vuong test (1989) for non-nested models is carried out under standard normal distribution. The extended model (Equation 7) includes endogeneity, macro- and firm-fixed effects. The endogenous model (Equation 8) includes endogeneity and firm-fixed effects. The exogenous model (Equation 3) includes macro- and firm-fixed effects.

Table 6. Corruption and Economic freedom components, sub-sample of the African countries

	Competitors		Private investment regulation		Employment regulation		Sales regulation		Prices regulation		Financial ability		Financial efficiency		Property right protection		Export regulation	
Competitors	0.160																	
	(0.105)																	
Private investment regulation			-0.289	**														
			(0.104)															
Employment regulation					-0.150													
					(0.097)													
Mean employment regulation					2.489	**												
					(0.969)													
Sales regulation							-0.288	**										
							(0.134)											
Prices regulation									-0.198	*								
									(0.105)									
Financial efficiency											-0.426	**						
											(0.162)							
Financial constraint													-0.133	**				
													(0.059)					
Property right protection															-0.217	**		
															(0.074)			
Mean of property right protection															-2.065	**		
															(0.814)			
Export regulation																	0.248	**
																	(0.059)	
Firm size	-0.087		-0.160	**	-0.137	*	-0.115		-0.133	*	-0.105		-0.104		-0.136	*	-0.091	
	(0.076)		(0.075)		(0.074)		(0.075)		(0.074)		(0.076)		(0.079)		(0.074)		(0.076)	
Firm sector	0.048		0.013		0.027		0.023		0.027		0.040		0.037		0.039		0.039	
	(0.045)		(0.044)		(0.044)		(0.044)		(0.044)		(0.045)		(0.046)		(0.044)		(0.045)	
Legal organization of the firm	-0.092	**	-0.088	**	-0.095	**	-0.071	*	-0.074	*	-0.044		-0.091	**	-0.097	**	-0.076	*
	(0.042)		(0.040)		(0.040)		(0.040)		(0.040)		(0.042)		(0.043)		(0.040)		(0.041)	
GDP	0.000		0.000		0.001	**	0.000		0.000		0.000		0.000		0.000		0.000	
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
GINI	-0.027	**	-0.020		-0.028	**	-0.021		-0.018		-0.028	**	-0.025	*	-0.048	**	-0.014	
	(0.014)		(0.014)		(0.014)		(0.014)		(0.013)		(0.014)		(0.014)		(0.016)		(0.014)	
INV	-0.050	**	-0.057	**	-0.056	**	-0.044	*	-0.044	*	-0.045	*	-0.046	*	0.034		-0.050	**
	(0.024)		(0.023)		(0.023)		(0.023)		(0.023)		(0.024)		(0.025)		(0.038)		(0.024)	
GOV	0.291	**	0.368	**	0.429	**	0.387	**	0.391	**	0.321	**	0.393	**	-0.161		0.352	**
	(0.118)		(0.111)		(0.116)		(0.112)		(0.112)		(0.113)		(0.119)		(0.207)		(0.113)	
CIVIL	0.023		0.043		0.042		0.025		0.042		-0.004		0.041		0.087		0.014	
	(0.066)		(0.063)		(0.063)		(0.064)		(0.064)		(0.064)		(0.069)		(0.067)		(0.066)	
Constant	-0.688		0.258		-7.148	**	-0.211		-0.656		0.133		-0.553		8.018	**	-1.422	
	(1.496)		(1.465)		(3.119)		(1.434)		(1.410)		(1.448)		(1.476)		(3.295)		(1.451)	
$\rho_{benchmark}$	0.189	**	0.237	**	0.133	**	0.226	**	0.223	**	0.210	**	0.234	**	0.035	**	0.225	**
ρ_{id_macro}	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**
N	578		590		595		589		593		578		545		612		582	

Note: Dependent variable is the dichotomous index of corruption. We have reported in parenthesis the standard errors, while the asterisks stand for the p-value significance levels. We have that $* \ p < 0.1$, $** \ p < 0.05$. We have presented two measures of intraclass correlation corresponding to the benchmark model, without micro-fixed effects and macro variables $\rho_{benchmark}$ and to model without the macro variables ρ_{id_macro}

Table 7. Corruption and Economic freedom components, sub-sample of the Transition countries

	Competitors		Private investment regulation		Employment regulation		Sales regulation		Prices regulation		Financial ability		Financial efficiency		Property right protection		Export regulation	
Competitors	0.137	**																
	(0.063)																	
Private investment regulation			-0.194	**														
			(0.058)															
Employment regulation					-0.223	**												
					(0.068)													
Sales regulation							-0.223	**										
							(0.060)											
Mean of sales regulation							1.161	*										
							(0.614)											
Prices regulation									-0.123	**								
									(0.053)									
Financial reliability											-0.021							
											(0.075)							
Financial efficiency													-0.161	**				
													(0.031)					
Mean of financial efficiency													-0.717	**				
													(0.288)					
Property right protection															-0.215	**		
															(0.051)			
Export regulation																	0.127	**
																	(0.036)	
Firm size	-0.086		-0.145	**	-0.148	**	-0.163	**	-0.149	**	-0.121	**	-0.134	**	-0.107	*	-0.118	*
	(0.059)		(0.064)		(0.061)		(0.063)		(0.061)		(0.061)		(0.064)		(0.059)		(0.064)	
Legal organization of the firm	-0.067	**	-0.077	**	-0.066	**	-0.062	**	-0.068	**	-0.075	**	-0.057	**	-0.062	**	-0.066	**
	(0.024)		(0.026)		(0.025)		(0.026)		(0.025)		(0.025)		(0.027)		(0.024)		(0.026)	
GDP	-0.000	**	-0.000	*	-0.000	**	-0.000		-0.000		-0.000	**	-0.000		-0.000	**	-0.000	*
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
GINI	-0.017	*	-0.022	**	-0.019	**	-0.037	**	-0.018	*	-0.016	*	0.005		-0.012		-0.016	
	(0.009)		(0.010)		(0.009)		(0.015)		(0.009)		(0.009)		(0.013)		(0.009)		(0.010)	
INV	0.008		0.006		0.007		-0.008		0.013		0.009		0.033	*	0.019		0.016	
	(0.017)		(0.018)		(0.017)		(0.021)		(0.017)		(0.017)		(0.020)		(0.017)		(0.018)	
GOV	0.141	**	0.137	**	0.139	**	0.149	**	0.154	**	0.148	**	0.193	**	0.152	**	0.142	**
	(0.023)		(0.024)		(0.024)		(0.024)		(0.024)		(0.023)		(0.029)		(0.023)		(0.024)	
CIVIL	-0.098	**	-0.114	**	-0.100	*	-0.216	**	-0.111	**	-0.103	**	-0.049		-0.067		-0.141	**
	(0.049)		(0.054)		(0.053)		(0.085)		(0.052)		(0.050)		(0.059)		(0.050)		(0.053)	
Constant	-0.574		0.981		0.864		-1.072		0.345		0.059		0.727		-0.121		-0.178	
	(0.611)		(0.645)		(0.618)		(1.004)		(0.592)		(0.607)		(0.647)		(0.582)		(0.642)	
$\rho_{benchmark}$	0.112	**	0.100	**	0.109	**	0.107	**	0.106	**	0.111	**	0.103	**	0.107	**	0.107	**
ρ_{id_macro}	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**	0.000	**
N	1706		1408		1517		1522		1539		1670		1432		1710		1429	

Note: Dependent variable is the dichotomous index of corruption. We have reported in parenthesis the standard errors, while the asterisks stand for the p-value significance levels. We have that $* \ p < 0.1$, $** \ p < 0.05$. We have presented two measures of intraclass correlation corresponding to the benchmark model without micro-fixed effects and macro variables $\rho_{benchmark}$ and to the model without macro variables ρ_{id_macro}

Table 8. List of countries by macro regions.

country name	Africa	Mena	Transition	East Asia	South Asia	Latin America	OECD	Total
Albania	0	0	163	0	0	0	0	163
Argentina	0	0	0	0	0	100	0	100
Bangladesh	0	0	0	0	50	0	0	50
Belize	0	0	0	0	0	50	0	50
Bolivia	0	0	0	0	0	100	0	100
Botswana	101	0	0	0	0	0	0	101
Brazil	0	0	0	0	0	201	0	201
Bulgaria	0	0	125	0	0	0	0	125
Cameroon	57	0	0	0	0	0	0	57
Canada	0	0	0	0	0	0	101	101
Chile	0	0	0	0	0	100	0	100
China	0	0	0	101	0	0	0	101
Colombia	0	0	0	0	0	101	0	101
Costa Rica	0	0	0	0	0	100	0	100
Cote d'Ivoire	97	0	0	0	0	0	0	97
Croatia	0	0	127	0	0	0	0	127
Czech Republic	0	0	137	0	0	0	0	137
Dominican Republic	0	0	0	0	0	111	0	111
Ecuador	0	0	0	0	0	100	0	100
Egypt. Arab Rep.	0	102	0	0	0	0	0	102
El Salvador	0	0	0	0	0	104	0	104
Estonia	0	0	132	0	0	0	0	132
France	0	0	0	0	0	0	100	100
Germany	0	0	0	0	0	0	100	100
Ghana	119	0	0	0	0	0	0	119
Guatemala	0	0	0	0	0	106	0	106
Haiti	0	0	0	0	0	103	0	103
Honduras	0	0	0	0	0	100	0	100
Hungary	0	0	129	0	0	0	0	129
India	0	0	0	0	210	0	0	210
Indonesia	0	0	0	100	0	0	0	100
Italy	0	0	0	0	0	0	100	100
Kenya	113	0	0	0	0	0	0	113
Lithuania	0	0	112	0	0	0	0	112
Madagascar	116	0	0	0	0	0	0	116
Malawi	55	0	0	0	0	0	0	55
Malaysia	0	0	0	100	0	0	0	100
Mexico	0	0	0	0	0	100	0	100
Namibia	95	0	0	0	0	0	0	95
Nicaragua	0	0	0	0	0	100	0	100
Nigeria	93	0	0	0	0	0	0	93
Pakistan	0	0	0	0	103	0	0	103
Panama	0	0	0	0	0	100	0	100
Peru	0	0	0	0	0	108	0	108
Philippines	0	0	0	100	0	0	0	100
Poland	0	0	225	0	0	0	0	225
Portugal	0	0	0	0	0	0	100	100
Romania	0	0	125	0	0	0	0	125
Russian Federation	0	0	525	0	0	0	0	525
Senegal	124	0	0	0	0	0	0	124
Singapore	0	0	0	100	0	0	0	100
Slovak Republic	0	0	129	0	0	0	0	129
Slovenia	0	0	125	0	0	0	0	125
South Africa	121	0	0	0	0	0	0	121
Spain	0	0	0	0	0	0	104	104
Tanzania	83	0	0	0	0	0	0	83
Thailand	0	0	0	422	0	0	0	422
Trinidad and Tobago	0	0	0	0	0	101	0	101
Tunisia	0	52	0	0	0	0	0	52
Turkey	0	0	150	0	0	0	0	150
Uganda	137	0	0	0	0	0	0	137
Ukraine	0	0	225	0	0	0	0	225
United Kingdom	0	0	0	0	0	0	102	102
United States	0	0	0	0	0	0	100	100
Venezuela. RB	0	0	0	0	0	100	0	100
Zambia	84	0	0	0	0	0	0	84
Zimbabwe	129	0	0	0	0	0	0	129
Total	1,524	154	2,429	923	363	1,985	807	8,185

Figures

Figure 1. Summary index score of economic freedom and corruption

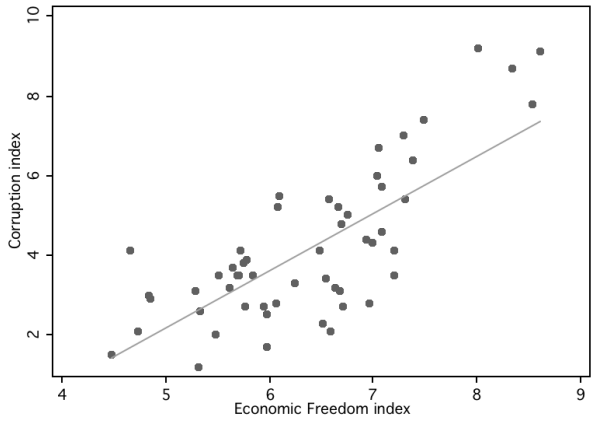


Figure 2. Summary index score of economic freedom and corruption, African countries

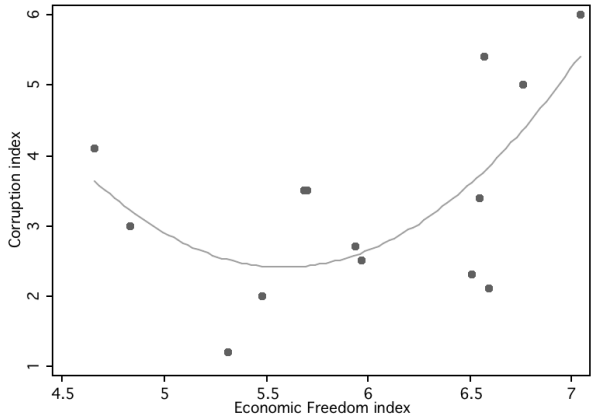
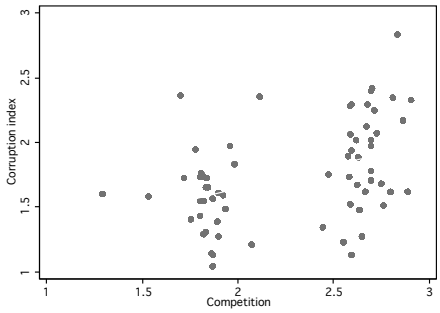
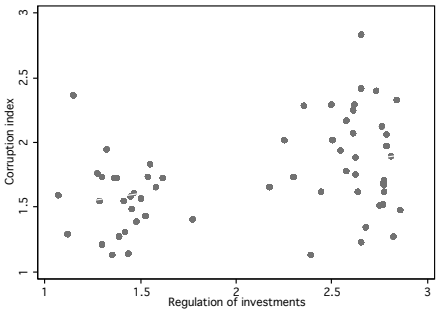


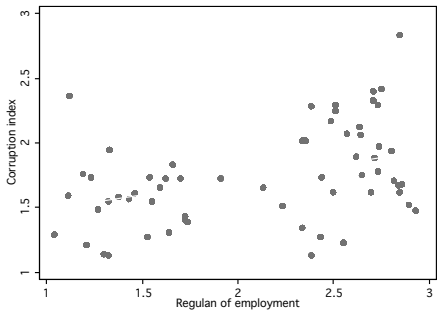
Figure 3. Economic freedom components and corruption, full sample



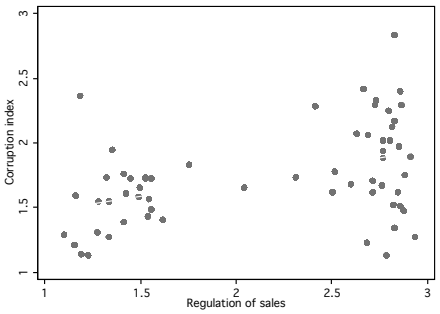
(a) Competitors (Area I)



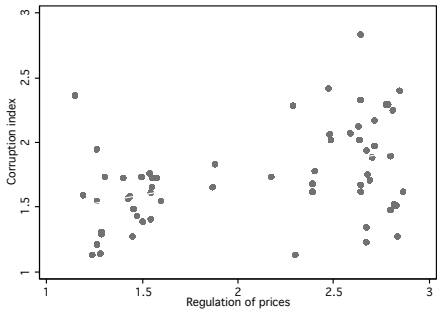
(b) Private investment regulation (Area II)



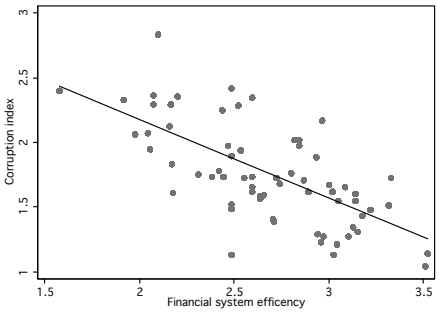
(c) Employment regulation (II)



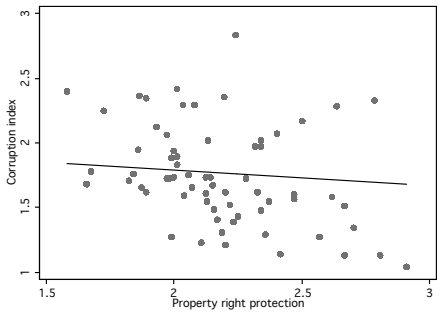
(d) Sales regulation (II)



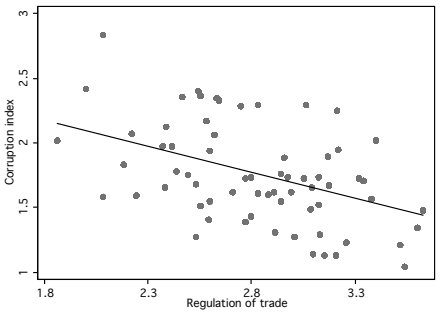
(e) Prices regulation (II)



(f) Fiscal market constraints (Area III)



(g) Property right protection (Area IV)



(h) Export regulation (V)

Note: The figures are built by aggregating individual data of economic-freedom components and corruption at the country level. The economic-freedom areas used to share economic freedom components are derived by Gwartney and Lawson (2000). For further information on sources, see Section 4.1.

Figure 4. Strategy for testing nested and non-nested models