FONDATION POUR LES ÉTUDES ET RECHERCHES SUR LE DÉVELOPPEMENT INTERNATIONAL

Working Paper 106 June 2014 document de travail

Corruption in Turbulent Times: a Response to Shocks?*

Joël Cariolle

Joël Cariolle has a PhD in Economics. He is an Associate researcher for FERDI, addressing issues related to economic vulnerability and governance. He is also expert in anti-corruption policies. // **cariolle.joel@gmail.com**

Abstract

Economic instability may trigger ex ante and ex post corruption strategies, respectively resulting from the perception and experience of economic fluctuations. Using measures of export instability reflecting its ex ante and ex post effects, dynamic panel estimations are conducted with corruption perception data covering 62 developed and developing countries over 1985-2005; and cross-section estimations with aggregated data on 22,062 firms' bribe reports in 38 developing countries. Estimations support a positive ex post effect of both positive and adverse sharp export fluctuations on corruption, channeled by restricted credit access and weak democratic institutions. By contrast, a deterrent ex post effect of both positive and negative normal export fluctuations is found, channeled by facilitated credit access and effective democratic institutions. Estimations also support a positive ex ante effect of instability on corruption, especially when access to financial markets is restricted. Therefore, when institutions are dysfunctional, both favorable and adverse shocks may increase corruption prevalence.

Keywords: corruption, instability, shocks, exports, financial markets, democracy

ACKNOWLEDGEMENTS

The author is grateful to Patrick Guillaumont, Bernard Gauthier, Jan Gunning, Olivier Cadot, Vianney Dequiedt, Michaël Goujon, Jean-louis Combes, Laurent Wagner and Gaëlle Balineau for helpful comments and suggestions. This paper benefited from the support of the FERDI (Fondation pour les etudes et recherches sur le développement international) and the Programme d'investissement d'avenir of the French Government. Remaining errors are mine.

* This paper has been presented at the 2014 European Public Choice Society Conference in Cambridge (April, 4-6, 2014) and at 63th annual congress of the Association Française des Sciences Economiques in Lyon (June, 18-16, 2014)

1. Introduction

As the columnist Eduardo Porter pointed out in the New York Times, if trust in institutions and perceptions of good governance are probably better off during good times than during hard times (Stevenson and Volfers, 2011), there is in parallel a high temptation for fraud, embezzlement and other corruption offences during "the general prosperity of economic booms".[1] His view strongly coincides with a former work of Galbraith (1997), who stresses that economic crises are often followed by scandals of large-scale corruption, revealing the prevalence of malpractices in the administration of public and private affairs prior to economic reversal. The 2008 worldwide financial crisis and its consequences on national public accounts and fiscal solvency are striking illustrations of the complex link between governance quality and output fluctuations. While poor norms of transparency and lack of accountability mechanisms in the management of public and private funds contributed to the dramatic economic collapse experienced by industrialized economies, these malpractices found a fertile ground in the recklessness and opulence of economic and financial expansion.

The relationship between governance quality and output fluctuations has already been emphasized by the economic literature. On the one hand, the contribution of bad governance to domestic instability is evidenced in important cross-country analyses (Acemoglu et al. (2003) or Mobarak (2005)). On the other hand, it has been shown that the ability of governments to handle economic crisis depends on the quality of institutions (Rodrik (2000); Arin et al. (2011)). Rodrik (2000) shows that democratic institutions foster political consensus around policy responses to external shocks, while Arin et al. (2011) find that corrupt OECD countries are less likely to rebalance their budget during serious attempts of fiscal consolidation. Thus, according to these studies and in the light of the recent economic events, the contour of a vicious circle between bad governance and the instability of output looms: economic shocks are more likely to occur, and their destabilizing effects are more likely to persist, where institutions fostering good public and private governance are weaker.

An under-documented element of this puzzling equation is the reverse causality, namely, the impact of output fluctuations on institutions and governance quality. To my knowledge, there are very few theoretical foundations for the study of corruption as a response to shocks (Aidt and Dutta, 2008; Dalgaard and Olsson, 2008). More generally, empirical analyses of the consequences of economic fluctuations on institutional variables have been so far studied by a handful of contemporaneous studies. Brückner and Ciccone (2011) find a positive effect of adverse climate shocks on the quality of institutions, arguing that citizens are likely to voice their discontent and hasten democratic change during hardships. Regarding corruption prevalence, Borcan et al. (2012) show that an unexpected public wage loss contributes to increase corruption practices in the Romanian education sector, while others advance that transient economic booms may foster

[1] Eduardo Porter "The Spreading Scourge of Corporate Corruption", in The New York Times, July 10, 2012.

illegal enrichment of agents in charge of public affairs, in African countries (Voors et al., 2011) but also in developed and emerging countries (Gokcekus and Suzuki, 2011). According to these studies, the direction of the effect of economic fluctuations on corruption is not clearly established and probably depends on the institutional framework (Aidt and Dutta, 2008; Dalgaard and Olsson, 2008).

This paper provides additional insights into the effects of economic instability on corruption. Following Elbers et al. (2007), instability is assumed to trigger *ex ante* and *ex post* corruption strategies, respectively resulting from agent's perception and experience of economic fluctuations. These strategies may concretize into corrupt transactions aimed at managing and coping with adverse fluctuations, but also taking advantage from favourable ones.

E*x ante* and *ex post* effects are estimated using measures respectively reflecting the perception and experience of instability. Measures of instability in the constant value of export earnings are used as a proxy for overall economic instability, since fluctuations in export volume represent an major, primary, and exogenous source of aggregate instability with strong destabilizing effects on growth, tax, and redistribution policy in both developed and developing countries (Guillaumont 2010, 2009; Loayza et al., 2007; Guillaumont and Chauvet, 2001; Jones and Olken, 2010; Easterly et al., 1993; Bevan et al., 1993). On the one hand, fixed effect (FE) and system-Generalized Method of Moments (GMM) estimations are conducted on a panel of 62 developed and developing countries covering the period 1985-2005, using data on corruption perceptions taken from the International Country Risk Guide (ICRG). On the other hand, cross-section estimations of these effects are also conducted on a sample 38 developing countries using aggregated data on 22,062 firms' reported informal payments drawn from the World Bank Enterprise Surveys (WBES).

Results are consistent with the literature's findings (Gokcekus and Suzuki, 2011; Voors et al, 2010; Dalgaard and Olsson, 2008). Strong and robust evidence of *ex ante* and *ex post* effects of instability on corruption perception and bribery incidence is given. Dynamic panel data estimations as well as cross-section estimations support that the *ex post* effect of instability is nonlinear, depending on factors underlying the responsiveness of corruption to export shocks. Estimations indeed support a positive *ex post* effect of both positive and adverse intense export shocks on corruption, driven by restricted credit access and weak democratic institutions. By contrast, they support a deterrent *ex post* effect of both positive and adverse normal export movements, driven by a facilitated credit access and effective democratic institutions. A positive *ex ante* effect of instability on corruption is also found, especially when access to financial markets is restricted. Thus, when institutions are dysfunctional, both positive and negative economic shocks may increase corruption prevalence.

The next section presents our analytical framework. Section 3 presents the data and our empirical approach. In sections 4 and 5, empirical results are presented and commented. Section 6 concludes.

2. Analytical framework

In this section, a general framework for the analysis of the effect of economic instability on corruption is presented. This article is among the very few attempts of building and testing a framework for the study of corruption at business cycle frequencies. Aidt and Dutta (2008) evaluate the impact of shocks on corruption in a model of entry regulation in a democracy. They argue that the pro-cyclical or contra-cyclical nature of the relationship between shocks and corruption depends on whether shocks and regulatory policy are observed by voters. Dalgaard and Olsson (2008) study the effect of resource windfalls on rent-seeking behaviors and show that if the former directly increase the incentive to engage in corruption, it also indirectly raises the opportunity cost of engaging in such activities by raising factors' productivity in productive sectors.

In this paper, I propose another explanation for the effect of shocks on corruption. Building on the literature on risk and saving in contexts of market failures (Elbers et al, 2007; Dercon, 2002; Bardhan and Udry, 1999), I consider that engaging in corruption may be a hedge against economic fluctuations. Corruption is indeed an informal, illegal, multidimensional, and revenue-generating activity, with a strong impact on resource allocation and contract enforcement. Intrinsic characteristics of corruption which make it a possible alternative to usual risk-coping and risk-management mechanisms are the following:

- First, as stressed by Lambsdorff (2002), its impact on resource allocation is dramatic. Corruption is indeed an illegal rent-seeking activity undertaken by economic agents to i) influence public regulations and thereby increasing the number and size of public rents, and to ii) take control over them.
- Second, corruption can also be viewed holistically as an institutional arrangement arising from the lack, the inappropriateness, or the ineffectiveness of formal institutions reducing the uncertainty upon (or ensuring the predictability of) interactions between agents (Graeff, 2005; Andvig, 2006; Williamson, 2009).
- Third, when the body of formal laws, rules and codes that are supposed to govern economic exchanges are failing, firms bribe payments may represent key productive decisions with noticeable consequences on firms' performances. This dimension of corrupt transactions is outlined by studies on the effects of cultural orientations on corrupt schemes, which stress that business corruption may increase when other resources get scarce (Robertson and Watson, 2004), or that corrupt strategies find a fertile ground in cultures where the fear of uncertainty is stronger (Husted, 1999; Søreide, 2009).

Thus, following the distinction between household's responses to income risk proposed by Elbers et al. (2007), I posit there exists *ex ante* and *ex post* effects of economic instability on corrupt behaviors. While the *ex post* effect of instability refers to the agent's decisions resulting from their *experience* of economic shocks, the *ex ante* effect refers to agent's decisions resulting from their *perception* of economic instability, regardless the actual impact of shocks.

2.1. The *ex ante* effect of instability on corruption

The *ex ante* effect of instability refers to agents' productive decisions aimed at lowering revenue exposure to economic fluctuations. These decisions translate into income smoothing strategies consisting in reducing the risk in the income process by, for example, diversifying production choices, or re-orienting production toward lower-return but lower-risk activities (Dercon, 2002). At macro level, the *ex ante* effect of economic instability on policy can be grasped through the Ehrlich–Becker's (1972) "comprehensive insurance" framework to manage external shocks[2], which consists in self-protection (i.e. reducing exposure to risk), self-insurance (i.e. transferring resources across time), or full hedging through contingent financial instruments (i.e. transferring resources across states of nature).

On the other hand, the business literature on the effects of cultural orientations on corrupt schemes emphasizes that an uncertainty avoidance motive for corruption may operate, especially in cultures where the aversion for uncertain or unknown situations prevails (Husted, 1999, Robertson and Watson, 2004). But more importantly, recent business studies show that firms with political connections are associated with a better access to financial services, a higher probability of being bailed out in case of financial distress, a better chance to win public procurement contracts, and hence a lower exposure to economic turmoil than their non-connected counterparts (Faccio et al, 2013; Boubakri et al. 2012; Goldman et al., 2013), even in low corruption environments (Amore and Bennedsen, 2013).

Building on this literature, I assume that risk-averse agents may engage in corrupt activities to "lock" resource inflows over a given timeframe. Resource-locking corruption strategies can indeed be undertaken *ex ante* to ensure future revenue inflows, thereby reducing the variance of income over time. As an example, long-term public contracts are probably much more valued by risk-averse private firms operating in unstable economic environments than those operating in stable environments, because they guarantee revenue inflows over a long timeframe. *Ceteris paribus*, the formers may hence be more inclined to corrupt in order to win such contracts than the latter. For the same resource-locking motive, private interests may also be incited to unduly influence governments and legislators to initiate and pass laws that give effect to their interest in trade protections or favorable economic regulations (Grossman and Helpman, 1994), thereby lowering their revenue exposure to international trade fluctuations and securing revenue inflows over time. Public agents may also have similar incentives for resource-locking corruption strategies. When macroeconomic instability undermines the predictability of the government's fiscal policy, creating uncertainty upon the allocation of resources at different layers of the government, public officials may bribe higher-level public agencies in order to maintain the allocation of such resources.

Finally, this 'resource-locking motive' for corruption tends to be corroborated by the recent work of Arin et al. (2011), who show that during serious attempts of correcting fiscal imbalances, corrupt

[2] Mentioned by Loayza et al (2007).

governments are less likely to cut spending than honest ones, since the former have "higher incentives to keep expenditures large (…) in order to accommodate the interests of influential lobbies".[3] That is why resource-locking corruption is expected to be an appealing income smoothing corruption strategy, spreading (lessening) in environments with high (low) output instability.

2.2. The *ex post* effect of instability on corruption

How the experience of shocks affects incentives to engage in corruption is much more puzzling (as suggested in Aidt and Dutta (2008) and Dalgaard and Olson (2008)), because two opposite corruption strategies can be invoked: *opportunistic corruption*, which stems from the mechanical ups and downs in public and private rents induced by export transitory movements (Voors et al, 2010; Dalgaard and Olsson, 2008); and *survival corruption*, which arises from the necessity to relax constraints on income or business during hardships (Borcan et al., 2012). While both mechanisms result from individuals' experience of instability, only the latter can be, strictly speaking, considered as a risk-coping mechanism. Given these two effects are expected to act in opposite ways, the direction and strength of the resulting net effect are therefore a priori uncertain.

2.2.1. Opportunistic corruption

As stressed by Voors et al. (2011) and Dalgaard and Olsson (2008), positive transitory shocks increase opportunities for corrupt transactions, which may incite agents to intensify their efforts to accumulate wealth through corrupt activities. Conversely, adverse transitory shocks reduce the number and/or the size of rents of which public and private agents were or would have unduly taken advantage.

The literature on the natural resource curse provides striking illustrations of how 'voracious' appetites for wealth accumulation are stimulated by temporary resource expansions. For instance, important rises in international raw material demand may undermine the rule of law and reorient economic activity toward rent-seeking activities (Arezki and Brükner, 2012; Van der Ploeg, 2011, 2010; Dalgaard and Olsson, 2008; Isham et al., 2005). Van der Ploeg (2010) also shows that, in natural resource rich countries, a precautionary motive may lie behind oil rent extraction during transient oil-demand positive shocks. By extrapolation, it is plausible that favorable shocks also give liquidity-constrained agents the incentive to insure themselves against future economic collapses, by engaging in corrupt activities during 'good years' and spending the resulting corruption proceeds during 'bad years'.

In a more general setting, opportunistic public and private agents are likely to accumulate extra-wealth through bribery, extortion or embezzlement when opportunities for corrupt transactions flourish. Therefore, such opportunistic corrupt behaviors are expected to be pro-cyclical, i.e. spreading during positive shocks and decreasing during negative shocks.

[3] in Arin, K.P., Chmelarova, V., Feess, E., and A. Wohlschlegel (2011), "Why are corrupt countries less successful in consolidating their budgets?", *Journal of Public Economics*, Vol.95, No.7-8, p.529.

2.2.2. Survival corruption

If the negative correlation between the development process and corruption prevalence has been widely emphasized (among others Treisman (2000)), the possibility of contra-cyclical corruption responses to shocks has been less considered by the literature (Borcan et al, 2012). Yet, various microeconomic surveys show that during negative income shocks, usual productive activities may not enable households to maintain their standard of living, so that labor supply adjustments represent an appealing strategy to earn extra income (Dercon, 2002). Interestingly, in a recent study, Robinson and Yeh (2009) show that transactional unprotected but better compensated sex is a way chosen by sex workers in Kenya to cope with health shocks, when formal and informal risk coping mechanisms do not allow them to fully smooth consumption. A similar motive for engaging in criminality has been stressed by Guillaumont and Puech (2006), who point out that individuals are likely to compensate income losses during hardships by engaging in criminal activities. Therefore, when usual coping mechanisms are not fully effective, engaging in risky informal income-generating activities may help hedging against adverse shocks.

In the same way, adverse transitory shocks may lead agents to engage in corrupt activities in order to cushion income losses. For instance, during economic downturns, public officials may require firms to pay higher and/or more frequent bribes to complete their income (Borcan et al., 2012). Similarly, firms under economic stress may be prone to fraud and bribery in order to relieve the state burden: e.g. avoiding taxation, fastening business or export licenses award, evading red tape, or smuggling. Therefore, if the 'survival' motive prevails, corruption should increase during economic downturns when the liquidity constraint hardens, and should decrease during economic upturns when the liquidity constraint softens.

2.2.3. The ex post net effect of instability

By reassembling these two corruption patterns in a unified analytical framework, testable scenarios for the *ex post* net effect of instability and corruption are derived.

Figures 1 and 2 represent four main situations corresponding to four different corruption outcomes. Each graph depicts how corruption responds (*y*-axis) to transient income movements (*x*-axis). Graphs 1a and 1b represent the simplest corruption scenarios, where the relationship is linear, i.e. the marginal effect of shocks is constant and corruption responses are symmetric. This constant marginal effect reflects a situation where corruption varies in the same proportion as transitory income varies, yielding:

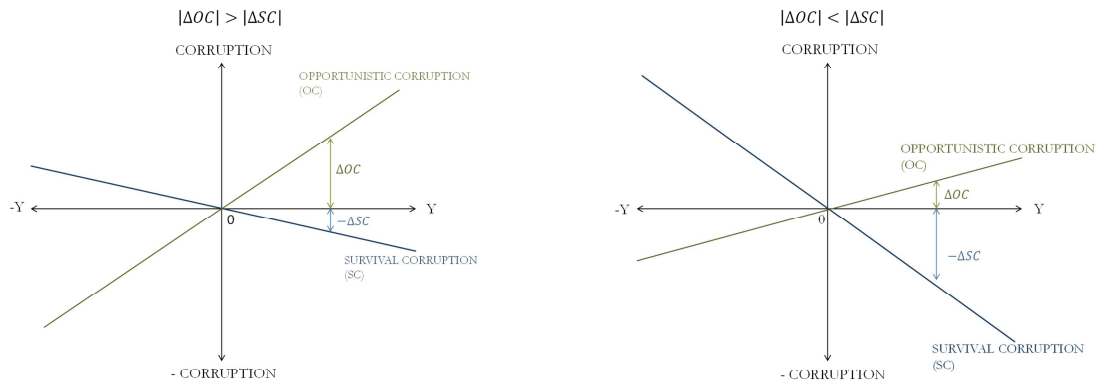
Scenario 1a: *opportunistic corruption* prevails, corruption is pro-cyclical. Variations in opportunistic corruption (OC) during positive and negative shocks outweigh variations in survival corruption (SC).

Scenario 1b: *survival corruption* prevails, corruption is contra-cyclical. Variations in SC during positive and negative shocks outweigh variations in OC.

Figure 1. The linear *ex post* net effect of instability on corruption

Symmetric corruption responses yielding

a. Pro-cyclical relationship or b. Contra-cyclical relationship



The linearity hypothesis on the effect of transitory income on corruption may be however too restrictive. In fact, the marginal effect of shocks may be decreasing or increasing, depending on the quality of the institutional framework. I identify two key interrelated characteristics of the institutional framework affecting the relative cost of engaging in additional corrupt transactions (Altunbas and Thornton, 2012; Lederman et al, 2005): on the one hand, the effectiveness of institutional safeguards against corruption – accountability and transparency mechanisms, the media, non-state actors, the judiciary, etc. – affecting the probability for corrupt agents of getting caught and sanctioned; and on the other hand, the access to financial markets, which determines the cost of alternative financial resources.[4]

Thus, in good institutional environments, it can be expected that the marginal effect of shocks on (opportunistic or survival) corruption is decreasing – i.e. that corruption responses are less than proportional than income shocks. In fact, where institutional safeguards against corruption are effective and/or financial markets are developed[5]**,** the relative cost of engaging in corruption increases with the size of corrupt transactions, and the marginal effect of shocks on corruption is decreasing. On the other hand, in unfavorable institutional environments, it can be expected that the marginal effect of shocks on (opportunistic or survival) corruption is increasing – i.e. that corruption responses are more than proportional than income shocks. In fact, where institutional safeguards against corruption are ineffective and/or financial markets are underdeveloped**,** the

[4] In the same spirit, Dalgaard and Olsson (2008) show in a rent-seeking model that the ratio "rent size/labor productivity" determine the opportunity cost of normal production, i.e. not engaging in rent-seeking.

[5] Ahlin and Pang (2008) show that financial development and the control of corruption are substitutes in promoting growth, arguing that in corrupt countries the demand for liquidity is higher.

relative cost of engaging in corruption increases with the size of corrupt transactions, and the marginal effect of shocks on corruption is decreasing.

In graphs 3iii) and 3iv), the linearity assumption on the marginal effect of shocks on corruption is relaxed: asymmetric responses to shocks emerge, yielding symmetric corruption patterns:

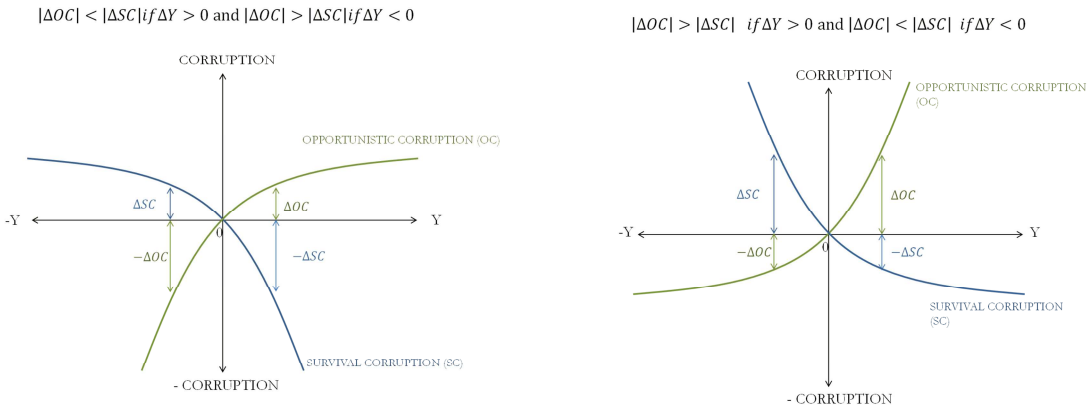
Scenario 2a: a *'symmetric deterrent' effect* of shocks on corruption arises when the marginal effect of income shock is decreasing, because OC outweighs SC during negative shocks while SC outweighs OC during positive shocks. As a result, corruption decreases during both positive and negative shocks.

Scenario 2b: a *'symmetric positive' effect* of shocks on corruption arises when the marginal effect of income shocks is increasing, because SC outweighs OC during negative shocks while OC outweighs SC during positive shocks. As a result, corruption spreads during both positive and negative shocks.

Figure 2. The nonlinear *ex post* net effect of instability on corruption

Asymmetric corruption responses yielding:

a. Symmetric deterrent effect of shocks or b. Symmetric positive effect of shocks



To sum up, when the relationship between corruption and shocks is linear, corruption may be pro-cyclical or contra-cyclical, depending on the relative prevalence of opportunistic or survival corruption. When the linearity assumption is relaxed, economic instability may have either a 'symmetric deterrent' *ex post* effect or a 'symmetric positive' *ex post* effect on corruption, depending on the marginal effect of shocks on corruption.

3. Data and methodology

Indicators of perception of corruption and experience of bribe payments are used in a dynamic panel analysis and a cross-sectional analysis, respectively. In each empirical framework, corruption variables are regressed upon a comparable set of independent variables reflecting the determinants of corruption.

In cross-section regressions, I use macro-level variables together with aggregated micro-level variables on firms' characteristics drawn from the World Bank Enterprise Surveys (WBES). Because firms have been interviewed anonymously between 2006 and 2011, data is pooled by country. I then compute country-averages of micro-level variables on firms' characteristics, considering only firms for which data on bribe payments is non-missing[6].

Appendix A.1 gives details on ICRG sample composition, while appendices A.2 and A.3 give details on WBES sample composition and the total number of firms by country considered for the averaging of firm-level variables. Appendices A.4 and A.5 expose descriptive statistics of the ICRG and WBES sample, respectively.

3.1. Corruption data

In dynamic panel regressions, I use an indicator of corruption perceptions taken from the International country Risk Guide (ICRG). In cross-section regressions, I use instead an aggregated indicator of country incidence of firms' bribe payments based on the World Bank Enterprise Surveys.

3.1.1. The ICRG indicator of corruption perceptions.

In dynamic panel data analysis, I use a measure of the perception of corruption in the public sector drawn from the International Country Risk Guide (ICRG), provided by the Political Risk Service (PRS) group.[7] It measures public corruption as a risk for business by assessing to what extent it may take the form of excessive patronage, nepotism, job reservations, 'favour-for-favours', secret party funding, suspiciously close ties between politics and business, or bribes. The ICRG ranges from 0 (higher corruption level) to 6 (lower corruption level). Whilst the ICRG corruption indicator takes into consideration low-level bureaucratic corruption, it insists on the risk of corruption prevailing in the political arena or high levels of the administration, which makes this indicator rather political-oriented.

I favour the use of the ICRG corruption indicator for a dynamic panel data analysis because it covers a range of 135 countries and an extensive 22-year period (1984-2005), which allows exploiting the

[6] Each aggregated micro-level variable is obtained by applying the following formula:
$Aggregated\ firms_{characteristics_i} = \frac{\sum_{j=1}^{N} firms_{characteristics_j}}{N_i}$ With *Ni* the total number of firms *j* in country *i* which have reported an informal payment or no informal payments.

[7] http://www.prsgroup.com/ICRG.aspx

time dimension of corruption data. Empirical estimations using the CPI are nevertheless conducted and included in appendices.

For the ease and convenience of result interpretation, we reversed the score of the ICRG indicator (as well as the CPI in robustness checks), a high score corresponding to a higher level of corruption and *vice versa*. Descriptive statistics are presented in Appendices.

3.1.2. WBES data on firms' experience of corruption

The WBES data provides a comprehensive and comparable-internationally firm-level assessment of business environment conditions around the world, based on a survey administered to around 130 000 companies in 135 countries. Notably, the WBES provides a wide range of data highlighting the burden of corruption for private firms along with key other firm-level characteristics. Details on the survey approach are provided in Svensson (2003).

In this study, I use a measure of experiences of corruption in conducting business, based on 22,062 firms' informal payments reported as percent of total sales[8]. I compute a variable equal to 1 if a firm has reported informal payments, 0 if it has reported no bribe payments (missing data is not considered as 0). Because missing data on bribery may be related to firms' characteristics, it raises the concern for a potential selection bias. Following Svensson (2003) and Fisman and Svensson (2007), I check whether firm respondents and non-respondents differ according to observables characteristics by regressing a dummy variable equal to 1 if a firm has missing data on corruption (0 otherwise) over firms characteristics such as firm's size, share of exports, public ownership, and access to finance. Results are presented in Appendix C and do not support an effect of firms' characteristics on missing data. Countries with less than 30 observations are excluded from the sample.

Data on bribery incidence is then averaged at the country level and computed as a share of responding firms. This aggregated measure of incidence circumvents the problem of unobserved characteristics that could explain the difference between firms' reported amount of bribe (Fisman and Svensson, 2007), such as firms' inclination of firms to understate the amount of bribe payments paid annually.

3.2. The instability of exports as a proxy-measure of overall economic instability

The instability of output can be sized by a large array of indicators (Cariolle and Goujon, 2013; Loayza et al, 2007). The literature on economic vulnerability (Combes and Guillaumont, 2002; Guillaumont, 2009, 2010) draws a distinction between :

[8] Enterprises were asked the following question: "We've heard that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percent of total annual sales, or estimated total annual value, do establishments like this one pay in informal payments or gifts to public officials for this purpose?"

- external sources of economic instability (exports, international prices, terms of trade, or international interest rates) and domestic ones (such as economic policy, agricultural production and natural or climatic shocks);
- primary instabilities (related to climatic events, terms of trade movements or political factors) and intermediate ones (related to changes in investment or real exchange rates);
- and between exogenous sources of instability (related to international trade, agricultural production and natural shocks) and endogenous sources of instability (linked to economic policy or domestic socio-political conditions).

In what follows, the emphasis is put on the instability of exports earning in constant dollar because it is i) a primary source of economic instability, ii) considered as exogenous, and iii) it affects both developed and developing countries. First, the focus on a primary source of instability is preferable, since the effect of a policy-dependent intermediate instability – such as growth, public spending or investment instabilities – on corruption strategies could be understated if governance is good and the country is resilient (Rodrik, 2000), or overstated if governance is weak and the country is non resilient (Acemoglu et al., 2003). Second, the instability in export volume is considered by various studies as an exogenous source of output fluctuations (Guillaumont, 2010, 2009; Guillaumont and Chauvet, 2001). Third, the instability in constant export earnings is related to external instabilities – e.g. instabilities in international commodity prices, in the terms of trade, or in international interest rates – that have a dramatic impact on growth, investment, tax receipt, and redistribution policy in both developed and developing countries (Jones and Olken, 2010; Dehn, 2000; Dawe, 1996; Bevan et al., 1993). It has been argued that external shocks in Least Developed Countries have only a marginal effect on growth instability, while internal sources of instability are found to be important contributors (Raddatz, 2007). However, in a recent work, Jones and Olken (2010) find that exogenous domestic natural shocks have a direct and dramatic impact on exports in developing countries. Therefore, export instability is also likely to reflect exogenous primary and domestic sources of economic instability such as climatic shocks and natural disasters in developing countries.

3.3. Estimating the *ex ante* and *ex post* effects of export instability

As stressed earlier, the *ex post* effect of instability relies on agent's *experience* of instability, reflecting the consequences of shocks on well-being or economic performance, while the *ex ante* effect of instability depends on agents' *perception* of it (Elbers et al, 2007; Guillaumont, 2010). To test the *ex post* and *ex ante* effects of export instability, I use two measures based on the distribution of export earnings in constant dollar, y_{it}, around a 16-years rolling mixed trend, $\hat{y}_{it}$.[9] These measures of instability are used in both dynamic panel and cross-section estimations.

[9] Extending the time window for computing trend values while reducing it for measuring instability over it do not affect results. Moreover, a time window for export trend computation between 10 and 20 years is suitable for both developed and developing countries Cariolle and Goujon (2013). For the remotest observations, I imposed a minimum of 13 non missing export data to estimate trend values.

Considering the export process exhibits both deterministic and stochastic paths,

$$y_{it} = \chi_0 + \chi_1 t + \chi_2 y_{it-1} + \xi_{it} \quad \text{with } \xi_t \text{ a zero-mean i.i.d disturbance term,}$$

Using raw data of exports in constant dollar from the World Development Indicators (WDI) covering the 1960-2005 period, the trend ($\hat{y}_{it}$) is estimated for each country *i* and each year *t* over a 16-year rolling time window as follows,

$$\hat{y}^T{}_{it} = \hat{\chi}_0 + \hat{\chi}_1 T + \hat{\chi}_2 y_{it-1} \quad \textit{with } T = [t; t\text{-}15] \qquad (1)$$

where *T* is both the time window and the time trend.

3.3.1. The ex ante effect of instability

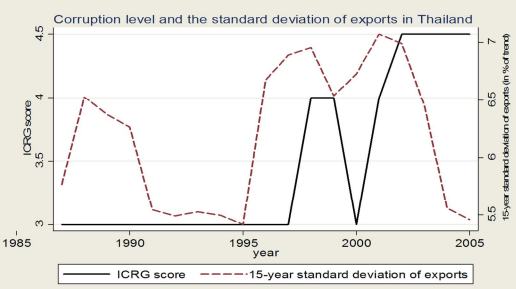
The *ex ante* effect of instability refers to adjustments in agents' behaviors aimed at lowering the variability in their income, regardless the impact of output fluctuations on agents' wealth or well-being (Elbers et al., 2007). As in Elbers et al. (2007), a variance-based measure of instability is used, expected to reflect agents' *perception* of instability. This measure is the long-run (16-year) rolling standard deviation of exports around the (16-year) rolling mixed trend $\hat{y}_{it}$ in country *i* at time *t*:

$$Std\_dev_{it} = 100 \times \sqrt{\frac{1}{T}\sum^{T}\left(\frac{y_{it} - \hat{y}_{it}}{\hat{y}_{it}}\right)^2} \quad \textit{with } T = [t; t\text{-}15] \qquad (2)$$

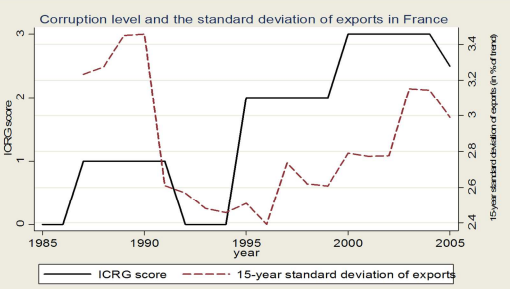
By computing the standard deviation of exports on a rolling basis and over a long time frame, the perception of instability is allowed to change over time while giving equal weights to remote and present fluctuations. In other words, this measure limits the influence of contemporaneous sharp export movements on agents' perception of instability, while capturing the lasting influence of remote fluctuations. This measure therefore gives more prominence to the way agents perceive instability than the way they actually experience it. Figure 3 illustrates the respective evolution of corruption levels and the standard deviation of exports in Thailand, France, Italy and Spain. It can be observed in these countries that the evolution of corruption score clearly tracks that of the standard deviation.

Figure 3. The standard deviation of exports and corruption changes

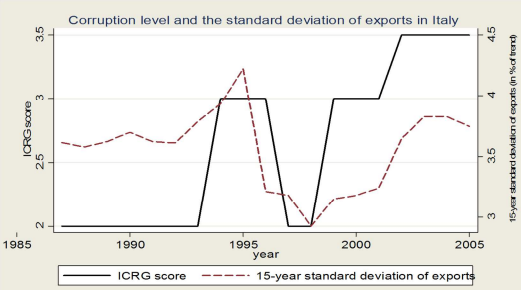
Thailand



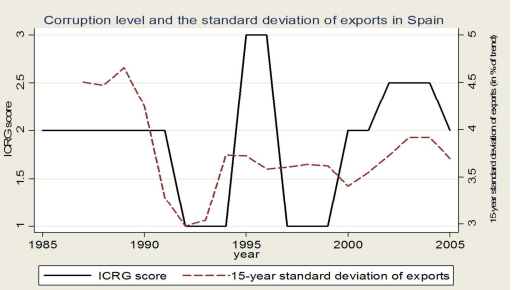
France



Italy



Spain



3.3.2. The ex post effect of export instability

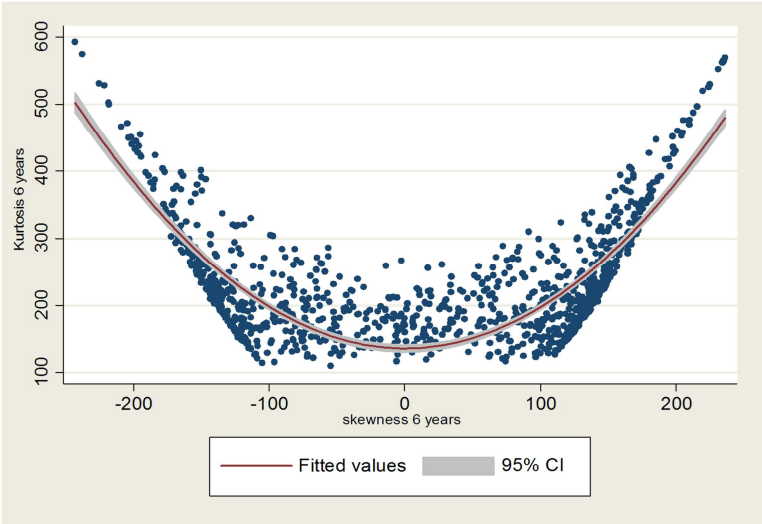
The empirical literature generally analyzes the *ex post* effect of instability using annual (monthly, daily, etc.) shock variables, reflecting the impact of positive or negative shocks on economic decisions (Dercon, 2002). As stressed by Voors et al. (2011), there may be a time dyssynchrony between export shocks – which are annual events in our dataset – and variations in corruption scores – which are of longer periodicity. The literature often introduces lagged shock variables to study their impact on institutional variables (Brückner and Ciccone, 2011; Voors et al, 2011). However, this approach presents the major drawback of overlooking the effect of repeated or persistent shocks on economic outcomes. Therefore, the annual shock-variable approach is likely to understate the lasting effect of persistent or repeated shocks, especially their effect on institutional outcomes such as corruption (even more corruption perceptions), which are known to change rather slowly over time. To circumvent these drawbacks, I use an original measure of experienced instability, based on the short run (6-year) rolling skewness of the distribution of exports around their trend:

$$Skewness_{it} = 100 \times \frac{\frac{1}{T}\sum^{T}\left(\frac{y_{it} - \hat{y}_{it}}{\hat{y}_{it}}\right)^{3}}{\left(\frac{1}{T}\sum^{T}\left(\frac{y_{it} - \hat{y}_{it}}{\hat{y}_{it}}\right)^{2}\right)^{3/2}} \quad with\ T = [t; t\text{-}5] \qquad (3)$$

Where y_{it} is the observed constant value of export in country *i* at time *t*, and $\hat{y}_{it}$ the rolling mixed trend in equation (1). First, the skewness provides a *de facto* measure of the asymmetry of shocks around a reference value (Rancière et al., 2008). Indeed, an increase in the value of the skewness corresponds to an increase in the size of positive shocks compared to negative ones. Second, the skewness is also a measure reflecting the intensity of fluctuations. Rancière et al. (2008) show that high values of skewness are strongly associated with the occurrence of crisis (if negative) or boom (if positive) in a large sample of countries over 1960-2000. They stress the strong link between (high) values of skewness and the kurtosis of a distribution, the latter reflecting the fatness of the tails or the peakedness of a distribution. Figure 4 supports this statement, by showing strong correlations between high absolute values of skewness and values of kurtosis.[10]

Figure 4. Graphical correlation between export skewness and export kurtosis.

6-years skewness versus 6-year kurtosis



Thus, our skewness-based measure of instability is expected to reflect two major dimensions of the experience of economic instability: on the one hand, the asymmetry of shocks; and on the other hand, the intensity of export fluctuations. To give an illustration, while a high negative value of skewness reflects the predominance of low-frequency large-size negative fluctuations, a small

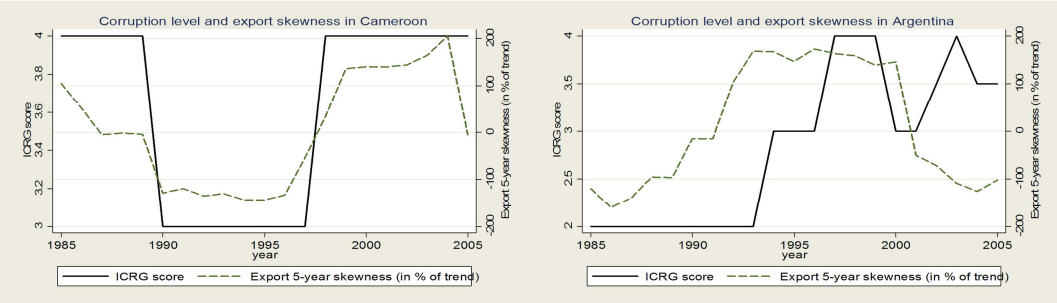
[10] The kurtosis is a measure of both the peakedness and tails' fatness of a random variable's probability distribution. The kurtosis measures the extent to which observed values far from the mean (or their trend) are frequent in comparison to those in the neighborhood of the mean (or their trend).

positive value of skewness reflects the predominance of high-frequency small-size positive fluctuations. This measure therefore seems particularly appropriate to size up the experience of instability.

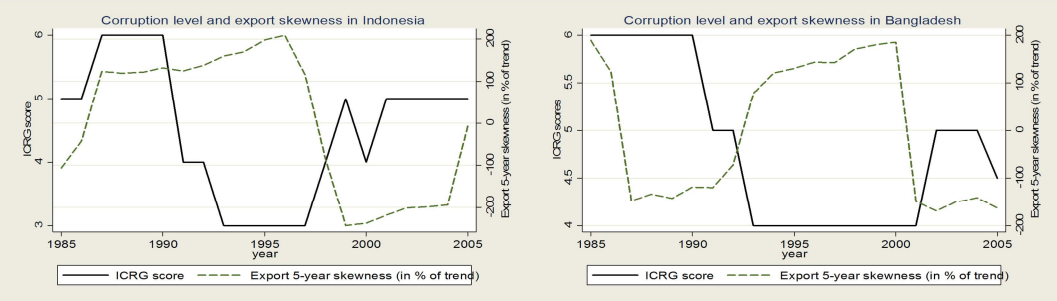
Figure 5 illustrates the relationship between export skewness, and corruption in Cameroon, Argentina, Indonesia and Bangladesh. It can be observed in these countries that the evolution of the skewness of exports fits quite well the evolution of corruption scores, revealing pro-cyclical relationships in Cameroon and Argentina, and contra-cyclical relationships in Indonesia and Bangladesh.

Figure 5. Export skewness and corruption changes

Pro-cyclical relationship (Cameroon, Argentina)



Contra-cyclical relationship (Indonesia, Bengladesh)



3.4. Control variables

Because empirical frameworks used in panel estimations and cross-section estimations are intended to be comparable, I control for the same determinants of corruption. In cross-section estimations, I also control for firms characteristics, such as firm size or public ownership, aggregated at the country level.

3.4.1. Dynamic panel estimations.

The effects of export instability on corruption are estimated within a dynamic panel framework using an unbalanced panel dataset on corruption perceptions covering 62 developed and

developing countries and the period 1985-2005. Descriptive statistics and data sources are presented in appendix A.1 and A.4.

The effect of the development process on corruption is proxied by variables capturing the structural long-term determinants of growth evidenced by Sala-i-Martin et al. (2004).[11] First, the annual growth rate of the population is included in empirical specifications as a proxy for human capital conditions. Low demographic growth rates are expected to result from a healthy and educated population, while high growth rates to characterize countries with low human capital which have not achieved their demographic transition.[12] The share of governmental spending in GDP is used as a proxy for the effect of public sector size on income. A measure of total natural resource rents (in % of GDP) is also included to account for the effect of natural resources endowments on long term growth. I control for usual determinants of corruption identified by the literature (Treisman, 2000; Tanzi, 1994; and Mauro, 2004), that is, trade openness, democracy, the political regime stability, and population size. It is worth reminding that many control variables – such as natural resources (Van der Ploeg, 2011, 2010; Isham et al., 2005) or state interventions (Tanzi, 1994; Guriev, 2004) – may both explain long term income growth and corruption. Finally, country fixed effects are expected to capture the effect of time invariant unobserved country characteristics affecting growth and corruption.

3.4.2. Cross-section estimations

In cross-section estimations, the measure of bribery incidence is regressed over instability variables and set of controls reflecting the determinants of economic development and corruption. Sample description, descriptive statistics and data sources are presented in appendix A.2, A.3, and A.5.

Because there is no constraint on time coverage in cross-section regressions, I replace the population growth proxy by the life expectancy at birth, the primary completion rate, and the share of women in parliaments as controls of human capital. In the same way as in panel estimations, I also control for the share of government spending in GDP, the share of natural resources in GDP, the population, the share of trade in GDP, democracy, and political regime durability[13].

[11] Including the log GDP per capita in the corruption equation does not increase the explanatory power, nor affect results of estimations (whether FE or sys-GMM). Moreover, the log GDP per capita is not significant in estimations. Because of multicolinearity concerns with other explanatory variables, the log GDP per capita has been excluded from the corruption equation. Results with the log GDP per capita included can be provided upon request.

[12] Although imperfect, this proxy for human capital allows maximizing the sample width and length. I control for direct measures of human capital, such as life expectancy, gender conditions, or primary completion rate, in cross-section estimations.

[13] The GDP per capita is not included in regressions to make results comparable to panel estimation results. However, including the log of the GDP per capita in cross-section does not increase the explanatory power of estimations, does not appear significant, and does not affect the estimated effects of instability variables. These estimations can nevertheless be provided on request.

In addition, I control for firms characteristics, using aggregated measures of the average share of public ownership, the average share of direct and indirect exports in total sales, the share of large-size firms in the total number of firms, and the share of working capital financed by internal funds.

4. Evidence from dynamic panel data analysis based on perceptions of corruption

Fixed effect and sys-GMM estimations of a dynamic panel framework are conducted.This dynamic empirical framework presents the great advantage of capturing regression-to-the-mean effect, as well as persistence in the perception of corruption levels (Voors et al., 2011). To ensure the robustness of our results, FE estimations of the various econometric models tested using Transparency International's Corruption Perception Index (CPI) as dependent variable are reported in Appendix B.

4.1. Model 1: baseline estimations

Following Elbers et al. (2007), I estimate the *ex post* and the *ex ante* effects by respectively including in a dynamic corruption framework our measures of skewness and standard deviation of exports along with other control variables:

$$Corrupt_{it} = \alpha_0 + \alpha_1.Corrupt_{it-1} + \boldsymbol{\alpha_2.Skewness_{it}} + \boldsymbol{\alpha_3.Std\_dev_{it}} + \alpha_4.Controls_{it} + \lambda_t + \mu_i + \varepsilon_{it}, \quad (4a)$$

Where i and t are country and time subscripts respectively, $Corrupt_{it}$ is the ICRG indicator of corruption perception, $Skewness_{it}$ and Std_dev_{it} our respective indicators of experience and perception of export instability, $Controls_{it}$ a vector of control variables, λ_t a time fixed effect, μ_i a country fixed effect, and ε_{it} an i.i.d. error term. Within fixed effect (FE) and sys-GMM panel estimations of equation (4a) are run, using panel data from 62 developed and developing countries over 1985-2005 (1125 observations in baseline estimations).

Contrary to Voors et al. (2011), FE estimations with and without time dummies of equation (4a) in table 1a (column (2)) show respectively a 1% and 11% significant negative net *ex post* effect[14]; but no significant *ex ante* effect of export instability on corruption perceptions. Based on estimations of model 1, an increased experience of positive (negative) shocks significantly reduces (increases) country corruption scores, which supports the existence of contra-cyclical corruption variations, driven by survival corruption strategies.

[14]The high between-R^2 in column (2) and the change in the significance of the skewness coefficient probably result from problems of multi-colinearity between time dummies and export skewness, since universal time-related export shocks may have been captured by time dummies.

Table 1a. Dynamic panel estimations of equation (4a): evidence from the ICRG

Dependent variable:	Corruption perceptions			
	Within fixed effects			Sys-GMM
	(1)	**(2)**	**(3)**	**(4)**
Lagged Corruption	0.762 *** (0.00)	0.716*** (0.00)	0.696*** (0.00)	0.768*** (0.00)
Export skewness	**-0.0004*** (0.00)**	**-0.0004*** (0.00)**	**-0.0002 (0.11)**	**-0.0005* (0.10)**
Export standard deviation	**-0.017† (0.15)**	**-0.003 (0.77)**	**-0.004 (0.74)**	**-0.010 (0.92)**
Population growth		-0.034 (0.31)	-0.040 (0.33)	-0.898 (0.41)
Natural resources		0.008** (0.03)	0.009*** (0.01)	0.027 (0.25)
Government size		-0.013** (0.04)	-0.013** (0.04)	0.085 (0.17)
Log population		0.617*** (0.00)	-0.012 (0.68)	0.557 (0.70)
Polity regime stability		-0.0002 (0.91)	-0.003* (0.06)	-0.010 (0.71)
Democracy		-0.015** (0.02)	-0.018*** (0.01)	-0.030 (0.79)
Log openness		0.018* (0.08)	0.065 (0.56)	1.140**†** (0.11)
Constant	0.776*** (0.00)	-9.86*** (0.00)	2.85 (0.55)	38.86 (0.32)
Country fixed effects	Yes	Yes	Yes	Yes
Time dummies	No	No	Yes	Yes
Obs(countries)	1125 (62)	1125 (62)	1125 (62)	1125 (62)
R-squared Within	0.59	0.61	0.64	Wald chi2(28) = 596
Hansen test (p-val)				0.77
AR(1) test (p-val)				0.00
AR(2) test (p-val)				0.56
Number of instruments				41

Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%. Hansen J-statistic test for joint instrument validity; null hypothesis is that the instruments are valid, i.e., uncorrelated with the error term.

Sys-GMM estimation: time dummies are excluded instruments; the skewness of exports are treated as predetermined and instrument the differenced equation by its lagged levels (lags 1 to 8); lagged corruption and the standard deviation are treated as endogenous and instrument the equation in system and the differenced equation respectively (lags 2 to 11 for corruption; lags 2 to 4 for the export standard deviation). Instruments are collapsed, orthogonal deviations are preferred to first-difference deviations, and the Windmeijer correction of the two-step estimated variance is applied.

I apply the dynamic panel GMM estimator to equation (4a) to check whether the lagged dependent variable does not bias results in panel FE regressions. Because the estimated effect of the export skewness on corruption is unlikely to suffer from reverse causality bias, it is considered

as a weakly exogenous in sys-GMM specifications. However, Koren and Tenreyro (2007) have shown that poor countries may specialize into a limited number of sectors, with relatively simple production technologies and a higher vulnerability to international price movements, thereby suggesting that the standard deviation of exports may be potentially endogenous on a longer run. This variable is therefore considered as such in sys-GMM specifications.[15]

Results are presented in column (4a). Estimates pass the Hansen test of identification and the Arellano-Bond test of two-order autocorrelation in a reliable confidence level, confirm the significant negative effect of the export skewness on corruption observed in FE estimations in a 10% confidence level, but do not give evidence of a significant effect of the export standard deviation on corruption. Therefore, baseline estimates support a significant negative *ex post* effect but no significant *ex ante* effect of export instability on corruption.

In what follows, I address potential nonlinearities stressed in the analytical framework that could affect the direction of the effects of export instability on corruption.

4.2. Disentangling the *ex post* effect of instability on corruption

In a second econometric model, I insert simultaneously in the corruption equation a variable of positive skewness and a variable of negative skewness, to account for possible asymmetric corruption responses to positive and negative shocks. In a third econometric model, I test whether the direction of the *ex post* effects of export instability on corrupt deals depends on the size and frequency of export fluctuations. It is indeed likely that previously mentioned financial and institutional constraints bind during intense fluctuations (Loayza et al, 2007).

4.2.1. Model 2: accounting for the asymmetry of export fluctuations

Following Rancière et al. (2008), we insert the negative and the positive skewness of exports together in the corruption equation. The negative (positive) skewness of export is computed as a variable equal to the absolute value of skewness if the latter is negative (positive) and equal to zero otherwise. By doing this, we can identify *symmetric effects* of positive and negative shocks driven by *asymmetric corruption responses* to them, as illustrated in figure 2. We therefore run FE and sys-GMM estimations of the following corruption equation:

$$Corrupt_{it} = \alpha_0 + \alpha_1.Corrupt_{it-1} + \boldsymbol{\alpha_{2a}.Positive\_skewness_{it}} + \boldsymbol{\alpha_{2b}.Negative\_skewness_{it}} + \alpha_3.std\_dev_{it} + \alpha_4.Controls_{it} + \lambda_t + \mu_i + \varepsilon_{it} \quad (5a)$$

Results are presented in table 2a. FE estimations show a 'symmetric deterrent' *ex post* effect of export instability on corruption, with a significant negative effect of positive skewness on corruption perceptions. System GMM estimation gives additional support to these finding by showing a 1% and 2% significant negative effect of the positive and negative skewness on corruption. These results, as well as FE estimation of equation (5a) using the CPI in Appendix B,

[15] Details on the sys-GMM calibration are provided in the bottom of each table.

support the scenario presented in sub-section 2.1 of a decreasing marginal effect of shocks on corruption practices, yielding asymmetric corruption responses to shocks and a 'symmetric deterrent' *ex post* effect of export instability on corruption.

In the next econometric model, we further disentangle the *ex post* effects of instability on corruption by testing whether the decreasing or increasing nature of the marginal effect of shocks, and therefore the direction of estimated relationships, depends on the size and frequency of export fluctuations.

Table 2a. Dynamic panel estimations of equation (5a): evidence from the ICRG.

Dependent variable:	Corruption perceptions		
	Within fixed effects		Sys-GMM
	(1)	**(2)**	**(3)**
Lagged Corruption	0.714*** (0.00)	0.654*** (0.00)	0.716*** (0.00)
Export skewness > 0	**-0.001*** (0.01)**	**-0.001* (0.07)**	**-0.002*** (0.01)**
Export skewness < 0	**-0.0003 (0.46)**	**-0.0003 (0.38)**	**-0.002** (0.02)**
Export standard deviation	0.001 (0.93)	-0.004 (0.76)	-0.001 (0.99)
Country fixed effects	Yes	Yes	Yes
Time dummies	No	Yes	Yes
Observations (countries)	1125 (62)	1125 (62)	1125 (62)
R-squared			Wald chi2(29)
Within	0.61	0.64	= 1226
Hansen test (p-val)			0.88
AR(1) test (p-val)			0.00
AR(2) test (p-val)			0.71
Number of instruments			48

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%. Hansen J-statistic tests for joint instrument validity; null hypothesis is that the instruments are valid, i.e., uncorrelated with the error term.

Sys-GMM estimation: time dummies are excluded instruments; the skewness of exports is treated as predetermined and instrument the differenced equation by its lagged levels (lags 1 to 8); lagged corruption and the standard deviation are treated as endogenous and instrument the equation in system and the differenced equation respectively (lags 2 to 11 for corruption; lags 2 to 3 for the export standard deviation). Instruments are collapsed, orthogonal deviations are preferred to first-difference deviations, and the Windmeijer correction of the two-step estimated variance is applied.

4.2.2. Model 3: accounting for the intensity of export fluctuations

Following Alderman (1996), Dercon (2002), or Loayza et al. (2007), the direction of the *ex post* effect of instability probably differs according to the destabilizing nature of output variations. As Dercon (2002, p.2) points out, "Other characteristics of income risk include the frequency and intensity of shocks, and the persistence of their impact (…). Relatively small but frequent shocks are more easily to deal than large, infrequent negative shocks." In the same way, Dalgaard and Olsson (2008) theoretically show that while large levels of windfall gains will increase rent-seeking activities, modest inflows will produce the opposite indirect effect by inducing a more-than-proportional increase in productivity in productive activities.

Opportunistic corruption may prevail over survival corruption during sharp transitory booms, while survival corruption is also likely to prevail during sharp busts, when usual financial and institutional safeguards against malpractices are overwhelmed by corrupt behaviors. By contrast, institutional or financial constraints may not bind during normal fluctuations. The decreasing or increasing nature of the marginal effect of exports shocks on corruption, illustrated in graphs 4iii) and 4iv) of section 2.1, may therefore depend on the destabilizing nature of export movements.

To account for nonlinear *ex post* effects reliant on the size and frequency of export fluctuations, I introduce together in the corruption equation the quadratic terms of the positive and negative 6-year rolling skewness of exports (equation (6a)). Panel FE and sys-GMM estimations of the following equations are conducted:

$$Corrupt_{it} = \alpha_0 + \alpha_1.Corrupt_{it-1} + \boldsymbol{\gamma_{2a}.Positive\_skewness_{it}} + \boldsymbol{\gamma_{2b}.Negative\_skewness_{it}} + \boldsymbol{\gamma_{2c}.Positive\_skewness^2_{it}} + \boldsymbol{\gamma_{2d}.Negative\_skewness^2_{it}} + \alpha_3.std\_dev_{it} + \alpha_4.Controls_{it} + \lambda_t + \mu_i + \varepsilon_{it} \quad (6a)$$

Results are presented in table 3a. FE estimates of equations (6a) highlight a 1% significant U-shaped symmetric *ex post* effect of export instability on corruption perceptions. Sys-GMM estimates also support the existence of a U-shaped symmetric *ex post* effect of export instability on corruption, with a 1% significant positive effect of export booms on corruption. Moreover, it is worth noting that this U-shaped effect of positive shocks is consistent with empirical findings of Dalgaard and Olsson (2008*)*. These results are robust to change in the corruption perception indicator, as FE estimation using the CPI in Appendix B display the same nonlinear corruption patterns.

The size and frequency of export fluctuations are therefore found to be an important determinant of the nonlinear *ex post* effect of instability on corruption. When fluctuations are normal, i.e. small and frequent, instability has a 'symmetric deterrent' effect on corruption, stemming from the decreasing marginal effect of shocks on corrupt transactions. When fluctuations are intense, i.e. large and infrequent, instability has a 'symmetric positive' effect on corruption, stemming from an increasing marginal effect of shocks on corrupt transactions. In the next econometric model, I test whether financial and institutional constraints could drive these nonlinear corruption patterns.

Table 3a. Dynamic panel estimations of equation (6a): evidence from the ICRG

Dependent variable:	Corruption perceptions		
	Within fixed effects		Sys-GMM
Lagged Corruption	0.715*** (0.00)	0.695*** (0.00)	0.735*** (0.00)
Export skew>0	**-0.004*** (0.00)**	**-0.003*** (0.00)**	**-0.007*** (0.00)**
Export skew<0	**-0.003*** (0.00)**	**-0.003*** (0.00)**	**-0.004* (0.07)**
[Export skew >0]²	**1e-05*** (0.00)**	**1e-05*** (0.00)**	**3e-05*** (0.00)**
[Export skew <0]²	**1e-05*** (0.00)**	**1e-05*** (0.00)**	**1e-05 (0.35)**
Export std_dev	-0.002 (0.87)	-0.003 (0.84)	-0.017 (0.87)
Fixed effects	Yes	Yes	Yes
Time dummies	No	Yes	Yes
Obs. (countries)	1125 (62)	1125 (62)	1125 (62)
Hansen test (p-val)			0.80
R-squared: Within	0.613	0.645	Wald (31) = 1929
AR(1) test (p-val)			0.00
AR(2) test (p-val)			0.29
Num. instruments			51

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. †significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%.

Sys-GMM estimation: The positive and negative skewness of exports (lags 1 to 6), and the squared terms (lags 1 to 5) are treated as predetermined and instrument the differenced equation. Lagged corruption (lags 2 to 8) is treated as endogenous and instruments the equation in system. The standard deviation of exports is treated as endogenous and instruments the differenced equation by its lagged levels (lags 2 to 3).

4.3. Model 4: financial market access and democracy as channels of the *ex post* effect of instability on corruption

As a reminder, access to credit and insurance markets determines households' strategies for smoothing their consumption or income path (Paxson, 1992; Dercon, 2002). Notably, it has been argued that informal "risky" risk-coping and risk-managing strategies, such as prostitution (Robinson and Yeh (2011)) or crime (Guillaumont and Puech (2006)), may be adopted when financial markets do not enable agents to fully protect against fluctuations in their revenue. It is hence likely that corruption strategies are undertaken by liquidity-constrained agents to mitigate the adverse effects of income instability. Moreover, as stressed earlier, access to lending may also

determine the nature of the marginal *ex post* effect of income shocks on corrupt transactions (whether they are driven by survival or opportunistic motives) by increasing or reducing the opportunity cost of engaging in illegal income-generating activities. Thus, the 'symmetric deterrent' *ex post* effect arising from the decreasing marginal effect of shocks on corruption (see figure 3iii)) should hold in situations of *soft budget constraint*. On the contrary, the 'symmetric positive' *ex post* effect arising from the increasing marginal effect of shocks on corruption (see figure 3iv)) should hold in situations of *hard budget constraint*.

As for the role of institutional constraints, the lack of accountability and transparency mechanisms – such as financial/economic regulations and administrative rules, transparent procedures, effective law-enforcement institutions and poorly empowered watchdog and oversight bodies – are seen as common features of corrupt countries. Actors, rules, and mechanisms promoting accountability and transparency mechanisms are often associated with democratic institutions and are considered as strong corruption deterrents (Klitgaard, 1988). Because they allow an improved scrutiny of voters upon political decisions, they foster political competition, and they support the freedom of media, democratic institutions increase the probability for corrupt agents of being detected and sanctioned (Lambsdorff, 2002; Treisman, 2000, 2007; Sandholtz and Koetzle, 2000). According to Sandholtz and Koetzle (2000), this virtuous effect of democracy on governance depends on how well entrenched pillars of democracy are. Among these pillars of democracy, freedom of media plays a key role in promoting integrity in the management of public and private affairs. It is very likely that democratic institutions, supported by a high degree of media freedom constrains corrupt actors and shapes how corruption responds to shocks by making incentives to engage in additional corrupt transactions decreasing.

These reasons motivate an analysis of the role of access to credit markets and democratic institutions in driving the *ex post* effect of instability on corruption. I use the logarithm of the credit provided to the private sector in % of GDP (drawn from the WDI) as a proxy for formal financial markets access; while I use i) the democracy variable (polity 2), ii) the logarithms of press freedom (from Freedom House) and iii) economic influence over media (from Freedom House) as separate proxies for the effectiveness of accountability and transparency mechanisms. In two separate econometric specifications, I insert these proxies for financial and institutional constraints as interaction terms with the skewness of exports in the corruption equation.

Equation (7a) provides a test of the financial market channel for the *ex post* effect of instability on corruption:

$$Corrupt_{it} = \alpha_0 + \alpha_1.Corrupt_{it-1} + \boldsymbol{\rho_{2a}.Positive\_skewness_{it}} + \boldsymbol{\rho_{2b}.Negative\_skewness_{it}} + \boldsymbol{\rho_{2c}.Positive\_skew_{it}*credit\_market_{it}} + \boldsymbol{\rho_{2d}.Negative\_skew_{it}*credit\_market_{it}} + \rho_{2e}.credit\_market_{it} + \alpha_3.std\_dev_{it} + \alpha_4.Controls_{it} + \lambda_t + \mu_i + \varepsilon_{it} \quad (7a)$$

Equation (8a) provides a test of the democracy channel for the *ex post* effect of instability on corruption:

$$Corrupt_{it} = \alpha_0 + \alpha_1.Corrupt_{it-1} + \boldsymbol{\rho'_{2a}.Positive\_skewness_{it}} + \boldsymbol{\rho'_{2b}.Negative\_skewness_{it}} + \boldsymbol{\rho'_{2c}.Positive\_skew_{it}*democ_{it}} + \boldsymbol{\rho'_{2d}.Negative\_skew_{it}*democ_{it}} + \rho'_{2e}.democratic\_institutions_t + \alpha_3.std\_dev_{it} + \alpha_4.Controls_{it} + \lambda_t + \mu_i + \varepsilon_{it} \quad (8a)$$

FE and sys-GMM estimates of equations (7a) and (8a) are presented in table 4a and 5a. FE and sys-GMM estimations support a symmetric hump-shaped *ex post* effect of export instability on corruption depending on access to credit. FE estimation of equation (7) without time dummies (column (1)) stresses a significant 'symmetric deterrent' effect of instability on corruption above a 7.4% and 20% credit threshold, for episodes of positive and negative shocks respectively. Below these thresholds, a 'symmetric positive' effect of instability on corruption level is evidenced, but in a low 15% confidence level. The same corruption patterns are evidenced in FE (with time dummies) and sys-GMM estimations, but not in reliable confidence levels. Although this evidence has to be considered with caution, the liquidity constraint hence appears as a credible channel for the *ex post* effect of instability evidenced in sub-section 4.2.

Evidence on the role of free media in channeling the 'symmetric deterrent' *ex post* effects of instability on corruption is also salient. FE and sys-GMM estimations both suggest that a higher degree of democracy and media freedom exert a significant negative effect on corruption during both episodes of positive and negative shocks. However, estimations suggest that democratic institutions seem more effective in countering survival corruption during negative shocks than opportunistic corruption during positive shocks.

Table 4a. Dynamic panel estimation of equation (7a): evidence from the ICRG

Dependent variable:	Corruption perceptions		
	Within fixed effects		Sys-GMM
	(1)	(2)	(3)
Corruption t- 1	0.713*** (0.00)	0.693*** (0.00)	0.825*** (0.00)
Export skew>0	0.002† (0.14)	0.001 (0.26)	0.004 (0.39)
Export skew<0	0.003† (0.11)	0.002 (0.28)	0.002 (0.55)
Skew>0 × credit access	-0.001** (0.4)	-5e-04† (0.14)	-0.001 (0.29)
Skew<0 × credit access	-0.001* (0.09)	-5e-04 (0.24)	-0.001 (0.44)
Export std_dev	-0.003 (0.82)	-0.004 (0.79)	0.027 (0.78)
Country fixed effects	Yes	Yes	Yes
Time dummies	No	Yes	Yes
Obs (countries)	1100(61)	1100(61)	1100(61)
R-squared:			Wald chi2(32)=
Within	0.62	0.65	1593
Hansen test (p-val)			0.79
AR(1) test (p-val)			0.00
AR(2) test (p-val)			0.33
Number of instruments			48

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%. Hansen J-statistic tests for joint instrument validity; null hypothesis is that the instruments are valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly from the second-stage equation.

Sys-GMM estimation: The positive and negative skewness of exports are treated as predetermined and instrument the differenced equation by their lagged levels (lags 1 to 5). Lagged corruption is treated as endogenous and instrument the equation in system (lags 2 to 8). The standard deviation of exports (lags 2 to 4) and the interaction terms (lags 2 to 5) are treated as endogenous and instrument the differenced equation. In all GMM estimations, time dummies are excluded instruments, instruments are collapsed, orthogonal deviations are preferred to first-difference deviations, and the Windmeijer correction of the two-step estimated variance is applied.

Table 5a. Dynamic panel estimations of equation (8a): evidence from the ICRG

Dependent variable:	Corruption perceptions					
	Within fixed effects			Sys-GMM		
	(1)	(2)	(3)	(4)	(6)	(7)
Corruption t- 1	0.607*** (0.00)	0.604*** (0.00)	0.593*** (0.00)	0.847*** (0.00)	0.801*** (0.00)	0.605*** (0.00)
Export skew>0	**-0.0001 (0.81)**	**-0.002 (0.31)**	**-0.001 (0.26)**	**0.001 (0.56)**	**-0.018† (0.14)**	**-0.012* (0.09)**
Export skew<0	**0.0004 (0.55)**	**-0.004† (0.11)**	**-0.006*** (0.00)**	**0.001 (0.31)**	**-0.026* (0.07)**	**-0.018*** (0.01)**
Skew>0 × democracy	**-0.0001 (0.28)**			**-5e-04† (0.15)**		
Skew<0 × democracy	**-0.0001 (0.20)**			**-6e-04* (0.10)**		
Skew>0 × free press		**-4e-04 (0.43)**			**-0.005 (0.16)**	
Skew<0 × free press		**-0.001† (0.12)**			**-0.007* (0.09)**	
Skew>0 × econ. infl. media			**-3e-04 (0.49)**			**-0.005* (0.10)**
Skew<0 × econ. infl. media			**-0.002*** (0.00)**			**-0.008*** (0.01)**
Export std_dev	0.017 (0.33)	0.017 (0.31)	0.026† (0.14)	0.022 (0.86)	0.062 (0.77)	0.042 (0.79)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Obs (countries)	784(62)	784(62)	784(62)	784(62)	784(62)	784(62)
R-squared:				Wald chi2(25)	Wald chi2(32)	Wald chi2(32)=
Within	0.58	0.58	0.59	= 489	= 279	359
Hansen test (p-val)				0.28	0.94	0.53
AR(1) test (p-val)				0.00	0.00	0.00
AR(2) test (p-val)				0.52	0.64	0.22
Number of instruments				53	45	43

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%. Hansen J-statistic tests for joint instrument validity; null hypothesis is that the instruments are valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly from the second-stage equation.

Sys-GMM estimation of the democracy channel (col (4)): The positive and negative skewness of exports are treated as predetermined and instrument the differenced equation by their lagged levels (lags 1 to 6). Lagged corruption is treated as endogenous and instrument the equation in system (lags 2 to 11). The standard deviation of exports (lags 2 to 7) and the interaction terms (lags 2 to 6) are treated as endogenous and instrument the differenced equation. **Sys-GMM estimation of the press-freedom channel (col (5))**: The positive and negative skewness of exports are treated as predetermined and instrument the differenced equation by their lagged levels (lags 1 to 5).

Lagged corruption is treated as endogenous and instrument the equation in system (lags 2 to 10). The standard deviation of exports (lags 2 to 4) and the interaction terms (lags 2 to 5) are treated as endogenous and instrument the differenced equation. **Sys-GMM estimation of the economic influence over media channel (col(6))**: The positive and negative skewness of exports are treated as predetermined and instrument the differenced equation by their lagged levels (lags 1 to 4). Lagged corruption is treated as endogenous and instrument the equation in system (lags 2 to 7). The standard deviation of exports (lags 2 to 4) and the interaction terms (lags 2 to 6) are treated as endogenous and instrument the differenced equation. In all GMM estimations, time dummies are excluded instruments, instruments are collapsed, orthogonal deviations are preferred to first-difference deviations, and the Windmeijer correction of the two-step estimated variance is applied.

4.4. Model 5: financial market access as a channel for the *ex ante* effect of instability

Until now, dynamic panel estimations do not provide evidence of a significant *ex ante* effect of export instability on corruption. It is nevertheless very likely that the direction of the *ex ante* effect of instability also depends on access to financial markets (Bardhan and Udry, 1999). Resource locking corruption should indeed be higher when limited access to financial markets do not allow reducing income variability, while resource locking corruption should be lower when access to financial markets is good. Thus, equation (9a) provides a test of financial market access as a channel for the *ex ante* effect of instability on corruption:

$$Corrupt_{it} = \alpha_0 + \alpha_1.Corrupt_{it-1} + \alpha_2.Skewness_{it} + \boldsymbol{\rho_{3a}.std\_dev_{it}} + \boldsymbol{\rho_{3b}.std\_dev_{it}*credit\_market_{it}} + \rho_{3c}.credit\_market_{it} + \alpha_4.Controls_{it} + \lambda_t + \mu_i + \varepsilon_{it} \quad (9a)$$

FE and sys-GMM estimates of equation (9a) are displayed in table 6a. FE estimations highlight a significant hump-shaped relationship between the standard deviation of exports and corruption scores depending on credit market access. In fact, FE with time dummies shows that a higher perception of instability is significantly and positively associated with corruption when the share of credit provided to the private sector is below 33% of GDP, while it is significantly and negatively associated with corruption beyond this threshold. Moreover, although sys-GMM estimates do not support such nonlinearity a reliable confidence level[16], FE estimations using the CPI in appendix B also support a significant hump-shaped *ex ante* effect of instability on corruption depending on credit access.

Therefore, the role of financial markets in channeling the *ex ante* effects of export instability on corruption is also noticeable and supports that corruption may help financially-constrained agents managing their income exposure to economic fluctuations.

[16] One technical explanation for the absence of significant relationship in sys-GMM estimation is the low time-variability of the 16-year export standard deviation. Estimations of the *ex ante* effect of export instability on corruption is much more salient in a cross-section analysis of firms informal payments in section 5.

Table 6a. Dynamic panel estimations of equation (9a): evidence from the ICRG.

Dependent variable:	Corruption perceptions		
	Within fixed effects		Sys-GMM
	(1)	(2)	(3)
Corruption t- 1	0.710*** (0.00)	0.687*** (0.00)	0.749*** (0.00)
Export skewness	-0.0004*** (0.00)	-0.0002† (0.11)	-0.0005 (0.50)
Export std_dev	**0.057** (0.03)**	**0.04* (0.07)**	**0.101 (0.70)**
Std dev × credit access	**-0.019** (0.02)**	**-0.017* (0.07)**	**-0.035 (0.65)**
Country fixed effects	Yes	Yes	Yes
Time dummies	No	Yes	Yes
Obs (countries)	1100(61)	1100(61)	1100(61)
R-squared:			Wald chi2(32)=
Within	0.61	0.65	407
Hansen test (p-val)			0.79
AR(1) test (p-val)			0.00
AR(2) test (p-val)			0.24
Number of instruments			39

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%. Hansen J-statistic tests for joint instrument validity; null hypothesis is that the instruments are valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly from the second-stage equation.

Sys-GMM estimation of equations (9): Lagged corruption is treated as endogenous and instrument the equation in system (lags 2 to 11). The standard deviation of exports (lags 2 to 5) and the interaction terms (lags 2 to 4) are treated as endogenous and instrument the differenced equation. In all GMM estimations, time dummies are excluded instruments, instruments are collapsed, orthogonal deviations are preferred to first-difference deviations, and the Windmeijer correction of the two-step estimated variance is applied.

5. Evidence from cross-section analysis based on experiences of bribery

In this section, models 1, 2, 3, and 4 are re-estimated in a cross-section framework using the aggregated measure of bribery incidence presented in section 3. Because changes in corruption perceptions may not reflect actual changes in experiences of corrupt transactions, it is worth testing whether previously evidenced nonlinearities hold with a measure of corruption reflecting the incidence of informal payments. Our cross-section analysis covers 38 developing countries[17], where 22,062 firms have been interviewed between 2006 and 2011. Descriptive statistics and details on sample composition are provided in Appendix A.

5.1. Model 1: baseline estimation

OLS cross-section estimation of equation (4b) is conducted:

$$Bribery_i = \beta_0 + \boldsymbol{\beta_1.Skewness_i} + \boldsymbol{\beta_2.Std\_dev_i} + \beta_3.Controls_i + \xi_i, \quad (4b)$$

[17] Countries with less than 30 respondent firms have been dropped from the sample.

Where *i* is the country subscript, $Bribery_i$ is the aggregated measure of bribery incidence, and ξ_i an i.i.d. error term. Results are reported in table 1b and support a significant positive *ex ante* effect of instability on the incidence of bribes. According to column (3), a 10% increase in the standard deviation of export results in a 20% increase in bribery incidence. Estimates in column (3) do not provide evidence of a significant *ex post* effect of instability.

OLS estimation of econometric model 2 are therefore conducted to test whether the *ex post* effect of export instability on bribery incidence is driven by asymmetric responses to positive and negative shocks.

Table 1b. OLS estimations of equation (4b): evidence from the WBES.

Dependent variable:	Bribery incidence		
	(1)	**(2)**	**(3)**
Export standard deviation	**2.175** (0.05)**	**1.273 (0.18)**	**1.978* (0.07)**
Export skewness	**0.045 (0.19)**	**0.054† (0.12)**	**0.017 (0.65)**
Life expectancy at birth		-0.010 (0.98)	0.150 (0.77)
Primary completion rate		-0.222 (0.38)	-0.217 (0.43)
Women share in parliament		-0.515 (0.32)	-0.428 (0.37)
Natural resources		0.530* (0.10)	0.212 (0.52)
Government size		-1.081 (0.16)	-0.630 (0.52)
Log population		1.102 (0.69)	4.91 (0.25)
Polity regime stability		0.336* (0.08)	0.124 (0.62)
Democracy		-0.653 (0.42)	-0.397 (0.69)
Trade openness		0.123 (0.24)	0.100 (0.39)
% firms public ownership			0.321 (0.96)
% indirect exports			1.351 (0.60)
% of direct exports			-0.122 (0.91)
% of working capital financed by internal fund			-0.732* (0.08)
% of large-size firms			-1.024† (0.11)
Constant	1.649 (0.83)	17.70 (0.73)	1.43 (0.98)
Observations	38	38	38
R-squared	0.07	0.49	0.57

Standards errors robust to heteroskedasticity. P-values in parenthesis. †significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%.

5.2. Model 2: accounting for the asymmetry of export shocks

OLS cross-section estimation of equation (5b) is conducted:

$$Bribery_i = \beta_0 + \boldsymbol{\beta_{1a}}.\boldsymbol{Positive\_skewness_i} + \boldsymbol{\beta_{1b}}.\boldsymbol{Negative\_skewness_i} + \beta_2.std\_dev_i + \beta_3.Controls_i + \xi_i \quad (5b)$$

Results are reported in table 2b. Including separately the positive and negative skewness of export raises by 18% the explanatory power of the regression. Results support a 2% significant 'symmetric positive' *ex post* effect of instability on bribery incidence. A 10% increase in the positive and negative export skewness both result in a 2% increase in the incidence of bribes. Moreover, the

effect of the standard deviation of exports on bribery incidence is positive and significant in a 2% level, supporting again the hypothesis of resource locking corrupt transactions in unstable countries.

Table 2b –OLS estimation of equation (5b): evidence from the WBES.

Dependent variable:	Bribery incidence
Export standard deviation	1.997** (0.02)
Export skewness > 0	**0.201** (0.02)**
Export skewness < 0	**0.194** (0.02)**
Observations	38
R-squared	0.75

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. †significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%.

In the next econometric model, I test whether the nature of the marginal effect of shocks on bribery depends on the intensity of export fluctuations.

5.3. Model 3: accounting for the intensity of export shocks

OLS cross-section estimation of equation (6b) is conducted:

$$Bribery_i = \beta_0 + \boldsymbol{\delta_{1a}}.\boldsymbol{Positive\_skewness_i} + \boldsymbol{\delta_{1b}}.\boldsymbol{Negative\_skewness_i} + \boldsymbol{\delta_{1c}}.\boldsymbol{Positive\_skewness^2_i} + \boldsymbol{\delta_{1d}}.\boldsymbol{Negative\_skewness^2_i} + \beta_2.std\_dev_i + \beta_3.Controls_i + \xi_i \quad (6b)$$

Results reported in table 3b are consistent with those of table 3a, as they support a significant U-shaped effect of positive shocks depending on their intensity. There is no such evidence regarding negative shocks. Again, a significant *ex ante* positive effect of export instability on bribery incidence is found.

Table 3b. OLS estimation of equation (6b): evidence from the WBES

Dependent variable:	Bribery incidence
Export std_dev	1.723* (0.07)
Export skewness > 0	**-0.249† (0.11)**
Export skewness < 0	**0.037 (0.79)**
[Export skew >0]²	**0.003** (0.02)**
[Export skew <0]²	**0.001 (0.51)**
Observations	38
R-squared	0.83

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. †significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%.

Therefore, according to OLS estimation of model 3, the intensity of fluctuations channel holds during episodes of positive shocks only. In the next model, we test the relevance of the credit and the institutional constraints for channeling the *ex post* effect of instability on bribery incidence.

5.4. Model 4: financial market access and democracy as channels of the *ex post* effect of instability on corruption

In equation (7b), I test whether financial market access is a key channel for the *ex post* effect of instability on corruption:

$$Corrupt_i = \beta_0 + \boldsymbol{\varphi_{1a}.Positive\_skewness_i} + \boldsymbol{\varphi_{1b}.Negative\_skewness_i} + \boldsymbol{\varphi_{1c}.Positive\_skew_i*credit\_market_i} + \boldsymbol{\varphi_{1d}.Negative\_skew_i*credit\_market_i} + \varphi_{1e}.credit\_market_i + \beta_2.std\_dev_i + \beta_3.Controls_i + \xi_i \quad (7b)$$

In equation (8b), I test whether democratic institutions are a key channel for the *ex post* effect of instability on corruption:

$$Corrupt_i = \beta_0 + \boldsymbol{\varphi'_{1a}.Positive\_skewness_i} + \boldsymbol{\varphi'_{1b}.Negative\_skewness_i} + \boldsymbol{\varphi'_{1c}.Positive\_skew_i*Democ_i} + \boldsymbol{\varphi'_{1d}.Negative\_skew_i*Democ_i} + \varphi'_{1e}.democratic\_institutions_i + \beta_2.std\_dev_i + \beta_3.Controls_i + \xi_i \quad (8b)$$

Logarithms of the share of credit provided to the private sector in GDP, and of the share of domestic credit provided by the banking system, are both used as proxies for access to financial markets. Proxies for democratic institutions are the same as those used in dynamic panel analysis.

Results are reported in tables 4b and 5b and are highly consistent with dynamic panel estimates. Estimates in table 4b indeed support that a restricted access to financial markets is significantly associated with a 'symmetric positive' *ex post* effect of export instability, driven by an increasing marginal effect of shocks. An 11% significant 'symmetric deterrent' *ex post* effect of export instability, driven by a decreasing marginal effect of shocks, is found when access to financial markets is proxied by the "share of domestic credit" variable. Therefore, these are additional evidence on the role of access to financial markets in channeling the nonlinear *ex post* effect of instability on corruption.

Estimates in table 5b also support the role of democratic institutions in channeling these nonlinearities. These results are consistent with those of Voors et al (2010), who find that the adverse effect of income shocks on corruption holds in countries with lower governance levels. Estimation in column (1) shows in a 10% level that democracy dampens the significant 'symmetric positive' *ex pos*t effect of instability on bribery incidence. Columns (2) and (3) support that media freedom also dampens the positive *ex post* effect of instability on bribery, especially media independence from economic influences (column (3)).

Table 4b. OLS estimation of equation (7b): evidence from the WBES.

Dependent variable:	Bribery incidence	
	(1)	(2)
Export std_dev	0.218 (0.77)	0.780 (0.40)
Export skew>0	**0.550* (0.07)**	**0.791** (0.05)**
Export skew<0	**0.563* (0.10)**	**0.674** (0.05)**
Skew>0 × credit access	**-0.118 (0.16)**	**-0.179† (0.11)**
Skew<0 × credit access	**-0.127 (0.20)**	**-0.147† (0.11)**
Obs (countries)	37	37
R-squared:	0.83	0.80

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%. In column (1), access to credit market is proxied by the share of credit provided to the private sector in GDP (in log), while in column (2) access to credit market is proxied by the share of domestic credit provided by the banking system in GDP (in log).

Table 5b. OLS estimations of equation (8b): evidence from the WBES.

Dependent variable:	Bribery incidence		
	(1)	(2)	(3)
Export std_dev	1.528 * (0.06)	1.542† (0.13)	0.748 (0.50)
Export skew>0	**0.344*** (0.01)**	**-1.120 (0.24)**	**-1.401* (0.10)**
Export skew<0	**0.349** (0.03)**	**-1.148 (0.29)**	**-1.467† (0.14)**
Skew>0 × democracy	**-0.030* (0.07)**		
Skew<0 × democracy	**-0.033† (0.12)**		
Skew>0 × free press		**-0.342 (0.24)**	
Skew<0 × free press		**-0.433 (0.27)**	
Skew>0 × econ. infl. media			**-0.601* (0.07)**
Skew<0 × econ. infl. media			**-0622* (0.10)**
Observations	38	38	38
R-squared:	0.79	0.80	0.82

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%.

5.5. Model 5: financial market access as a channel for the *ex ante* effect of instability

Finally, the role of financial markets in channeling the *ex ante* effect of instability is tested in equation (9b):

$$Bribery_i = \beta_0 + \beta_1.Skewness_i + \boldsymbol{\varphi_{2a}.std\_dev_{it}} + \boldsymbol{\varphi_{2b}.std\_dev_{it}*credit\_market_{it}} + \beta_3.credit\_market_{it} + \beta_4.Controls_i + \xi i \quad (9b)$$

OLS estimates of equation (9b), presented in table 6b, confirms the positive *ex ante* effect of export instability on bribery incidence previously evidenced, but does not support in a reliable confidence level that an improved access to financial markets dampen this effect.

Table 6b. OLS estimations of equation (9b): evidence from the WBES.

Dependent variable:	Bribery incidence	
	(1)	(2)
Export skewness	0.010 (0.77)	-0.003 (0.77)
Export std_dev	**2.924* (0.09)**	**1.040* (0.07)**
Std dev × credit access	**-0.483 (0.39)**	**-0.226 (0.31)**
Observations	37	37
R-squared	0.63	0.73

Controls not reported. Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%. In column (1), access to credit market is proxied by the share of credit provided to the private sector in GDP (in log), while in column (2) access to credit market is proxied by the share of domestic credit provided by the banking system in GDP (in log).

6. Concluding remarks

This paper is a first attempt to set an analytical framework for the empirical analysis of the *ex ante* and *ex post* effects of economic instability on corruption. To test these effects I use measures of export instability reflecting the perception and experience of shocks, respectively, and find strong and consistent evidence of *ex ante* and *ex post* effect of instability on corruption.

Dynamic panel data estimations, using an indicator of corruption perception, and cross-section estimations, using a measure of bribery incidence, stress that the *ex post* effect of instability is nonlinear, depending on factors underlying the increasing or decreasing nature of the marginal effect of shocks on corruption. In fact, instability is found to have a 'symmetric deterrent' *ex post* effect on corruption perception and bribery incidence when export fluctuations are small and frequent, when access to financial markets is facilitated, and when democratic institutions are effective. By contrast, when export fluctuations are intense, when access to credit markets is restricted, and when democracy is low, a 'symmetric positive' *ex post* effect of export instability is found. On the other hand, estimations support a strong positive *ex ante* effect of export instability

on corruption perception and experience; and that the financial constraint also dampens the positive *ex ante* effects of instability on corruption perceptions.

Thus, by addressing the modalities by which economic fluctuations affect corruption levels, this paper hopefully opens new rooms for theoretical and empirical analyses of corruption prevalence, but also for the elaboration of anti-corruption policies. First, results point to the damaging effects of export instability on governance in fragile states, since corrupt strategies may spread as a substitute for imperfect financial markets and/or a low state resilience to external fluctuations. These findings provide an additional argument in support to the reinforcement of state capacity for mitigating the consequences of shocks and policies lowering country's exposure to them. More specifically, improving access to financial markets and supporting democracy through media freedom should yield anti-corruption outcomes, since these dimensions of institutional quality appears in estimations as a key channels of the effects of instability on corrupt transactions. Finally, evidence of positive *ex post* and *ex ante* effects of export instability on corruption strategies highlights the role played by external factors of economic stability, such as aid and remittances (Combes and Ebeke, 2011; Guillaumont and Chauvet, 2001), in improving the quality of governance.

References

Acemoglu, D., Johnson, S., Robinson, and Thaicharoen J Y. (2003). Institutional causes, macroeconomic symptoms: instability, crises and growth. *Journal of Monetary Economics*, *50*(1), 49-123.

Ahlin, C., and Pang, J. (2008). Are financial development and corruption control substitutes in promoting growth? *Journal of Development Economics*, *86*(2), 414–433.

Alderman, H. (1996). Saving and economic shocks in rural Pakistan. *Journal of Development Economics, 51*(2), 343-365.

Altunbas, Y., and Thornton, J. (2012). Does Financial Development Reduce Corruption?. *Economics Letters*, *114*(2), 221–223.

Amore, M.D., and M. Bennedsen (2013). The Value of Political Connections in a Low-Corruption Environment. *Journal of Financial Economics, 110*(2), 387-402.

Arezki, R., and M. Brükner (2012). Resource Windfalls and Emerging Market Sovereign Bond Spreads: The Role of Political Institutions. *World Bank Economic Review*, *26*(1), 78-99.

Arin, K.P., Chmelarova, V., Feess, E., and A. Wohlschlegel (2011). Why are corrupt countries less successful in consolidating their budgets?. *Journal of Public Economics*, *95*(7-8), 521-530.

Andvig, J.C. (2006). Corruption and Fast Change. *World Development*, *34*(2), 328-340.

Bardhan, P. and C. Udry, *Development Microeconomics,* Chapters 6, 7 and 8, Oxford University Press, 1999.

Bevan, D., Collier, P. and J.W. Gunning (1993). Trade shocks in developing countries, Consequences and policy responses. *European Economic Review*, *37*(2-3), 557-565.

Boubakri, N., Guedhami, O., Mishra, D., and W. Saffar (2012). Political connections and the cost of equity capital. *Journal of Corporate Finance, 18*(3), 541-559.

Borcan, O., Lindhal, M., and A. Mitrut (2012), "The Impact of Unexpected Wage Cut on Corruption: Evidence from a 'Xeroxed' Exam", Working Paper, University of Gothenburg.

Brückner, M., and A. Ciccone (2011). Rain and the Democratic Window of Opportunity. *Econometrica*, *79*(3), 923-947.

Cariolle, J., and M. Goujon. Measuring Macroeconomic Instability: A critical Survey Illustrated with Export Series. Forthcoming in the *Journal of Economic Surveys*, issued online on July 2013.

Combes, J.L., and C. Ebeke (2011). Remittances and Household Consumption Instability in Developing Countries. *World Development*, *39*(7), 1076-1089.

Combes, J-L., and P. Guillaumont. (2002). Commodity Price Instability, Vulnerability and Development. *Development Policy Review*, 20(1), 25–39.

Dalgaard, C.J., and O. Olsson (2008). Windfall gains, political economy, and economic development. *Journal of African Economies*, *17* (Suppl. 1), 72–109.

Dawe, D. (1996). A New Look at the Effects of Export Instability on Investment and Growth. *World Development*, *24*(12), 1905-1914.

Dercon, S. (2002). Income risk, coping strategies, and safety nets. *The World Bank Research Observer*, *17*(2), 141-166.

Elbers, C., Gunning, J.W., and B.H. Kinsey (2007). Growth and Risk: Methodology and Micro Evidence. *World Bank Economic Review, 21(*1), 1-20.

Ehrlich, I., and G. Becker (1972). Market Insurance, Self-Insurance, and Self-Protection. *Journal of Political Economy, 80*, 623–48.

Faccio, M., Masulis, M.W., and J.J. McConnell (2013). Political Connections and Corporate Bailouts. *Journal of Finance, 61*(6), 2597-2635.

Galbraith, J.K. (1997) *The Great Clash 1929*. New York: Mariner Books, Houghton Mifflin Company.

Gokcekus, O., and Y. Suzuki (2011). Business cycle and corruption. *Economics Letters*, *111*(2), 138-140.

Goldman, E., Rocholl, J., and J. So (2013). Politically Connected Boards of Directors and The Allocation of Procurement Contracts. Forthcoming in the *Review of Finance* (issued online the 11th of Januray 2013).

Graeff, P. Why should one trust in corruption? in eds. Lambsdorff, G, Taube, M. and M. Schramm, *The New Institutional Economics of Corruption*, Chapter 3, Routledge, 2005.

Grossman, G.M., and E. Helpman (1994). Protection for Sale. *American Economic Review*, *84*(4), 833-850.

Guillaumont, P. (2010). Assessing the Economic Vulnerability of Small Island Developing States and the Least Developed Countries. *Journal of Development Studies*, *46*(5), 828-854.

Guillaumont, P. (2009). *Caught in a trap: Identifying the Least Developed Countries*. Economica.

Guillaumont, P., and L. Chauvet, (2001). Aid and Performance : A Reassessment. *Journal of Development Studies*, *37*(6), 66-92.

Guillaumont, P., and F. Puech (2006). *Macro-economic instability and crime*. Working Paper E2006.02, Etudes et Documents, Centre d'Etudes et de Recherches sur le Développement International, University of Auvergne, Clermont-Ferrand.

Guriev, S. (2004). Red tape and corruption. *Journal of Development Economics*, *73*(2), 489– 504.

Husted, B.W. (1999). Wealth, Culture, and Corruption. *Journal of International Business Studies*, *30*(2), 339-360.

Isham, J., Woolcock, M., Pritchett, L. and G. Busby (2005). The Varieties of Resource Experience: Natural Resource Export Structures and the Political Economy of Economic Growth. *World Bank Economic Review*, *19*(2), 141-174.

Jones, B., and B. Olken (2010). Climate Shocks and Exports. *American Economic Review: Papers & Proceedings*, *100*(2), 454-459.

Klitgaard, R., *Controlling corruption*, University of California Press, 1988.

Koren, M., and S. Tenreyro (2007). Instability and Development. *Quarterly Journal of Economics*, *122*(1), 243-287.

Lambsdorff, J.G. (2002). Corruption and Rent-seeking. *Public Choice*, 113(1-2), 97-125.

Lederman, D., Loayza, N.V., and R.R. Soares (2005). Accountability and corruption: political institutions matter. *Economics & Politics*, *17*(1), 1-35.

Loayza, N.V., Rancière, R., Servén, L., and J. Ventura (2007). Macroeconomic instability and Welfare in Developing Countries: An Introduction. *World Bank Economic Review*, *21*(3), 343-357.

Mauro, P. (2004). The persistence of corruption and slow economic growth. *IMF Staff Paper*, *51*(1), 1-18.

Mobarak, A. (2005). Democracy, Instability, and Economic Development. *Review of Economics and Statistics*, *87*(2), 348-361.

Paxson, C.H. (1992). Using Weather Variability to Estimate the Response of Savings to Transitory Income in Thailand. *American Economic Review*, *82*(1), 15-33.

van der Ploeg, F. (2011). Natural Resources: Curse or Blessing?. *Journal of Economic Literature*, *49*(2), 366-420.

van der Ploeg, F. (2010). Aggressive oil extraction and precautionary saving: coping with instability. *Journal of Public Economics*, *94*(5-6), 421-433.

Rancière, R., Tornell, A., and F. Westermann (2008). Systemic crises and growth. *The Quarterly Journal of Economics*, *123*(1), 359-406.

Robertson, C.J., and A. Watson (2004). Corruption and change: the impact of foreign direct investment. *Strategic Management Journal*, *25*(4), 385-396.

Robinson, J., and E. Yeh (2009). Transactional Sex as a Response to Risk in Western Kenya. *American Economic Journal: Applied Economics* (2011), *3*(1), 35-64.

Rodrik, D. (2000). Participatory Politics, Social Cooperation, and Economic Stability. *American Economic Review*, *90*(2), 140-144.

Sala-i-Martin, X., Doppelhofer, G., and R.I. Miller (2004). Determinants of Long-Term Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach. *American Economic Review*, *94*(4), 813-835.

Sandholtz, W., and W. Koetzle (2000). Accounting for corruption: Economic structure, democracy, and trade. *International Studies Quarterly*, *44*, 31-50.

Søreide, T. (2009). Too risk averse to stay honest? Business corruption, uncertainty and attitudes toward risk. *International Review of Law and Economics*, *29*(4), 388-395.

Stevenson, B. and J. Wolfers (2011). Trust in Public Institutions over the Business Cycle. *American Economic Review*, *101*(3), 281-287.

Svensson, J. (2003). Who Must Pay Bribes and How Much? *The Quarterly Journal of Economics*, *118*(1), 207-230.

Fisman, R., and J. Svensson (2007). Are corruption and taxation really harmful to growth? Firm level evidence. *Journal of Development Economics*, *83*(1), 63-75.

Tanzi, V. (1994). *Corruption, government activities, and markets*. IMF Working Paper WP/98/63, International Monetary Fund, Washington D.C.

Transparency International (2009), *Global Corruption Barometer*. Berlin.

Treisman, D. (2007). What Have We Learned About the Causes of Corruption from Ten Years of Cross-National Empirical Research? *Annual Review of Political Sciences*, *10*, 211-244.

Treisman; D. (2000). The causes of corruption: a cross-national study. *Journal of Public Economics*, *76*(3), 399-457.

Voors, M.J., Bulte, E.H., and R. Damania (2011). Income Shocks and Corruption in Africa: Does a Virtuous Cycle Exist?. *Journal of African Economies*, *20*(3), 395-418.

Williamson, C.R. (2009). Informal institutions rule: institutional arrangements and economic performance. *Public Choice*, *139*(3-4), 371-387.

APPENDICES

A. DATASETS

A.1. ICRG SAMPLE COMPOSITION

country	Obs	country	Obs	country	Obs
Algeria	19	France	19	Pakistan	19
Argentina	19	Gabon	19	Papua New Guinea	17
Australia	14	Guyana	11	Paraguay	19
Austria	19	Honduras	19	Peru	19
Bangladesh	19	Hungary	19	Philippines	19
Belgium	19	India	19	Portugal	19
Bolivia	9	Indonesia	19	Senegal	19
Brazil	19	Ireland	19	South Africa	19
Burkina Faso	14	Italy	19	Spain	19
Cameroon	19	Japan	19	Sudan	19
Canada	19	Kenya	19	Sweden	19
Chile	19	Madagascar	19	Thailand	19
Costa Rica	19	Malawi	19	Togo	19
Cuba	9	Malaysia	19	Trinidad and Tobago	16
Denmark	19	Mali	12	Tunisia	18
Dominican Republic	19	Mexico	19	United Kingdom	19
Ecuador	19	Morocco	19	United States	9
El Salvador	19	Netherlands	19	Uruguay	19
Finland	19	New Zealand	19	Zambia	19
Greece	19	Nicaragua	19		
Guatemala	19	Norway	19		

Latin America and Caribbean = 30% of total sample

Middle East and North Africa = 8% of total sample

North America = 2% of total sample (Canada, USA)

Eastern and central Asia = 2%

East Asia and Pacific = 13%

South Asia = 5% of total sample (India, Bangladesh, Pakistan)

Sub Saharan Africa = 20% of total sample

Western Europe = 20% of total sample

A.2. WBES SAMPLE: FIRMS-LEVEL VARIABLES AND NUMBER OF FIRMS WITH NON-MISSING DATA

Variables / Country	Bribery incidence	State ownership	% of indirect exports	% of direct exports	Internal funds	Large size firms
Argentina	1475	1474	1473	1473	1462	1475
Bolivia	722	717	722	722	707	722
Botswana	500	499	500	500	497	500
Bulgaria	758	758	758	758	741	758
Burkina Faso	229	229	227	227	226	229
Cameroon	302	302	302	302	300	302
Cape Verde	116	116	116	116	106	116
Chile	1826	1825	1823	1823	1790	1826
Colombia	1556	1556	1556	1556	1550	1556
Congo Dem. Rep.	541	540	541	539	540	541
Costa Rica	38	38	36	36	36	38
Dominican Republic	325	319	324	324	324	325
Ecuador	860	859	859	859	848	860
El Salvador	672	670	671	671	667	672
Gambia The	135	135	135	135	135	135
Guatemala	874	872	874	874	873	874
Honduras	541	541	538	538	534	541
Indonesia	1199	1193	1195	1195	1159	1199
Madagascar	64	64	64	64	63	64
Malawi	122	122	122	122	122	122
Mali	648	642	644	644	624	648
Mauritania	195	195	195	195	195	195
Mexico	979	978	979	979	979	979
Mozambique	457	457	457	457	457	457
Namibia	281	281	281	281	280	281
Nicaragua	533	530	532	532	531	533
Pakistan	499	497	470	446	498	499
Panama	534	534	531	531	527	534
Paraguay	424	422	424	424	421	424
Peru	1280	1279	1280	1280	1274	1280
Philippines	1205	1202	1201	1201	1118	1205
Senegal	494	494	494	494	494	494
Swaziland	286	286	286	286	285	286
Togo	110	110	110	110	107	110
Uruguay	619	615	618	618	610	619
Venezuela	191	189	190	190	179	191
Zambia	472	472	472	472	472	472
Total	**22062**	**22012**	**22000**	**21974**	**21731**	**22062**

A.3. WBES SAMPLE: % OF FIRMS BY YEAR OF INTERVIEW

(BASED ON THE DEPENDANT VARIABLE "BRIBERY INCIDENCE")

country	2006	2007	2008	2009	2010	2011
Argentina	36	9			45	9
Bolivia	56				43	
Botswana	53				47	
Bulgaria		98	2			
Burkina Faso				100		
Cameroon				100		
Cape Verde				100		
Chile	46				49	5
Colombia	46				49	5
Congo Dem. Rep.	47				53	
Costa Rica					84	16
Dominican Republic					100	
Ecuador	61				39	
El Salvador	50				24	26
Gambia The	100					
Guatemala	36				49	15
Honduras	39				42	19
Indonesia				97	3	
Madagascar			94	6		
Malawi				100		
Mali	68			31		
Mauritania	100					
Mexico	91				3	6
Mozambique		100				
Namibia	100					
Nicaragua	39				36	24
Pakistan		100				
Panama	94				5	1
Paraguay	39				53	7
Peru	35				65	
Philippines				100		
Senegal		100				
Swaziland	100					
Togo				100		
Uruguay	15				84	1
Venezuela					91	9
Zambia		100				

A.4. ICRG SAMPLE: SUMMARY STATISTICS

	Source	Obs	Mean	Std. Dev.	Min	Max
ICRG	PRS group	1125	2.6	1.4	0	6
Export 16-year std dev	World Development Indicators 2010	1125	7.0	3.6	1.9	20.6
Export 6-year skewness > 0		1125	67.5	69.4	0	242.92
Export 6-year skewness < 0		1125	47.8	64.0	0	242.93
Population growth (in %)	WDI 2010	1125	15	1.0	-0.70	6.0
Log population		1125	16.6	1.3	13.5	20.8
Log credit to private sector		1100	3.5	1	1	5
Natural resources (% of GDP)		1125	5.2	8.1	0	59
Political regime stability	Polity IV	1125	29.5	33.4	0	196
Democracy		1125	5.4	5.8	-9	10
Gvt expenditures (% of GDP)	Penn World Tables 2010	1125	15.6	5.9	4.6	53.2
Log openness (const. LCU)		1125	4.0	0.5	2.4	5.3
Log press freedom index	Freedom House	784	-2.1	0.61	-3.4	0
Log economic influence over media		789	-3.4	0.66	-4.6	-1.6

A.5. WBES SAMPLE: SUMMARY STATISTICS

	Source	Obs	Mean	Std. Dev.	Min	Max
Bribery incidence	WBES	38	25.08	26.88	1.72	100
Export 16-year std dev	World Development Indicators 2010	38	8.95	4.35	2.85	23.10
Export 6-year skewness > 0		38	58.51	64.50	0	196.71
Export 6-year skewness < 0		38	56.95	58.88	0	188.98
Life expectancy at birth	WDI 2010	38	64.81	10.48	46.19	79.25
Primary completion rate		38	82.13	20.06	41.86	111.65
Woman share in parliament		38	18.74	7.78	7.9	38.6
Log population		38	16.31	1.39	13.09	19.28
Log credit to private sector		37	3.19	0.60	1.56	4.48
Log domestic credit by banks		37	3.27	0.92	0	4.49
Gvt expenditures (% of GDP)		38	13.19	4.34	7.35	25.71
Trade openness (% in GDP)		38	76.67	29.37	35.53	155.62
Natural resources (% of GDP)		38	8.61	9.65	0.12	35.55
Political regime stability	Polity IV	38	18.32	16.06	0	91.5
Democracy		38	5.21	4.91	-9	10
Log press freedom index	Freedom House	38	-3.85	0.35	-4.39	-2.94
Log economic influence over media		38	-2.63	0.32	-3.21	-1.79
State ownership (% firms)	WBES	38	0.41	0.46	0	1.83
Indirect exports (% of firm's sales)		38	2.74	2.80	0.01	15.29
Direct exports (% of firm's sales)		38	5.90	3.93	0.63	17.42
Internal funds (% of working capital)		38	67.26	12.30	41.01	91.75
% of large-size firms		38	16.8	8.65	1.02	35.2

B. ROBUSTNESS CHECKS: ESTIMATIONS WITH THE CORRUPTION PERCEPTION INDEX OF TRANSPARENCY INTERNATIONAL

Dependent variable:	**CPI**							
Equations:	(4a)	(5a)	(6a)	(7a)	(8a)			(9a)
Corruption t- 1	0.551*** (0.00)	0.554*** (0.00)	0.553*** (0.00)	0.532*** (0.00)	0.550*** (0.00)	0.553*** (0.00)	0.605*** (0.00)	0.528*** (0.00)
Export skewness	-0.0001 (0.45)							-0.0001 (0.49)
Export skew>0		-0.001*** (0.01)	-0.003** (0.05)	-0.001 (0.65)	-0.001 (0.18)	-0.002 (0.23)	-0.002** (0.02)	
Export skew<0		-0.004* (0.07)	-0.003** (0.03)	0.001 (0.50)	-0.002† (0.15)	-0.002 (0.18)	-0.002† (0.13)	
[Export skew >0]^2			1e-05 (0.17)					
[Export skew <0]^2			1e-05** (0.03)					
Skew>0 × credit access				-1e-05 (0.96)				
Skew<0 × credit access				-4e-05 (0.23)				
Skew>0 × democracy					-3e-05 (0.69)			
Skew<0 × democracy					-4e-05 (0.62)			
Skew>0 × free press						-0.0003 (0.48)		
Skew<0 × free press						-0.0004 (0.32)		
Skew>0 × econ. infl. media							-0.001 (0.16)	
Skew<0 × econ. infl. media							-0.001 (0.21)	
Export std_dev	-0.016 (0.62)	-0.009 (0.79)	-0.011 (0.05)	-0.002 (0.97)	-0.011 (0.67)	-0.009 (0.78)	0.014 (0.67)	0.091* (0.08)
Export std_dev× credit access								-0.032** (0.04)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs (countries)	610(77)	610(77)	610(77)	601(76)	601(76)	610(77)	610(77)	601(76)
R-squared:								
Within	0.43	0.44	0.45	0.46	0.44	0.44	0.45	0.45

Controls not reported. When possible coefficients are rounded to three decimal places. Standards errors robust to heteroskedasticity. P-values in parenthesis. † significant at 15% *significant at 10%; **significant at 5%; ***significant at 1%.

CPI sample composition (610 observations 77 countries)

Latin America and Caribbean = 26% of total sample

Middle East and North Africa = 9% of total sample

North America = 4% of total sample

Eastern and central Asia = 2%

East Asia and Pacific = 14%

South Asia = 5% of total sample

Sub Saharan Africa = 16% of total sample

Western Europe = 24% of total sample

C. COMPARISON OF FIRMS REPORTING AND NOT REPORTING BRIBE DATA

Dependent variables:	public ownership	indirect exports	direct exports	Small size	Medium size	Large size	Financial constraint
Firms missing corruption data	-0.048 (0.45)	-0.120 (0.65)	0.262 (0.72)	-0.053 (0.42)	0.04 (0.34)	0.022 (0.77)	0.019 (0.69)
Constant	0.305*** (0.00)	2.61*** (0.00)	7.06*** (0.00)				
Countries	38	38	38	38	38	38	38
Firms	30628	31180	31146	31290	31290	31290	30600
R2 / Pseudo R2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Estimator	OLS	OLS	OLS	PROBIT	PROBIT	PROBIT	O-PROBIT

Standards errors robust to heteroskedasticity and clustered by countries. P-values in parenthesis. *significant at 10%; **significant at 5%; ***significant at 1% † significant at 15%.

Créée en 2003, la **Fondation pour les études et recherches sur le développement international** vise à favoriser la compréhension du développement économique international et des politiques qui l'influencent.

Contact
www.ferdi.fr
contact@ferdi.fr
+33 (0)4 73 17 75 30