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An econometric analysis**

Gbewopo Attila



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Besøksadresse: C.J. Hambros plass 2d

Adresse: Postboks 8159 Dep.
0033 Oslo

Internett: www.nupi.no

E-post: pub@nupi.no

Fax: [+ 47] 22 36 21 82

Tel: [+ 47] 22 99 40 00

Is corruption contagious? An econometric analysis

Gbewopo Attila[†]

CERDI-CNRS, University of Auvergne

[Abstract] In this paper, I analyze how corruption in one country may be affected by its neighbors' corruption. It seeks to explain why corruption is perpetuating in large geographical areas populated by developing countries despite anticorruption efforts made in the single country.

In our empirical approach, we capture the spatial dependency by regional corruption. Three main techniques are used: spatial autocorrelation tests, GMM and three stage least squares. Our results show that, a lower regional corruption (as measured by the average of the level of corruption in one country's neighbors) is associated with a lower level of national corruption. Among the potential mechanisms explaining this correlation, the level of economic development (GDP per capita) seems to be the most important. Foreign aid and trade openness show less clear results. Non-economic mechanisms such as cross-country contagion processes of voice expressions and demands on accountability are other possible transmission mechanisms.

Keywords: Corruption, economic development, trade, persistence, political factors, social factors.

JEL classification: H1, O10, O2, Z13

[†] Please address correspondance to: Centre d'Etudes et de Recherches sur le Developpement International (CERDI), 65 Boulevard, François Mitterrand, 63000 Clermont Ferrand, France. E-mail : G.ATTILA@u-clermont1.fr .

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Introduction

Evidence is growing that corruption¹ slows economic growth for the single country (Ades and di Tella, 1996; Mauro, 1995, 1997; Murphy, Shleifer and Vishny, 1991; Rose-Ackerman, 1996, Rose-Ackerman and Coolidge, 1997; World Bank, 1997, Dreher and Herzfeld, 2005; Gerlagh and Pelligrini, 2004; Minorov, 2005). It is important therefore to understand the causes of corruption in order to eradicate it efficiently.

This paper aims to study the contagion effects of corruption, captured through spatial interactions between countries. To my knowledge this is a set of mechanisms that so far has not received much attention in empirical research of corruption². I inquire whether spatial interdependency contributes to understand the persistence of corruption. Here, I assume that the persistence of corruption in developing countries can be explained by the contagion phenomenon. If such an effect exists it should to be based on interactions between individuals (Manski, 2000) of two different countries.

The contagion effect may mainly take place at the bribe payers' end, since the migration at the main bribe receivers' end, among the public employees, naturally is quite limited³. Here spillover mechanisms have to be more indirect: being educated at the same regional university centers, the same American, French or British university, or participation to the same conferences; for example customs officers from the same region may participate to an anticorruption conference. Fisman and Miguel (2006, 2007) consider that diplomats' behaviors in violating parking could be "interpreted as an indication of their home country's cultural tolerance for corruption rather than their own personal values". Bribe payers such as businessmen may physically move into a neighbor country and pay bribes there.

Besides this increase in neighborhood opportunities, common language and culture shared by different people are sources of commercial relations (Moreno and Trehan, 1997). Another possible link is colonization history. But, it is also possible that people from nearby countries may have different social traditions, norms and trust vis-à-vis malfeasance, crime or

¹ A prominent question in the literature has been how to define corruption. It is obvious that there is no unique definition of corruption. Different propositions, ranging from "too restrictive" to "too wide" (Amundsen, and al, 2000) share a common denominator which can be expressed as follows: "*the abuse of public authority or position for private gains*".

² Our study is related to the empirical analysis of growth where Ades and Chua (1997) and others authors have documented a relationship between regional political instability and growth². Moreno and Trehan (1997) documented neighborhood growth rate effects. Unlike these authors, I examine if regional dependency will have an impact on the level of corruption in a given country. Seldadyo (2008) has examined the space and governance nexus and concludes that spatial interactions matter. In this paper I will concentrate on corruption issues.

³ An outline of theoretical possibilities here can be found in Andvig (2006).

corruption. Proximity induces countries to know about each other or to be influenced not only by economic or political arrangements but also institutional contexts in a given country. Individuals then decide accordingly to corrupt or to be corrupted by individuals from a nearby country, keeping in mind their own culture or that of the closest countries. And because agents of cross-border corruption are capable of doing business under certain constraints everywhere in the world, it is almost impossible to hold them accountable anywhere (Johnston, 1997).

The present study is related to the empirical literature of determinants of corruption. Existing econometric studies have looked at cross-section econometrics where country observations have been considered statistically independent (Treisman, 2000; Straub, 2000; Fretchete, 2001; Seldadyo and de Haan, 2005; Serra, 2006). However, cross-section econometrics (such as ordinary least squares) of corruption which are based on the assumption of stochastic independence across countries are not efficient (Anselin, 2003). Thus, in order to take into account the spatial effects, two methodologies (which I describe in details below) are applied, assuming that countries' observations are not independent: the spatial correlations tests and the Generalized Method of Moments with clusters. The former make it possible to detect the space dependence of a given variable, which is corruption in this study. The latter deals with the problem of endogeneity provided that many variables are plausibly endogenous. A lot of right-side variables in the corruption equation are determined at the same time as corruption and interact with it (Treisman, 2000; Lambsdorff, 1999a). Indeed, they should all be considered endogenous. This is the case for the variables of economic development measured by per capita income (Mauro, 1995; Hall and Jones, 1999; Treisman, 1998), trade policy (Ades and Di Tella (1995; 1996; 1997); Wei, 2003; Neeman et al., 2003; Laffont and N'Guessan, 1999), decentralization (Fishman and Gatti, 1999; de Mello and Barenstein, 2001).

The remainder of this paper is organized as follows. Section I presents some preliminary tests and selected variables. In section II and III the econometric approach and results are discussed. The robustness of the results is tested in section IV. Conclusions and policy implications are finally presented.

Section I – Empirical analysis of corruption: first diagnosis

Empirical analyses are carried out on data covering four biannual periods (1996, 1998, 2000 and 2002) (so as to match the temporal coverage of corruption variables) and 120 developing and developed countries (see appendix A1 for the list of these countries). The preliminary tests rely on the estimates of spatial correlations tests. Before its presentations, we describe the variable of corruption – that is, the national corruption of a single country.

1.1- Corruption measurement issues⁴

Corruption is difficult to measure because its activities are developed secretly. At macroeconomic level, only perception indexes are available⁵. The corruption data we use in this study come from the governance database of Kaufmann, Kraay and Mastruzzi (KKM, 2003). This database includes five other indicators⁶ of governance apart from that of corruption. Our estimates are based on data from 1996, 1998, 2000 and 2002⁷. For the purpose of the analysis, we rescaled this variable from 0 (lowest corruption) to 10 (highest corruption)⁸. These data have some good characteristics which justify our preference for them and because they fill some gaps of the existing indicators found elsewhere in the literature. First, unlike the corruption variable of International Country Risk Guide (ICRG) indicator the index of KKM is a composite one and is thus more precise and informative than any individual indicator. Second, it is a product of an unobserved component model which allows efficient computation of data coming from different individual sources. That is, it ensures comparability and clustering of individual measures. Third, the data from KKM (2003) include continuous variables, getting us rid of multinomial models regressions⁹.

“Control of Corruption” measures perceptions of corruption, conventionally defined as “*the exercise of public power for private gains*”. Despite this straightforward focus, the par-

⁴ Data sources for all other variables employed in the analysis are detailed in appendix A2. Summary statistics are provided in appendix A3.

⁵ For discussions on use (abuse) and critics of governance and corruption indicators see Williams and Siddique (2007); Seligson, 2006; Kurt and Schrank, 2007; Arndt and Oman, 2006; Kaufmann et al, 2007).

⁶ There are (i) Voice and Accountability; (ii) Government effectiveness, (iii) Regulatory Quality (iv) “Rule of Law” (v) “Political Stability and Absence of Violence”.

⁷ This database is available for more recent years, the latest year being 2007. As part of our future research agenda, the analyses undertaken here could be extended.

⁸ We rescale the indicator on a 0-10 basis according to the following formula: $x = 10 * \left(\frac{x - x_{\min}}{x_{\max} - x_{\min}} \right)$.

⁹ The corruption variable of Transparency International (TI) is also a composite one but not continuous. Another limit of this variable is the aggregation methodology, which change each year, making it difficult year to year comparison. Finally, the sample coverage of TI’s variable is lower than the KKM’s.

ticular aspect of corruption measured by the various sources differs somewhat, ranging from the frequency of “additional payments to get things done,” to the effects of corruption on the business environment, to measuring “grand corruption” in the political arena or in the tendency of elites to engage in “state capture”. The presence of corruption is often a manifestation of the lack of respect of both the corrupter (typically a private citizen or firm) and the corrupted (typically a public official or politician) for the rules which govern their interactions, and hence represents a failure of governance (KKM, 2003).

Table 1 summarizes the main characteristics of corruption data for selected groups of countries covering the study’s periods¹⁰.

Table 1: Corruption perception in major groups of countries

	1996	1998	2000	2002
Sub-Saharan Africa	6.10	6.15	6.08	6.19
Latin America	5.41	5.38	5.22	5.16
OECD countries	1.90	1.94	1.23	1.43
Other Developing Countries	5.35	5.33	5.34	5.22
Overall mean	5.00	5.00	5.00	5.00

NB: Data are ranged on 0–10 scale; where 0 means the lowest corruption level and 10 the highest corruption level.

On average, all developing countries seem to be more significantly affected by corruption than OECD countries. Thus, these figures confirm the idea according to which developing countries have higher levels of corruption than developed countries. Nevertheless, it proved difficult to establish significant corruption differences between sub-Saharan Africa, Latin America and Asia. Another characteristic of this variable is the high correlation (a correlation coefficient of at least 0.94) between values of different periods.

1.2- Measure of regional corruption

The spatial autocorrelation is based on the concept of contiguity: two units are assumed to be contiguous if they share a common border. I first compute the regional corruption based on the neighborhood matrix¹¹ and then present the tests and results.

¹⁰ Figures indicate the unweighted average level of corruption. In brackets, we have the number of countries.

¹¹ Knowing that we have a sample of 120 countries, the neighborhood matrix is 120X120.

To measure the contagion effect, we proceed as follow. For a country i , we calculate the simple average of corruption index values of its neighbors as defined by Ades and Chua (1997). To calculate regional corruption values for Togo for example, I sum corruption values of its neighbors (Benin, Ghana and Burkina Faso) and this sum is then divided by three, the number of Togo's neighbors.

The index values range as previously rescaled between 0 and 10 with bigger values associated with more corruption.

In table 2, we present figures of the unweighted regional corruption.

Table 2: The unweighted regional corruption statistics

	1996	1998	2000	2002
Sub-Saharan Africa	7.88	7.12	7.92	8.21
Latin America	7.37	6.64	7.40	7.67
OECD Countries	2.69	2.27	2.53	2.80
Other Developing Countries	5.63	5.02	5.58	5.86
Overall mean	6.34	5.68	6.33	6.60

As one could expect, African countries have on average the highest corruption concentration at the regional level. This is the case for all periods and confirms at a first glance high level of corruption in Africa.

Nonetheless this preliminary result which is specially based on descriptive statistics needs to be strengthened through some rigorous empirical analyses. In the next subsections, I use two techniques to quantify the contagion effect of corruption: the tests of spatial autocorrelation and the Generalized Moments Method (GMM).

1.3-Tests of spatial autocorrelation

The global autocorrelation and the Moran Diagram make it possible to detect the space dependence of a given variable, which is corruption in this study.

The global correlation highlights the global spatial dependence at the level of single countries. This correlation is based, for a given variable, on the index of Moran which is calculated as follows:

$$I = \frac{\sum_i \sum_j w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{S_0} \bigg/ \frac{\sum_i (x_i - \bar{x})^2}{N}$$

with: $S_0 = \sum_i \sum_j w_{ij}$ et $\bar{x} = \frac{1}{N} \sum_i x_i$

where w_{ij} represents the weighting coefficient and is defined for two countries i and j by:

$$w_{ij} = \begin{cases} 1 & \text{if country } i \text{ is neighbour of country } j \\ 0 & \text{elsewhere} \end{cases}$$

Table 3 presents the coefficients of global autocorrelation calculated on a sample of 122 countries (developed and developing) over the period 1996–2002. Calculations are based on corruption data, as described in the previous paragraphs.

Table 3: Index of spatial global correlation

	Index of Moran (I)	Centered value of corruption variable	P-value Ho
1996	0.416	6.425	0.000
1998	0.465	7.180	0.000
2000	0.442	6.827	0.000
2002	0.452	6.970	0.000

Ho: Global Independence between countries.
Estimations based on corruption data of KKM(2003)

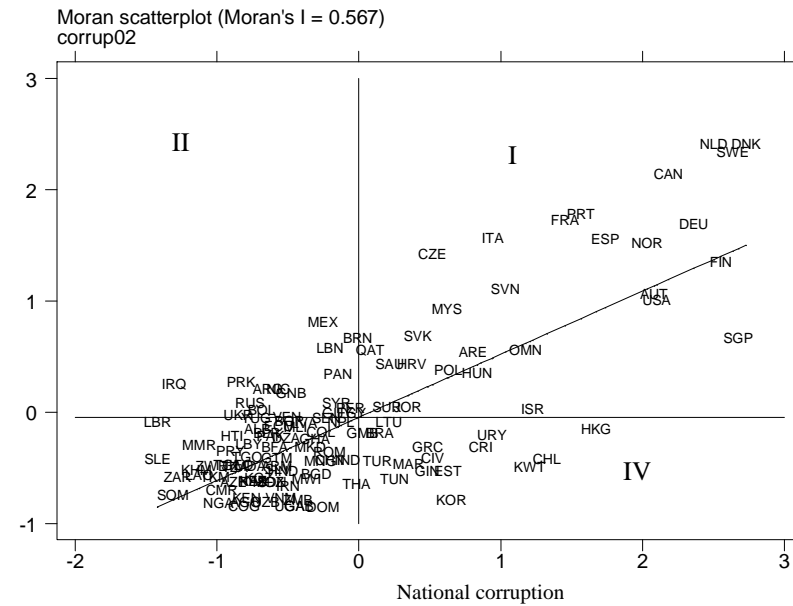
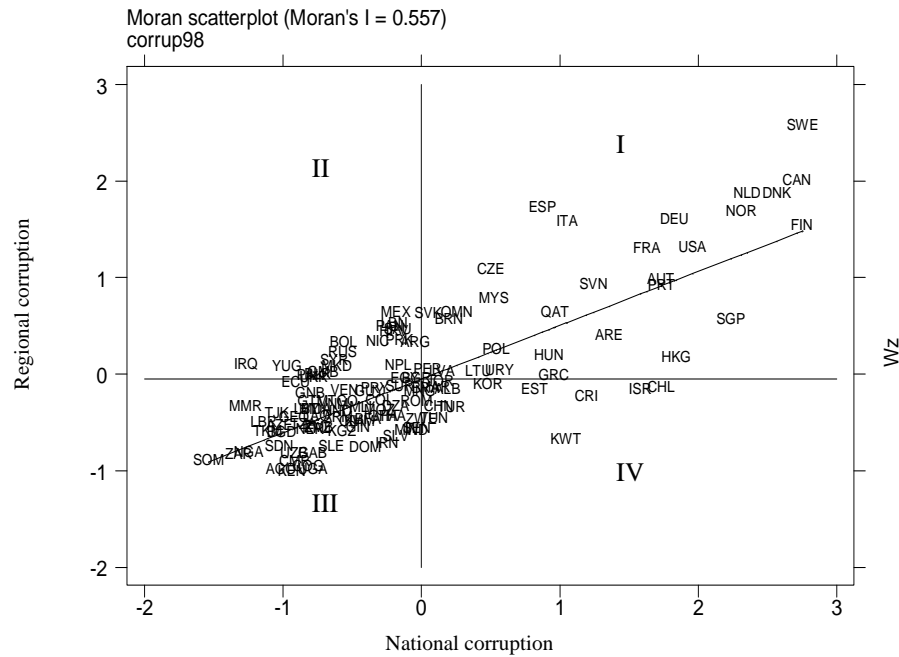
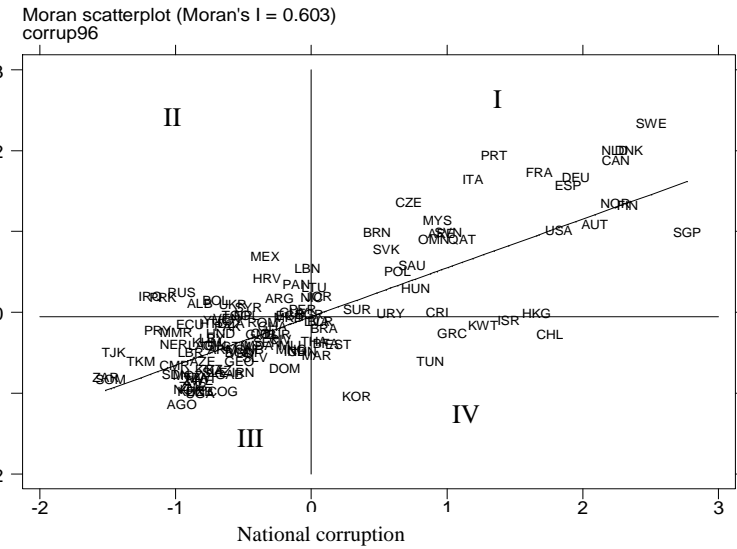
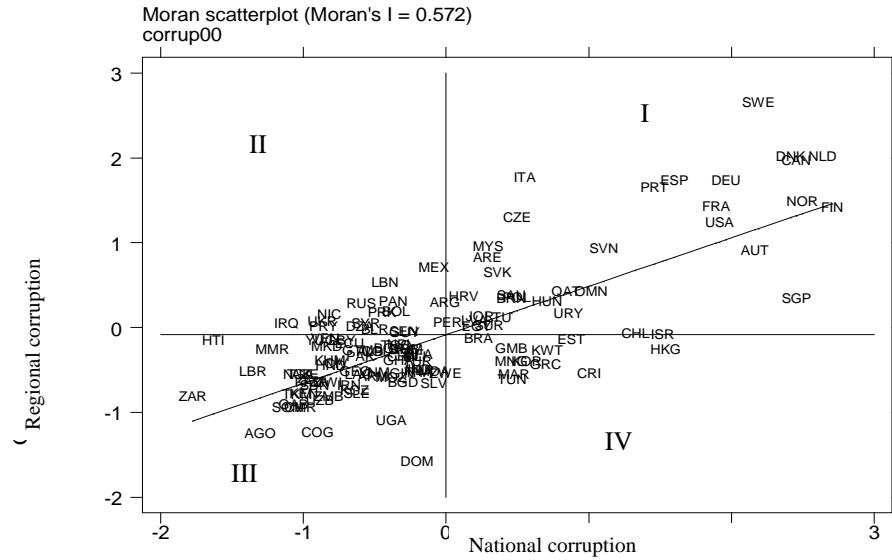
All the coefficients in Table 3 are positive and significant at 1% confidence level. Hence, neighborhood countries tend on average to share similar behaviors vis-à-vis corruption.

The correlation between national corruption and corruption in neighboring countries can also be detected through the diagrams of Moran (Anselin, 2003). On these diagrams (Figure 2), national corruption is represented in X-axis and the regional corruption in Y-axis. The scatter plots are represented by the coordinates of each country of the sample. The diagram of Moran presents two advantages: (i) the adjustment line (average relationship) makes it possible to consider spatial correlation between national corruption and regional corruption and (ii)

the scatter plots contribute to appreciate the geographical distribution of the spatial correlation of corruption. There is a positive autocorrelation when there is a clustering of countries having similar levels of corruption (quadrants I and III). When there is a grouping of countries with dissimilar levels of corruption, one speaks about negative autocorrelation (quadrants II and IV).

The diagrams of Moran show a positive relation between national corruption and regional corruption. Moreover, these diagrams support the assumption of a bipolar distribution of the levels of corruption: a clustering of the majority of developed countries (Sweden, Finland, Denmark, France, Norway, Switzerland, etc) whose levels of corruption are low (quadrant I) and a grouping of the developing countries with high levels of corruption (quadrant III).

Figure 2 : Diagrams of Moran



Section II.- The Generalized Method of Moments estimations

2.1- Motivations

As I intend to analyze the contagion effect of corruption, by looking at the spatial interactions, my question is what the better econometric approach to use is. To deal with the weaknesses of the existing literature, I argue that the generalized moment method (GMM) is more appropriate.

Using the GMM approach allows me to deal with the problem of endogeneity as many variables seem to be endogenous. This method is more efficient than the simple instrumental variables analysis (two stage least squares). As we have outlined above, almost all the variables under consideration are affected by issues of simultaneity and endogeneity. Nevertheless, we focus on three of them: (i) the per capita GDP, (ii) trade openness and (iii) regional corruption that we consider all endogenous. As previously mentioned, some variables like fractionalization, colonial tradition and natural endowment could be considered as "mostly exogenous" (Treisman, 1998). The level of development can affect corruption, and the reverse is also true, i.e. corruption reduces growth (Mauro, 1995). On the other hand, trade reduces corruption, but it is also likely that corrupt bureaucrats create opportunities for themselves to extract rents by generating barriers to trade (Treisman, 1998).

The third variable has to my knowledge not been studied in any econometric research on corruption before. Interactions between regional corruption and national corruption might be endogenous (cf. Manski, 2000). Yet, the challenge here is to find some good and valid instruments for regional spillovers. Referring to the empirical studies, we chose population, log of infant mortality, life expectancy and land area and distance from the equator as instruments. A good instrument is the one that is highly correlated to the instrumented variable and slightly if not at all to the unobserved components (errors) of the explained variable. If we consider the instrument candidates, their relationship to GDP is well established in theory. As far as trade is concerned, Di Tella et al. (1999) used population and land area as instruments. Even though no theoretical explanation may support our instruments choice, we rely upon exogeneity tests. More specifically, Hansen tests are provided so as to test if the chosen instruments are exogenous.

In addition, this method makes it possible to take into account the correlation between countries. Unlike much of previous empirical analysis, my study goes one step further and will help to get more insights on determinants of corruption.

As data are only available on four periods, one may question the most appropriate method to employ. Among the studies that have discussed the time dimension, Treisman (1998) estimated

separately two equations for the years 1980 and 1990 respectively. So did Ades and Di Tella (1999). In this study, we pool the data for the four periods.

Furthermore, the fixed effects approach presents some limits for analyzing corruption. The main reason why fixed effect models are not appropriate is due to the low variability of corruption level over time. Indeed, only a smaller proportion of the variance of the corruption variable is explained. As a consequence, the standard errors tend to be larger and the coefficients estimates are biased toward zero (Woodridge, 2002). On the other hand, using the standard fixed effects method prevents from estimating the importance of the time-invariant variables which, according to Treisman (1998), seems important in the explanation of corruption¹². Even though this approach could account for the bias due to the omission of these variables, it is not possible to get further empirical insights on how they contribute to explain the contagion effect which is my concern. Common cultural factors – such as language, ethnicity or the same colonial history – are time-invariant and, as previously argued, contribute to the expansion of corruption and spatial spillovers.

2.2- The model specification and the variables of control

Let C_{it} be the vector of national corruption, C_{jt} the vector of neighbor country's corruption, X_{it} the vector of time-varying explanatory variables for a country i at period t and Z_i a certain number of time-invariant variables. The corruption equation under consideration is of the form:

$$C_{it} = \beta_1 * WC_{jt} + \sum_{i=2}^n \beta_i x_{it} + \sum_{k=1}^K \delta_k z_i + \mu_i + \varepsilon_{it}$$

WC_{jt} represents the regional corruption as calculated in previous subsection using W as the spatial matrix weight¹³. It is important to point out that the coefficient β_1 captures the magnitude of spatial interactions among countries (Brueckner, 2003).

Including other determinants of corruption is necessary in order to avoid the bias of omitted variables in the corruption equation. Such determinants may contribute to explain the interactions between countries and thereby the spatial spread of corruption.

¹² Using Hausman-Taylor method could help one estimate the magnitude of time invariant-variables. However, in the specific case of corruption dependent variable, this method is not efficient. First, it could hardly overcome the problem of low within variation of corruption. Second, this method, as documented in the literature, is sensitive to the choice of the time-invariant endogenous variables.

¹³ In this regard, it is important to note that our analysis is consistent with the empirical analysis of spatial interactions.

- a) Level of development captured by the gross domestic product (GDP) per capita: a higher level of income is associated with a lower corruption (Scott, 1969; Paldam, 2002; Mbaku, 1999; Treisman, 1998; Tanzi, 2000)¹⁴
- b) Trade openness: greater (natural) openness is associated with lower corruption (in the context of perfect competition) (Ades and Di Tella, 1996, 1999, Nguesan and Laffont, 1999; Wei, 2000). As regard rents, the countries that export minerals and fuel are assumed to be more corrupt.
- c) Voice and accountability: used to capture the political factors. However the theory is ambiguous on the effect of political factors on corruption (LaPalombara, 1994; Rose-Ackerman, 1999; Huntington, 1996).
- d) Foreign aid/GNI: the relationship between foreign aid and corruption could be either positive or negative (Knack, 2003; Braütigam, 2004).
- e) Social factors: some social attributes can generate corruption or constrain it. They are captured by the ethnic and religious fractionalization and the proportion of protestants in 1980.
- f) Legal origin: legal origin affects corruption (La Porta et al., 1998). We consider two variables here, namely the British and the French legal origin.

Section III- Results of the GMM regressions

3.1- The neighborhood corruption effect

Before presenting the main results, it is worth noting that apart from regional corruption, all the variables in any econometric specification are defined at the national single country level.

The first column of Table 4 includes only the average of neighbors' corruption. This preliminary specification allows us to evaluate the simple correlation between national and regional levels of corruption. However, this coefficient may be biased because of omitted variables that may explain corruption. I therefore introduce other determinants of corruption in column 2 and thereafter. Different specifications are tested so as to examine the channels by which the contagion effect operates¹⁵.

Our results strongly support the hypothesis that the perception of corruption in one country is affected by the corruption in its neighbor countries as measured by the regional average of corruption. Indeed, the higher the neighbors' corruption, the higher it is in one single country.

¹⁴ Kaufmann and Kraay (2002) have reached the opposite result wherein in their econometric specification Corruption causes lower GDP – strong effect while increased GDP increase corruption – but only slightly so in any rough correlation between them high GDP goes together with low corruption level.

¹⁵ For example, to conclude if the log of real GDP per capita is a transmission channel of the contagion effect, one will have to compare the coefficient of regional corruption in columns (1) and (2) and test if the two coefficients are significantly different.

Hence, positive spatial interactions of corrupt behaviors are confirmed. How do these interactions occur? In the next paragraphs, I analyze the main channels through which the regional corruption affects the level of corruption in a given country.

3.2- The other factors of corruption

Theoretically, I expect a negative sign for this coefficient, which means that corruption decreases with the level of development. Globally, our results support this hypothesis (Treisman, 1998). In addition, this variable seems to be an important channel through which the regional corruption exerts its effect on one country's corruption as we observe a great decrease of its coefficient once the income per capita variable is included. In column (2), the magnitude of the coefficient of regional corruption variable is reduced up to 62% of the one in column (1).

In column 4 of Table 4, I include, in addition to the real GDP variable, three other variables: trade openness, mineral and fuels rents and voice and accountability. In the following lines, I comment the specific effect of each variable.

Let us first consider trade openness. The trade variable is captured in the literature of the share of imports to GDP. Ades and Di Tella (1995, 1997), Treisman (1998) and Laffont and N'Guessan (1999) among others used the ratio of imports in GDP to capture the competition and rents in the national market of countries.

However, using this indicator as a measure of competition is questionable. Lambsdorff (1999) argues that the ratio of imports to GDP is a distorted indicator of competition. According to him, this variable depends on country size. The larger countries may compensate their low import ratio by increasing competition in the national market. To overcome this distortion, I use the sum of imports and exports of goods and services normalized by the size of the economy $(X+M)/GDP$. As expected, we have a negative effect from this variable, that is, the more a country is opened to trade, the lower is its perceived rate of corruption. However, this effect seems to be sensitive to the introduction of other variables such as GDP and regional corruption. The last two columns ((9) and (10)) confirm this assumption when I remove the GDP and the regional corruption variables. That is to say, trade openness is a potential channel through which the contagion effect of corruption is transmitted.

Countries that have high rates of raw material exports are expected to have high corruption levels. I used the export of natural resources (fuels, minerals) which may capture countries' endowment in natural resources (Treisman, 1999). Globally speaking, our results confirm this expectation.

As far as the foreign aid variable is concerned, my regressions show that its effect on corruption is negative but weak.

The expected theoretical relationship between corruption and political factors is ambiguous. Many factors characterize different political systems: the characteristics of the political regime, press freedom, etc. Knowing that the correlation between these factors is quite high, it is inappropriate to introduce them individually in the corruption index. In consequence, to capture the effect of all these factors as much as possible, we used the variable accountability and voice which is from the database of Kaufmann, Kraay and Mastruzzi (KKM, 2003) as previously described. The results support the hypothesis that accountability and voice reduce national corruption. More importantly, my results suggest that accountability and voice contribute to explain the contagion effect of neighborhood corruption.

In columns (6) to (7) of Table 4, we introduce variables which capture social characteristics: ethnic fractionalization, religious fractionalization, British legal origin and French legal origin. They are prospective channels through which regional corruption exerts its effects. This assumption is only weakly supported by our data, however. While ethnic fragmentation increases corruption, religious fragmentation on the contrary reduces it. As far as ethnic fragmentation is concerned, some authors explain this result by the fact that ethnic division slows down the level of development (Treisman, 1999; La Porta, 1997; Islam and Montenegro, 2002). Nevertheless, this result is not robust (when we drop the GDP variable from the regression, the effect becomes non-significant). But, in his empirical study, Treisman has found that the sign of this variable changes from positive to negative after controlling for GDP per capita. The author explains this result by the fact that ethnic division slows down development and therefore indirectly increases the level of corruption. In theory, the relationship between ethnic fragmentation and corruption could be positive or negative (Isham and Montenegro, 2002). In the same sense, we argue that if there is at least a viable institution which allows individuals to denounce power abuse, the relation should be positive.

Table 4: GMM regressions; Dependent Variable: Corruption index (KKM, 2003)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM
Average of neighbors' corruption	1.288*** (12.1)	0.448** (2.11)	0.409* (1.92)	0.633*** (2.79)	0.800 (0.86)	1.222*** (12.2)	1.097*** (9.77)	0.967 (0.95)		
Log of real gdp per capita		-0.857*** (-4.34)	-0.691*** (-2.79)	-0.359* (-1.77)	-0.753** (-2.52)			-0.378 (-0.80)	-1.012*** (-3.78)	-0.974*** (-5.24)
Trade openness				-1.166** (-2.32)	-0.430 (-1.18)			-0.243 (-0.61)	0.0847 (0.16)	
Rent (natural resources endowments)				0.00424 (-2.33)	0.00690 (-1.04)			0.000246 (-1.81)	0.00849* (-1.24)	0.00877* (-1.33)
Foreign aid/GNI					-0.0315 (-1.15)			-0.0110 (-0.42)	-0.0407* (-1.83)	-0.0333** (-2.10)
Voice and accountability			-0.448* (-1.95)	-0.583** (-2.33)	-0.374 (-1.04)			-0.633* (-1.81)	-0.301 (-1.24)	-0.303 (-1.33)
Ethnic fractionalization							1.993*** (2.84)	1.489 (0.96)	0.453 (0.76)	0.410 (0.70)
Religion fractionalization							-2.066*** (-3.66)	-2.228 (-1.17)	-0.600 (-1.10)	-0.619 (-1.17)
British legal origin						0.351 (0.74)		0.248 (0.28)	0.442 (0.87)	0.449 (1.00)
French legal origin						0.872* (1.80)		0.694 (0.74)	1.150** (2.20)	1.126** (2.22)
Constant	-1.499*** (-2.68)	9.104*** (3.63)		9.301*** (3.66)	8.314 (1.16)	-1.770*** (-3.24)				
Observations	312	311	311	247	173	312	312	173	173	176
R-squared	0.45	0.78	0.80	0.74	0.37	0.51	0.62	0.47	0.68	0.69
Hansen J statistic	6.157	0.858	1.444	1.391	0.573	6.868	5.404	0.0607	0.0275	0.0644
p-value of Hansen J statistic	0.0460	0.354	0.229	0.238	0.449	0.0323	0.0671	0.805	0.868	0.968

For a given specification, bold figures refer to variables that are considered endogenous. Student statistics are in parenthesis. *** means that the variable is significant at 1% level; ** means the variable is significant at 5% level; * means the variable is significant at 10% level.

3.3- Using an alternative measure of regional corruption

In addition to the previous measure of regional corruption, I used an alternative measure which is a weighted average of corruption. The existing literature debates what "neighbors" are exactly. Geographic distance may be a poor measure of economic distance for other countries not belonging to the neighborhood of a given country (Conley and Ligon, 2002). With globalization and the rapid development of new information and communication technologies, how more close is Côte d'Ivoire to Ghana or to China? I therefore assume, as do Moreno and Trehan (1997), that each country belongs to the neighborhood of every other country. Clearly, for a given country the regional corruption is calculated as the weighted average of the levels of corruption of all countries in the world: the weight is the inverse of the distance separating the capital of this country from the capital of the others. Put differently, the relative importance of each country in a particular neighborhood varies inversely with its distance from the country whose neighborhood it is. Thus, for a given country, its neighbors' corruption is weighted more heavily than that of the remaining countries:

$$C_i = \frac{\sum C_j * 1/d_{ij}}{\sum 1/d_{ij}} \text{ with } i \neq j \text{ where } d_{ij} \text{ is the distance between the capitals of two countries.}$$

Statistics are reported below.

Table 5: Alternative indicator of regional Corruption statistics

	1996	1998	2000	2002
Sub-Saharan Africa	7.70	4.15	4.50	4.19
Latin America	7.34	4.02	4.41	4.16
OECD countries	1.79	2.61	2.73	2.79
Other Developing Countries	6.93	4.10	4.42	4.21
Overall mean	6.07	3.78	4.08	3.90

The obtained figures represent the average corruption of the neighborhood of each country. Sub-Saharan countries show higher neighborhood corruption than OECD countries and the

sample overall average. However, the difference between Latin America and other developing countries seems not to be highly significant.

The alternative measure of regional corruption allows me to look at specific countries. Four African countries (Nigeria, Zimbabwe, Tanzania, Zambia) are among the ten highest corruption-neighborhood locations. The ten countries with the lowest neighborhood corruption are developed countries (table 6).

Table 6: Neighborhood-corruption locations rankings

Top ten locations	Bottom ten locations
Nigeria	Sweden
Zimbabwe	Austria
Uzbekistan	Finland
Zambia	Singapore
Tanzania	Netherlands
Taiwan	Denmark
Paraguay	USA
Nicaragua	Germany
Ukraine	Iceland
Serbia Montenegro	Ireland
Source : based on author's calculations	

In this paragraph, we will discuss our previous results in regard to those stemming from the alternative measure of spatial corruption.

Looking at Table 7, the impact of spatial corruption on domestic corruption appears to be reinforced.

This result somehow contributes to explain why corruption persists at a high level in some groups of countries or at low level in others. Let us consider the case of African countries which are assumed to have a higher level of corruption than the other developing countries. These African countries are also supposed to share similar institutional or economic characteristics. Because of the contiguity and the spillovers effects, when the level of corruption increases in a given country (for example Togo), the consequence is an increase in corruption in a nearby country (for example Benin). As far as the two countries exhibit persistent increases in corruption, they will be locked into a vicious circle where corruption feeds corruption. In a symmetric way, any reduction in corruption in a single country, for example

South Africa, would be associated with reduced corruption in neighboring countries such as Botswana or Zimbabwe.

What would happen if developed countries interact with developing ones? What will happen if a country like Senegal – where corruption is perceived to be high – interacts with France, a supposed low-corruption country? According to our econometric results, if the level of corruption decreases in France, the corruption level in Senegal will also decrease as a consequence. However, it is important to note that the direction of causality does not seem obvious. Will the level of corruption in France increase if the corruption level in Senegal increases? The answer may be yes. But the final level of corruption resulting from the interactions of these two countries may probably depend on some factors like the negotiation power or the influence of France.

The remaining results don't fundamentally change. That is to say, the levels of development, trade and political factors are the main channels of impact.

Table 7: GMM regressions; Dependent Variable: Corruption index (KKM, 2003)

	(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(12)	(13)
	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM
Weighted average of neighbors' corruption	3.823*** (44.3)	4.746*** (5.36)	4.785*** (5.05)	3.416*** (5.80)	3.727*** (4.37)	3.556** (2.59)	3.980* (1.97)	3.836*** (39.0)	3.738*** (32.8)	2.154*** (3.27)
Log of real gdp per capita		0.301 (1.04)	0.301 (0.99)	-0.175 (-1.05)	-0.0683 (-0.27)	-0.328 (-1.10)	-0.195 (-0.62)			-0.317 (-1.64)
Trade openness				0.275 (1.09)	0.234 (1.36)	0.140 (0.43)	0.115 (0.29)			-0.156 (-0.99)
Rent (Natural resources endowments)				0.00687 (1.43)	0.00611 (1.18)	0.00202 (0.26)	0.000780 (0.088)			0.00119 (0.29)
Foreign aid/GNI						-0.0776** (-2.10)	-0.0782 (-1.66)			-0.0476*** (-3.05)
Voice and accountability			0.0219 (0.088)	0.170 (0.67)	0.169 (0.69)	0.241 (0.78)	0.273 (0.68)			-0.0700 (-0.33)
Ethnic Fractionalization									0.282 (1.29)	1.280*** (3.18)
Religion Fractionalization									-0.243 (-1.51)	-0.639** (-2.32)
British legal origin								-0.0987 (-0.73)		-0.0820 (-0.22)
French legal origin								-0.0844 (-0.64)		0.0248 (0.052)
Constant	-14.12*** (-33.7)	-20.99*** (-3.19)		-12.03*** (-2.70)	-14.23** (-2.17)	-10.65 (-1.11)	-13.68 (-1.02)	-14.10*** (-32.6)		
Observations	312	311	311	247	247	173	173	312	312	173
R-squared	-1.94	-3.57	-3.65	-1.49	-1.97	-1.70	-2.40	-1.96	-1.81	0.01
Hansen J statistic	2.503	0.533	0.512	2.530	2.440	0.131	0.198	3.394	3.313	0.162
p-value of J	0.286	0.465	0.474	0.112	0.118	0.717	0.656	0.183	0.191	0.687

For a given specification, bold figures refer to variables. Student statistics are in parenthesis. *** means that the variable is significant at 1% level; ** means the variables is significant at 5% level; * means the variable is significant at 10% level.

Section IV- Checking the robustness of our results

The GMM used in the previous section prevents me to take into account the dynamic persistence of corruption because I could not introduce the lagged values of the dependent variable (because convergence conditions could not be met). One may question whether my analysis is sufficient to confirm definitely the spatial contagion effect. In order to clear up any ambiguity, I therefore use the feasible generalized three-stage least square results (3SLS) where data are stacked by periods. Unlike the two-stage least square (2SLS), the 3SLS method takes into account the correlation between the different equations of the system under consideration. By allowing for a correlation between error terms, I argue that the persistence idea in the perception of corruption over time is taken into account. With respect to spatial interactions, a shock in the error term in any country will be transmitted to all other countries through the multiplier effect (Anselin, 2002).

Tables 8 and 9 present 3SLS results for both the simple regional corruption and the weighted regional corruption. Most of our previous results are confirmed after I corrected for the dynamic correlations in the error terms. Specifically, regional corruption affects national corruption. Clearly, the reduction in the level of corruption in a country's neighbors is associated with a lower level of corruption in this country. Besides this result, the level of development as measured by per capita income is inversely related to the spread of corruption.

Table 8: Three stages least squares regressions; Dependent Variable: Corruption index (KKM, 2003)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	3SLS	3SLS	3SLS	3SLS	3SLS	3SLS	3SLS
Average of neighbors' corruption	0.451*** (4.37)	0.609*** (21.85)	1.188*** (12.20)	0.416*** (4.15)	0.562*** (12.57)	0.546*** (11.64)	0.406*** (3.99)
Log of real gdp per capita	0.202 (1.47)		-0.823*** (6.61)	0.184 (1.32)			0.181 (1.25)
Trade openness	-0.014*** (5.30)	-0.013*** (6.43)	-0.005** (2.45)	-0.011*** (3.57)	-0.010*** (4.12)	-0.010*** (4.19)	-0.011*** (3.58)
Rent (Natural resources endowments)	0.014** (2.07)	0.013** (2.25)	0.013** (2.01)	0.010 (1.40)	0.010 (1.59)	0.010 (1.61)	0.010 (1.41)
Foreign Aid/GNP	0.052 (1.25)	0.034 (0.95)		0.039 (0.93)	0.024 (0.66)	0.038 (0.97)	0.047 (1.04)
Voice and accountability	-0.777*** (5.04)	-0.836*** (5.84)	-1.013*** (5.37)	-0.774*** (4.56)	-0.840*** (5.24)	-0.825*** (5.09)	-0.761*** (4.41)
Ethnic Fractionalization				2.186*** (2.76)	1.804*** (2.62)	1.929*** (2.74)	2.283*** (2.82)
Religion				-0.676 (0.89)	-0.485 (0.76)	-0.153 (0.21)	-0.444 (0.51)
British legal origin				-0.952** (2.07)	-0.928** (2.32)	-0.813* (1.95)	-0.879* (1.82)
French legal origin				-0.344 (0.97)	-0.230 (0.81)	-0.161 (0.55)	-0.295 (0.79)
Dummy Africa						-0.196 (0.23)	-0.142 (0.17)
Constant	2.907*** (4.31)	3.895*** (15.08)	7.551*** (11.42)	2.673*** (4.05)	3.585*** (10.33)	3.439*** (9.48)	2.578*** (3.87)
Number of observations	41	41	57	41	41	41	41
R squared (min, max)	0.21	0.09	0.39	0.32	0.20	0.21	0.32

For a given specification, bold figures refer to variables. Student statistics are in parenthesis. *** means that the variable is significant at 1% level; ** means the variables is significant at 5% level; * means the variable is significant at 10% level.

Table 9: Determinants of corruption: the contagion effects; Dependent Variable: Corruption index (KKM, 2003)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	3SLS	3SLS	3SLS	3SLS	3SLS	3SLS	3SLS	3SLS
Weighted average of neighbors' corruption	1.049*** (46.49)	0.04785* (1.63)	0.266*** (3.83)	0.285*** (3.80)	0.189*** (2.85)	0.209*** (2.88)	0.216*** (2.93)	0.188*** (2.80)
Log of real gdp per capita		-1.216*** (16.00)	-0.873*** (4.45)		-0.861*** (4.29)			-0.904*** (4.37)
Trade openness			-0.004** (2.32)	-0.009*** (5.12)	-0.004** (2.00)	-0.009*** (4.07)	-0.009*** (3.88)	-0.005** (2.05)
Rent (Natural resources endowments)			0.011** (2.51)	0.008 (1.65)	0.012** (2.38)	0.007 (1.33)	0.007 (1.35)	0.012** (2.42)
Foreign Aid/GNP			-0.076** (2.31)	0.026 (1.01)	-0.069** (2.02)	0.024 (0.86)	0.028 (0.86)	-0.065* (1.75)
Voice and accountability			-0.419*** (3.69)	-0.595*** (4.94)	-0.499*** (3.88)	-0.655*** (4.82)	-0.652*** (4.73)	-0.485*** (3.71)
Ethnic Fractionalization					0.409 (0.71)	1.336** (2.19)	1.340** (2.14)	0.479 (0.82)
Religion					-0.365 (0.73)	-0.652 (1.14)	-0.623 (0.95)	-0.106 (0.19)
British legal origin					-0.549* (1.77)	-0.813** (2.32)	-0.800** (2.18)	-0.464 (1.42)
French legal origin					-0.260 (1.09)	-0.542** (2.07)	-0.534* (1.96)	-0.202 (0.81)
Dummy Africa							-0.119 (0.23)	-0.296 (0.62)
Constant	-1.646*** (10.16)	13.823*** (20.32)	10.603*** (6.67)	3.942*** (6.62)	11.203*** (6.85)	4.531*** (6.72)	4.469*** (6.44)	11.402*** (6.85)
Number of observations	101	99	41	41	41	41	41	41
R squared (min, max)	0.47; 0.88	0.77; 0.80	0.81; 0.85	0.69; 0.83	0.81; 0.86	0.74; 0.80	0.74; 0.81	0.84; 0.87

For a given specification, bold figures refer to variables. Student statistics are in parenthesis. *** means that the variable is significant at 1% level; ** means the variables is significant at 5% level; * means the variable is significant at 10% level.

Conclusion

“Governance matters”, this phrase summarizes the new direction given to economic policies in developing countries since 1980. Combating corruption has become a priority because developing countries are more corrupted than rich ones. In this line, researchers are interested in investigating the factors of corruption in theoretical as well as in empirical studies so as to help policy makers. At the same time, in most of the studies the persistence of corruption has hardly been studied. In the present study, contrary to much of previous empirical analyses, I allow for the correlation between countries. I also assume that this persistence in developing countries could be explained by the contagion effect captured by the neighborhood corruption.

My results demonstrate a cross-country spillover mechanism where a lower regional corruption, as measured by the average of the level of corruption in one country's neighbors, is associated with a lower level of national corruption. Among the operating channels, the level of development seems to be the most important one. While foreign aid and trade exhibit similar results, voice and accountability are other possible interaction mechanisms. These results are robust to the temporal error correlation in corruption perception in each country. As such, my results may help to get new insights into the determinants of corruption and its spatial effect.

The results of this paper may point to certain policy recommendations. I argue that since national corruption is affected by neighborhood corruption, countries localized in either close or distant geographical areas should coordinate their individual anti-corruption policies. In this regard, our study highlights and supports the importance of existing and new regional or international agreements on combating corruption¹⁶. To fight the plague, these actions should be reinforced and made effective through the definition and the application of punishment rules, the possibility to launch international prosecutions against people if they try to evade arrest for corruption at home, etc.

Further, based on the fact that most existing conventions and treaties against corruption took root in developed countries and even though they expand positively their activities in developing ones, new bilateral and global policies that are initiated by and among the developing countries should be encouraged so as to involve them more actively in the combat. If countries do not succeed in collaborating, corruption in whole regions may settle on high equilibria levels or even expand.

¹⁶ Among others, we can cite the OECD Anti-bribery Convention (1996), the Inter-American Convention Against Corruption (1997), the European Action on Corruption in the Private Sector (1998); the African Parliamentarians' Network Against Corruption (1999), the United Nations Convention against Corruption (2003), the African Union Convention on Preventing and Combating Corruption (2003).

References

- Acemoglu, D., S. Johnson and J. A. Robinson (2000). "The colonial origins of comparative development: an empirical investigation". NBER Working paper no 7771.
- Ades, A. and H. B. Chua (1997). "Thy Neighbor's Curse: Regional Instability and Economic Growth". *Journal of Economic Growth* 2(3), pp.279–304.
- Ades A. and R. di Tella; (1996). "The Causes and Consequences of Corruption: A Review of Recent Empirical Contributions". *IDS Bulletin*, 27(2).
- Ades, A. and R. di Tella; (1997). "National Champions and Corruption: Some Unpleasant Interventionist Arithmetic". *The Economic Journal*. 107(443), pp.1023–1042.
- Ades, A. and R. di Tella; (1999). "Rents, Competition, and Corruption". *The American Economic Review*. 89(4), 982–993.
- Alesina, A., A. Devleeschauwer, W. Easterly, et al. (2003). "Fractionalization". *Journal of Economic Growth* 8(2), pp.155–194.
- Andvig, J. C. (2006). "Corruption and fast change". *World Development* 34(2), pp.328–340.
- Andvig, J. C. and K. O. Moene (1991). "How corruption may corrupt". *Journal of Economic Behavior & Organization* 13(1), pp.63–76.
- Anselin, L. (2003). "Spatial Externalities, Spatial Multipliers, And Spatial Econometrics". *International Regional Science Review* 26 (2), pp.153–166.
- Arndt, C. and C. Oman (2006), "Uses and Abuses of Governance Indicators". OECD Online Bookshop.
- Azam, J. P.; (1999). "Institutions for Macroeconomic Stability in Africa". *Journal of African Economies*". 8, pp.8–31.
- Bardhan, P.; (1997). "Corruption and Development: A Review of Issues". *Journal of Economic Literature*". 35(3), pp.1320–1346.
- Brautigam, D.; (2000). "Aid, Dependence, and Governance". Stockholm: Almqvist and Wiksell.
- Brueckner, J. K. (2003). "Strategic interaction among governments: An overview of empirical studies." *International Regional Science Review* 26(2), pp.175–188.
- Brun, J.-F., J.-L. Combes and M.-F. Renard (2002). "Y-a-il une diffusion de la croissance entre les provinces chinoises?". CERDI Working Paper 2002-RA.
- Conley, T. G. and E. Ligon (2002). "Economic Distance and Cross-Country Spillovers." *Journal of Economic Growth* 7(2), pp.157–187.
- de Mello, L. and M. Barenstein (2001). Fiscal Decentralization and Governance: a Cross-country Analysis, International Monetary Fund; WP/01/171.
- Dreher, A. et T. Herzfeld (2005). "The Economic Costs of Corruption: A Survey and New Evidence", Mimeo.
- Fisman, R. J. and E. Miguel (2006), "Cultures of Corruption: Evidence from Diplomatic Parking Tickets", NBER Working Paper No. 12312,

- Fisman, R. and E. Miguel (2007), "Corruption, Norms, and Legal Enforcement: Evidence from Diplomatic Parking Tickets". *Journal of Political Economy*, 115(6), pp.1020–1048.
- Frechette, G. R. (2001). "A Panel Data Analysis of the Time-Varying Determinants of Corruption". Paper presented at the EPCS 2001.
- Gerlagh R. and Pellegrini, L. (2004). "Corruption's Effect on Growth and its Transmission Channels". *Kyklos* 57(3), pp.429–456.
- Goudie, A. W. and D. Stasavage; (1998). "A framework for the analysis of corruption". *Crime, Law and Social Change*; 29(2), pp.113–159.
- Hall, E. R. and C. I. Jones (1999). "Why do some countries produce so much more output per worker than others?" *Quarterly Journal Of Economics*. no. 114, pp.83–116.
- Hsiao, C. (2003). *Analysis of Panel Data*. Cambridge University Press.
- Inge, A.,J. C. Andvig and O.-H. Fjeldstad (2000). "Research on Corruption –A Policy Oriented Survey". CMI Commissioned Studies: Norad.
- Johnston, M. (1997). "Cross-Border Corruption: Points of Vulnerability and Challenges for Reform" in *Corruption and Integrity Improvement Initiatives in Developing Countries*. New York United Nations Development Program and OECD Development Centre.
- Kaufmann, D., A. Kraay and M. Mastruzzi (2003), "Governance Matters III: Governance Indicators for 1996–2002". World Bank Policy Research Working Paper No3106.
- Kaufmann, D., A. Kraay and M. Mastruzzi (2007), "Worldwide Governance Indicators Project: Answering the Critics", Policy Research Working Paper Series No 4149, World Bank.
- Klitgaard, R. (1989). "Incentive myopia". *World Development*. 17(4), pp.447–459.
- Knack, S. and A. Omar; (2003). "Trade intensity, country size and corruption". *Economics of Governance*. 4(1), pp.1–18.
- Kurtz, M. J. and A. Schrank (2007), "Growth and Governance: Models, Measures, and Mechanisms". *The Journal of Politics*, vol. 69, pp.538–554.
- La Porta, R.,F. L. de Silanes,A. Shleifer and R. Vishny (1998). "The Quality of Government". *Journal of Law, Economics and Organisation*. 15, pp.222–279.
- Laffont, J. J. and T. N'Guessan; (1999). "Competition and corruption in an agency relationship". *Journal of Development Economics*. 60, pp.271–295.
- Lambsdorff, G. J. (1999). "Corruption in empirical research: a review". Transparency International Working Paper. , Transparency International.
- Lapalombara, J. (1994), "Structural and Institutional Aspects of Corruption", *Social Research*, 61 (2), pp.325–50.
- Lancaster, T. D. and G. Montinola, R. (1997). "Toward a methodology for the comparative study of political corruption". *Crime, Law and Social Change*. 27(3), pp.185–206.
- Lui, F. T. (1986). "A dynamic model of corruption deterrence". *Journal of Public Economics*. 31(2), pp.215–236.

- Manski, C. F. (2000). "Economic Analysis of Social Interactions" *The Journal of Economic Perspectives*. 14(3), pp.115–136.
- Mauro, P. (1995). "Corruption and Growth". *Quarterly Journal of Economics*. 60(3), 681–712.
- Mauro, P. (1998). "Corruption and the composition of government expenditure". *Journal of Public Economics*. 69(2), pp.263–279.
- Mbaku, J. M. (1996). "Bureaucratic Corruption in Africa: The Futility of Cleanups". *Cato Journal*. 16 (1).
- Mironov, M. (2005). "Bad Corruption, Good Corruption and Growth". University of Chicago. Miméo.
- Moreno, R. and B. Trehan; (1997). "Location and the Growth of Nations". *Journal of Economic Growth*. 2, pp. 399–418.
- Murphy, K. M., A. Shleifer and R. W. Vishny (1991). "The Allocation of Talent: Implications for Growth". *The Quarterly Journal of Economics*. 106(2), pp.503–530.
- Neeman, Z., M. D. Paserman and A. Simhon (2003). "Corruption and Openness". CEPR Discussion Papers 4057.
- Paldam, M. (2002). "The cross-country pattern of corruption: economics, culture and the seesaw dynamics". *European Journal of Political Economy*. 18(2), pp.215–240.
- PNUD (2003). "Corruption et développement humain au Burkina Faso", in *Rapport sur le développement humain – Burkina Faso – 2003*.
- Plumper, T. and V. E. Troeger (2007). "Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects". *Political Analysis*, vol. 15, no. 2, pp.124.
- Rose-Ackerman, S. (1996). "Democracy and 'Grand' Corruption". *International Social Science Journal*. 48(149), pp.365–380.
- Rose-Ackerman, S. and J. Coolidge (1997). "High-Level Rent-Seeking and Corruption in African Regimes: Theory and Cases". World Bank Policy Research Working Paper No.1780. Washington DC.
- Scott, J. C.; (1969). "The Analysis of Corruption in Developing Nations". *Comparative Studies in Society and History*. 11(3), pp.315–341.
- Seldadyo, G. (2008). "Corruption and governance around the world. An empirical investigation", PhD. Dissertation, University of Groningen
- Seldadyo, H. and J. De Haan (2005). "The Determinants of Corruption: A Reinvestigation", A paper presented for the EPCS–2005 conference, Durham, UK,
- Seligson, M. A. (2006), "The Measurement and Impact of Corruption Victimization: Survey Evidence from Latin America", *World Development*, 34 (2), pp.381–404.
- Serra, D. (2006), "Empirical determinants of corruption: A sensitivity analysis", *Public Choice*, 126 (1–2), pp. 225–256.
- Shleifer, A. and R. W. Vishny; (1993). "Corruption". *Quarterly Journal of Economics*, 108. pp.599–617.

- Straub, S. (2000). "Determinants of Good Institutions: Do We Know Anything?" Inter-American Development Bank Research Working Paper 423, Washington D.C.
- Tanzi, V. (1997). "The Changing Role of the State in the Economy: A Historical Perspective". IMF working paper 97/114, Washington D.C.
- Tanzi, V. and H. R. Davoodi (2000). "Corruption, Growth, and Public Finances". Washington, D. C.: The International Monetary Fund, Fiscal Affairs Department: Working Paper No. 182.
- Tirole, J. (1996). "A Theory of Collective Reputations (with Applications to the Persistence of Corruption and to Firm Quality)". *The Review of Economic Studies* 63(1), pp.1–22.
- Treisman, D.; (2000). "The causes of corruption: a cross-national study". *Journal of Public Economics*. 76(3), pp.399–457.
- Wei, S.-J.; (2000). "Local Corruption and Global Capital Flows". *Brookings Papers on Economic Activity*. 2000(2), pp.303–346.
- Wooldridge, J. (2002). *Econometric Analysis of Cross-sectional and Panel Data*. The MIT Press.
- World Bank; (1997). *The State in a Changing World*. Oxford: Oxford University Press.
- Zellner, A.; (1962). "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias". *Journal of the American Statistical Association*. 57(298), pp.348–368.

Appendix A1 : Description and sources of the variables used

Variables	Definitions	Source
Corruption	Perception of corruption, defined as the exercise of public power for private gains. It is a composite measure resulting from different sources which cover many aspects of corruption: additional payment to get things done, business corruption, political corruption.	Kaufman, Kraay and Mastruzzi (2003)
Voice and accountability	Measures various aspects of the political process, civil liberties and political rights. These indicators measure the extent to which citizens of a country are able to participate in the selection of governments. We also include in this category indicators measuring the independence of the media, which serves an important role in holding monitoring those in authority and holding them accountable for their actions	
Real GDP per capita	It is calculated as the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 1995 U.S. dollars. Dollar figures for GDP are converted from domestic currencies using 1995 official exchange rates.	World Development Indicators (WDI) 2004
Trade openness	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	
Rent (Natural resources endowments)	Exports of fuel and minerals as proportion of % of total merchandise exports. Merchandise exports show the f.o.b. value of goods provided to the rest of the world valued in U.S. dollars.	
Foreign Aid/GNP	Aid includes both official development assistance (ODA) and official aid. Ratios are computed using values in U.S. dollars converted at official exchange rates.	
Ethnic Fractionalization	Probability that two randomly selected individuals will belong to different ethnic groups : $FRAC = 1 - \sum_{i=1}^M \left(\frac{n_i}{N} \right)^2$ M=number of ethnic groups, N= total population, n_i = number of people who belong to i^{th} ethnic group	Alesina et al; (2003)
Religion	Religious fractionalization : Probability that two randomly selected individuals will belong to different ethnic groups :	
British legal origin	Equal to 1 if a country has a British legal system, zero else	La Porta et al. (1998)
French legal origin	Equal to 1 if a country has a French legal system, zero else	

Appendix A2 : List of countries

Code	Country	Code	Country	Country	
AGO	Angola	HKG	Hong Kong	PER	Peru
ALB	Albania	HND	Honduras	POL	Poland
ARE	United Arab Emirates	HRV	Croatia	PRK	Korea, North
ARG	Argentina	HTI	Haiti	PRT	Portugal
ARM	Armenia	HUN	Hungary	PRY	Paraguay
AUT	Austria	IND	India	QAT	Qatar
AZE	Azerbaijan	IRN	Iran	ROM	Romania
BFA	Burkina Faso	IRQ	Iraq	RUS	Russia
BGD	Bangladesh	ISR	Israel	SAU	Saudi Arabia
BGR	Bulgaria	ITA	Italy	SDN	Sudan
BLR	Belarus	JOR	Jordan	SEN	Senegal
BOL	Bolivia	KAZ	Kazakhstan	SGP	Singapore
BRA	Brazil	KEN	Kenya	SLE	Sierra Leone
BRN	Brunei	KGZ	Kyrgyz Republic	SLV	El Salvador
CAN	Canada	KHM	Cambodia	SOM	Somalia
CHL	Chile	KOR	Korea, South	SUR	Suriname
CHN	China	KWT	Kuwait	SVK	Slovak Republic
CIV	Ivory Coast	LAO	Laos	SVN	Slovenia
CMR	Cameroon	LBN	Lebanon	SWE	Sweden
COG	Congo	LBR	Liberia	SYR	Syria
COL	Colombia	LBY	Libya	TGO	Togo
CRI	Costa Rica	LTU	Lithuania	THA	Thailand
CZE	Czech Republic	LVA	Latvia	TJK	Tajikistan
DEU	Germany	MAR	Morocco	TKM	Turkmenistan
DNK	Denmark	MDA	Moldova	TUN	Tunisia
DOM	Dominican Republic	MEX	Mexico	TUR	Turkey
DZA	Algeria	MKD	Macedonia	TZA	Tanzania
ECU	Ecuador	MLI	Mali	UGA	Uganda
EGY	Egypt	MMR	Myanmar	UKR	Ukraine
ESP	Spain	MNG	Mongolia	URY	Uruguay
EST	Estonia	MOZ	Mozambique	USA	United States
FIN	Finland	MWI	Malawi	UZB	Uzbekistan
FRA	France	MYS	Malaysia	VEN	Venezuela
GAB	Gabon	NER	Niger	VNM	Vietnam
GEO	Georgia	NGA	Nigeria	YUG	Yugoslavia
GHA	Ghana	NIC	Nicaragua	ZAR	Congo, Dem. Rep. (Zaire)
GIN	Guinea	NLD	Netherlands	ZMB	Zambia
GMB	Gambia	NOR	Norway	ZWE	Zimbabwe
GNB	Guinea-Bissau	NPL	Nepal		
GRC	Greece	OMN	Oman		
GTM	Guatemala	PAK	Pakistan		
GUY	Guyana	PAN	Panama		

Appendix A3: Statistics summary

Variables	Mean	Standard Deviation.	Minimum	Maximum
Log of gross domestic product (GDP) per capita	7.823	1.609	4.612	10.938
Log of trade	4.248	0.5166	2.820	5.831
Fuel and mineral exports	11.345	19.544	0.000012	99.634
Foreign aid	5.140	8.376	-0.364	57.391
Voice and accountability	0.165	0.906	-2.321	1.719
British legal origin	0.264	0.441	0	1
French legal origin	0.400	0.490	0	1
Ethnic fractionalization	0.421	0.251	0.012	0.930
Religious fractionalization	0.443	0.227	0.003	0.860
Log of population	15.610	1.969	9.868	20.718
Log of infant mortality	3.545	0.899	1.979	5.0888
Latitude to equator	.3411	0.198	.0111	0.722