Essays on Corruption in Sub-Saharan Africa

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A thesis submitted in partial fulfilment of the requirements for the degree of

Doctor of Philosophy in Economics

University of Warwick, Department of Economics

April, 2008

Table of Contents

List of Figures

List of Tables

Acknowledgements

I would like to thank my supervisors, Carlo Perroni and Ian Walker, for their insightful comments and constructive suggestions. I am especially indebted to Ian Walker, whose friendship and support went beyond his duties as my supervisor.

I am grateful to Alberto Alesina and Beatrice Weder for sharing their data set. I am thankful to Eric Gartzke for providing detailed explanations of his data set and for keeping me informed of its updates.

I am also grateful for the useful comments and suggestions of several seminar and workshop participants at the Department of Economics, University of Warwick.

I thankfully acknowledge *Fundação para a Ciência e a Tecnologia*, as well as *Fundação Calouste Gulbenkian*, for financial support.

I am thankful to Father Iain, for his unwavering encouragement and spiritual support.

I am deeply thankful to my husband, whose love and good humour in the face of foregone weekends and holidays because of my thesis persevered throughout the years.

I am grateful to my sister, whose constant support has been invaluable. I am also thankful for my brother's kind words in challenging moments.

I am profoundly grateful to my parents, who gave the final manuscript a careful and critical reading. Their tireless goodwill, encouragement, love and support from the moment I started my studies to the completion of this thesis have been critical throughout my life. This thesis is dedicated to my parents.

Declaration

I hereby declare that I have not used before or had published any material contained in this thesis.

I declare that this thesis is my own work.

I confirm that this thesis has not been submitted for a degree at another university.

Abstract

We study three topics on corruption that are of particular relevance to sub-Saharan Africa.

Firstly, we address the question of why corruption is such an endemic problem in sub-Saharan Africa. Is it policy driven or "destiny"? We analyse indices of perceived corruption and test several theories regarding the causes of corruption. We find strong support for two arguments: Countries with a British heritage are perceived to be less corrupt, while those with a common law system are perceived to be more corrupt. We find weaker support for four further arguments: Countries with good quality institutions and a greater proportion of women in the labour force are perceived as less corrupt. Countries with greater natural resource abundance and with greater trade openness are perceived to be more corrupt.

Secondly, we look at the supply side of bribery. Within the public procurement process, we study how a firm's uncertainty regarding the official's corruptibility and rival firms' costs influences the magnitude of the bribe it offers. Due to the illegal nature of bribery, we also explicitly consider different punishment mechanisms for corrupt firms. We find that secrecy leads to lower bribe levels, and that bribery can be completely deterred by either appropriate fixed fines or by firms being fined punitive damages.

Thirdly, we investigate whether more corrupt governments receive less aid. We develop a theoretical framework that treats corruption as a tax on aid. Although we are unable to empirically test this model, we use it to motivate our empirical analysis of aid receipts using data on sub-Saharan Africa. We find a negative correlation between a country's perceived level of corruption and its aid receipts. However, we find no causal effect of perceived corruption on aid receipts. We revisit the results of an influential paper in the literature and find that their result of no evidence that countries perceived as more corrupt receive less aid is not robust to a sample of sub-Saharan African countries, although we find no evidence of a causal effect. We find no evidence that the impact of perceived corruption on aid receipts differs across sectors.

List of Abbreviations

CC	Control of Corruption
CIA	Central Intelligence Agency
CPI	Corruption Perceptions Index
CRS	Creditor Reporting System
DAC	Development Assistance Committee
EBA	Extreme-Bounds Analysis
EDA	Effective Development Assistance
EITI	Extractive Industries Transparency Initiative
FCPA	Foreign Corrupt Practices Act
FE	Fixed Effects
GDP	Gross Domestic Product
ICRG	International Country Risk Guide
IRIS	Institutional Reform and Informal Sector
IV	Instrumental Variables
MCA	Millennium Challenge Account
MDGs	Millennium Development Goals
NGOs	Non-Governmental Organisations
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
OP	Ordered Probit
PPP	Purchasing Power Parity
PRS	Political Risk Services
PTS	Political Terror Scales
RE	Random Effects
TI	Transparency International
UK	United Kingdom
UN	United Nations
US	United States

Chapter 1

Introduction

> *"Corruption in Africa is a major concern, more so than on any other continent."*
>
> Transparency International

> *"The issue of good governance and capacity-building is what we believe lies at the core of all of Africa's problems. Until that is in place Africa will be doomed to continue its economic stagnation."*
>
> Commission for Africa (2005)

There is no completely clear-cut definition of corruption. A common definition of corruption is the misuse of public office for private gain [Johnston (1996)], where an official entrusted with carrying out a task engages in some sort of malfeasance for private enrichment. The essential aspects of corruption are, therefore, that the bribee must necessarily be in a position of power, created either by market imperfections or an institutional position that grants him discretionary authority, and that there is an illegal or unauthorised transfer of money or an in-kind substitute. Corruption is not exclusive to the public sector – it may also take place in the private sector. For example, payments to the manager of a financial institution in order to obtain a loan or secure more favourable terms on a transaction, or some form of gift exchange to get a job.

Although corruption is difficult to define, it is generally accepted to be a bad thing. Corruption is believed to undermine economic performance, weaken democratic institutions and the rule of law, disrupt social order and destroy public trust.

The early 1990s marked the awakening of policymakers to the problems of corruption. They had known it was there, but corruption, the C-word, was hardly specifically mentioned or acknowledged. There is now an overwhelming consensus that corruption is a significant impediment to economic and social development. In 1996, incoming World Bank President James Wolfensohn declared war on the *"cancer of corruption"*. The World Bank has since engaged in a comprehensive fight against corruption, both internally and in the countries it works with.

Specific actions have been taken in the international arena in an attempt to combat corruption. Two notable examples are the Organisation for Economic Cooperation and Development (OECD) Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (also known as the Anti-Bribery Convention) and the United Nations (UN) Convention Against Corruption. The Anti-Bribery Convention, which was signed in December 1997 and came into force in February 1999, makes it a crime to offer, promise or give a bribe to a foreign public official in order to obtain or retain international business deals. The UN Convention, which was signed in October 2003 and entered into force in December 2005, provides powerful new capacities for mutual legal assistance among countries in the fight against corruption, in particular making it easier to return assets stolen by corrupt leaders.

Some form of corruption exists in every country of the world. However, corruption appears to be particularly rampant in sub-Saharan Africa. Despite the obvious difficulties in measuring corruption, some organisations attempt to measure some facets of corruption, and provide indicators of corruption. These indicators are typically based on polls of experts or surveys of entrepreneurs or citizens in general, and, as such, are subjective indices of perceptions of corruption. For example, the commercial firm, Political Risk Services (PRS) produces the International Country Risk Guide (ICRG), which includes a monthly index of perceived corruption (available for a large number of countries and for a long period, comparable over time). The ICRG corruption index varies from zero to six (it is a discrete score with half digits), with higher values denoting *lower* perceived corruption. Figure 1.1 shows annual averages of the ICRG corruption index computed for the different regions of the world from 1982 to 1997.[1] Sub-Saharan Africa is clearly one of the most corrupt regions of the world.

To give a more recent picture of perceived corruption, for example, the ICRG corruption index for July 2007 shows that sub-Saharan Africa is the region perceived to be more corrupt, with an average corruption index of 1.9, followed by Eastern Europe and Central Asia with 2.1, Latin America and the Caribbean with 2.2, Middle East and North Africa with 2.3, South Asia with 2.4,

[1] Although the ICRG indicators are available until the current year, these data are sold at substantial prices to commercial subscribers. However, it is possible to obtain annual averages of a subset of ICRG indicators, including corruption, for the period 1982-1997 at a discounted price. Figure 1.1 is based on that data set. More detailed information on the ICRG corruption index is provided in Section 2.4.1.

East Asia and Pacific with 2.7, North America with 4.5, and Western Europe with 4.6.[2]

Another source is Transparency International, a non-governmental organisation devoted to combating corruption, which produces yearly indices of levels of perceived corruption. Sub-Saharan African countries consistently score very poorly. For example, in 2006, six of the ten most corrupt countries were sub-Saharan African, and it was the only region with more than one country in this "top" (or, more accurately, "bottom") ten.

Several commentators believe that corruption in Africa takes on a more damaging form than elsewhere. Martin Wolf, a former economist at the World Bank who now writes for the Financial Times, believes that *"in Africa, the corrupt remove resource wealth and provide nothing in return. In Asia, regimes like Suharto's would take a cut on everything, but the service would be delivered. While that extracts a price from the economy, it's far more beneficial."* Jeremy Pope, a founding member of Transparency International, defines Africa as a *"lootocracy"* and states that *"you don't find it anywhere else in the world. Even in Latin America, the leaders don't steal everything that moves and shift it offshore."*[3]

Sub-Saharan Africa faces serious development challenges. Not only is sub-Saharan Africa the poorest region in the world, but it was also the only major developing region with negative growth in income per capita in the past 25 years. Almost one half of its 674 million people live on less than US $1 a

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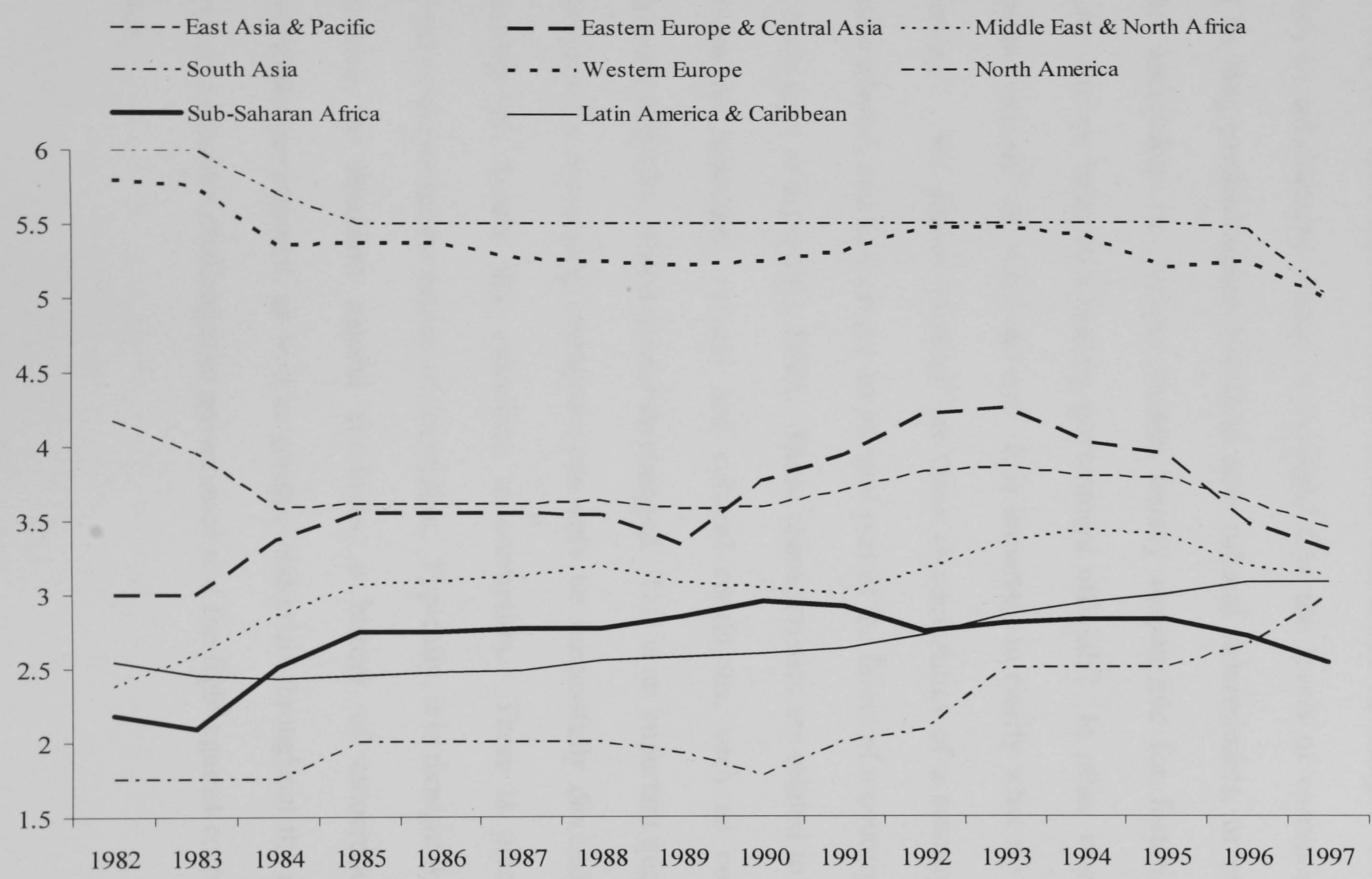
[2] These figures can be obtained as a free sample from the PRS website. Note, however, that these are monthly figures, and as such are likely to be noisier than annual averages of monthly figures.

[3] Both quotes are taken from Wrong (2005).

day. The region's health conditions are the worst in the world – it is afflicted by the HIV/AIDS pandemic and the resurgence of malaria. Life expectancy is a meagre 46 years and the under-five mortality rate is 171 deaths per 1,000 live births.[4]

[4] All figures come from World Bank (2005a).

Figure 1.1: ICRG Corruption Index – Annual averages by regions of the world



Notes: ICRG Corruption Index 0-6, where higher values denote *lower* perceived corruption.

Our starting point is that corruption poses one of the biggest challenges throughout sub-Saharan Africa. We examine three different issues that can be considered independently of one another, and that help to explore different facets of corruption. As a whole, they help to understand some mechanisms of corruption in sub-Saharan Africa.

The first question we consider is one that arises naturally – Why are countries in sub-Saharan Africa so corrupt? Can the levels of corruption be traced to long-predetermined historical and cultural determinants, or are the policies undertaken by African leaders mostly responsible for fostering or deterring corrupt behaviour among government officials? In other words, is corruption "destiny" or policy driven? It is important to clarify what we mean by "destiny". We define "destiny" as those characteristics of a country that cannot be altered, and as such are an integral part of the fabric of a country, in a sense analogous to a person's DNA. These characteristics are related to long-predetermined historical, natural and cultural conditions, such as colonial heritage and ethnicity, which cannot be changed. This is an important question, as strategies for combating corruption can only be successfully devised after ascertaining the factors that contribute to corruption. There is plenty of anecdotal evidence on the causes of corruption. Typically, it is thought that the combination of abundant natural resources, a history of autocratic and unaccountable government, as well as conflict and crisis throughout the region have posed particular challenges to governance and the fight against corruption in Africa.

Although anecdotal evidence can provide colourful examples of instances of corruption, a rigorous analysis is needed so that valid policy implications can be drawn. We conduct an empirical analysis using data on sub-Saharan African countries. Like previous studies, we use a measure of perceived levels of corruption. Unlike previous studies, we focus exclusively on sub-Saharan Africa and use a panel data set, covering 32 countries over 16 years. By using multiple observations for each country, we are able to control for country heterogeneity. We also address problems of reverse causality between corruption and several explanatory variables, namely, economic development, trade and aid flows.

The second topic we consider is one that has been largely ignored by the literature. Most of the research on corruption has focused on the choice of whether or not to engage in corruption on the part of administrators or politicians. Frequently, the private sector's willingness to offer bribes is given less attention. However, it takes two parties to enter into a corrupt deal. The amount of money that changes hands in corrupt dealings is enormous. Extrapolating from firm and household survey data, the World Bank Institute estimates that total bribes in a year are about US $1 trillion, roughly 3% of world income in 2002 [Rose-Ackerman (2004)].

It is thus important to study the decision-making process of firms that offer bribes. We consider the case of corruption in government procurement, in particular when firms offer bribes to be selected as the winner. We are interested in examining the conditions that influence firms' decisions of the magnitude of bribes, and consequently, how the choices made by corrupt officials based on these bribes affect allocation efficiency. We develop a simple theoretical model that looks at firms' bribes when there are information asymmetries regarding firm types and their ability to offer bribes and regarding whether the government official is corrupt. Due to the illegal nature of bribery, we also explicitly consider different punishment mechanisms for firms that offer bribes.

A study of firms' incentives to offer bribes in government procurement contracts is especially relevant in the sub-Saharan African context, where there are still significant infrastructure needs (for example, it has the lowest proportion of paved roads in the world, as only 13% of roads are paved). Furthermore, corruption in public procurement often leads to inferior quality construction and unnecessary purchases, which is particularly serious in countries with scarce funds and with limited capacity for on-going maintenance.

The final question we address is whether more corrupt countries in sub-Saharan Africa receive less aid. This seems to be quite a relevant question, as sub-Saharan African countries have consistently been among the world's largest recipients of aid, receiving about one third of all aid disbursed [OECD (2005a)]. In addition, achieving the UN Millennium Development Goals (MDGs) by 2015 has given aid to Africa a new emphasis. The prospects for accomplishing the MDG targets in Africa are extremely pessimistic. Unless things improve, it will take sub-Saharan Africa until 2147 to halve extreme poverty and there is no forecast for the halving of people suffering from hunger (the two targets of the principal MDG) because of the worsening of the region's situation. The achievement of universal primary education is not forecasted until 2129, and it will take until 2165 to cut child mortality by two-thirds [United Nations Development Programme (2003)]. Although primary responsibility to achieve the MDGs rests with developing countries, it is widely recognised that international support is critical, especially for the poorest countries. Aid from developed countries provides the main source of external financing for those countries, especially for sub-Saharan Africa. This has recently been reiterated at the G8 Gleneagles Summit in July 2005.

Previous studies have found no evidence that countries perceived to be more corrupt receive less aid. This result is somewhat puzzling, begging the question of whether there are specific characteristics inherent to corruption and its interaction with aid that provide an economic rationale for this pattern of aid flows. In addition, we are interested in verifying whether this result holds for sub-Saharan Africa. We use a simple theoretical set-up that helps to explain this (lack of) relationship between corruption and aid. Although we are unable to empirically test our theoretical model, we use it to motivate our empirical analysis. We study empirically whether, in the specific case of sub-Saharan Africa, those countries that are perceived to be more corrupt have lower bilateral aggregate aid receipts. We also look at aid receipts across sectors, motivated by the focus of the MDGs. As in Chapter 2, we address issues of potential endogeneity.

The topics addressed in this study are not meant to be exhaustive. There are many more relevant questions to be asked about corruption. However, we feel that they are a good starting point for thinking about corruption in sub-Saharan Africa.

Chapter 2

Corruption in Sub-Saharan Africa: "Destiny" or Policy Driven? An Empirical Study

2.1 Introduction

In recent years corruption has ceased to be a taboo subject in the policymaking arena. Several international institutions such as Transparency International and the World Bank have been actively involved in trying to combat corruption. However, in order to fight corruption effectively there must be an understanding of what causes corruption. Why are some countries more corrupt than others? The answer to this question is by no means clear-cut. Difficulties arise from the framework employed to study corruption to the measurement of corrupt activities.

Corruption has been studied as a political, economic, cultural or moral problem, and in many cases as a combination of these. Indeed, from the early stages of the study of corruption Rose-Ackerman (1978) argued that one must "*develop a set of analytic techniques that combine an economist's concern with modelling self-interested behaviour with a political scientist's recognition that political and bureaucratic institutions provide incentive structures far different from those presupposed by the competitive market paradigm.*"

Little is known with certainty about what causes corruption to be higher in one place than another. This lack of agreement on the nature and causes of corruption stems partly from the choice of analytical framework employed. Among others, this may vary between a rent-seeking approach, a multi-tiered approach - in which corruption is a function of the lack of durable political institutions and political competition, a weak and undeveloped civil society - and a view of corruption as a means of maintaining existing power structures and systems of political control.

Although the difficulty in measuring corruption directly has been an obstacle in the study of corruption, several indices that attempt to measure some facets of corruption have recently become available. These are indices of *perceived* corruption and they are based on polls of experts or surveys of entrepreneurs or citizens in general, who assign scores to countries in terms of the degree to which corruption is perceived to exist among public officials and politicians and the degree to which business transactions involve corruption or "questionable" payments. These subjective indices are available from commercial agencies, non-governmental organisations and international organisations.

The availability of these indices of perceived corruption has spurred the emergence of a body of work on cross-national comparative empirical research that investigates different theories on the determinants of corruption.[5] However, a widely accepted benchmark equation specifying the causes of corruption does not yet exist.

A study of the causes of corruption is particularly relevant to sub-Saharan Africa - is the region's corruption problem policy-driven or "destiny" (i.e., related to its long-predetermined historical, natural and cultural characteristics, which cannot be altered, such as colonial heritage)? Can the

[5] For example, Mauro (1995), La Porta et al. (1997a, 1999), Easterly and Levine (1997) and Treisman (2000) have used perceived corruption indices.

levels of corruption be traced to long-predetermined historical and cultural determinants, or are the policies undertaken by African leaders mostly responsible for fostering or deterring corrupt behaviour among government officials? If corrupt behaviour prevails because of long-predetermined historical and cultural factors does this suggest that corruption is by and large inevitable? We believe not. Long-predetermined history and culture can explain only a certain fraction of the level of corruption, and there remains sufficient room for improvements of a country's integrity. It also means that African countries need to have good policies that more than compensate the detrimental effect of their long-predetermined historical and cultural heritages.

Although anecdotal evidence on corruption in Africa is abundant, there are, to our knowledge, no empirical studies that explicitly analyse the causes of corruption in this continent. Existing empirical studies on the determinants of perceived corruption are based on worldwide comparisons, considering Africa as a homogeneous region. However, there seems to be gains in empirically exploiting the heterogeneity among the different states that constitute the African continent. Indeed, as the former President of Nigeria, Olusegun Obasanjo, stated, "*...people tend to see Africa as a homogeneous entity, which it is not...*"

We use an index of perceived corruption, from the International Country Risk Guide published by Political Risk Services, to assess the explanatory power of a number of hypotheses that the theoretical and empirical literature have found to be significant in explaining corruption levels in a country. We use data for the period 1982-1997 and for 32 sub-Saharan African countries.

We are interested in ascertaining whether perceived corruption in sub-Saharan Africa is mainly due to long-predetermined historical and cultural factors ("destiny"), or whether it is primarily driven by governments' policy choices.

We begin by running a baseline regression, consisting of the most "exogenous" group of variables, i.e., the long-predetermined historical, geographical, cultural and ethnic characteristics. We then sequentially add further groups of variables. First, we add a measure of economic development, then, we add a group of variables characterising the level of democracy and political instability, followed by the quality of legal and political institutions. Finally, we include variables capturing public policy.

As a starting point, we estimate our models using the country averages of perceived corruption over the period 1982-1997 (this could be interpreted as capturing the longer-term determinants of corruption). We then estimate our models using a pooled sample of observations; and finally, by explicitly taking into account the panel nature of the data set. We also attempt to determine the causal effect of some variables that we believe to not only contribute towards higher levels of corruption, but also to be affected by corruption. We perform instrumental variable estimation to address problems of endogeneity of income, trade and aid. However, finding good instruments is difficult and the results obtained are typically very sensitive to the choice of instruments, so we complement our analysis by using lagged values for the potentially endogenous variables (instead of current values). On the basis that, insofar as lagged values of these potentially endogenous variables are predetermined with respect to current perceived corruption, then they are less susceptible to endogeneity bias.

we should be able to address the causality issue. Although instrumental variable estimation of the pooled model allows us to determine the causal effects of income, trade and aid, this is generally not robust either to estimating the other models or to using lagged values. The trade variable is the only potentially endogenous variable that appears to have a causal effect on perceived corruption.

Nonetheless, we make an important improvement in relation to the existing literature, by providing results from different treatments of the corruption variable. That is, although we present our main results under the assumption that there is an inherent cardinality to the corruption index, we complement our analysis by also presenting results derived by treating the corruption index explicitly as an ordinal variable (classifying it into bands). The results obtained when treating the corruption index as ordinal broadly support those obtained when assuming the corruption index has some cardinal value.

We find strong support for two arguments: Countries with a British heritage are perceived as less corrupt, while those with a common law system are perceived to be more corrupt. We find weaker support for four further arguments: Countries with good quality institutions and a greater proportion of women in the labour force are perceived as less corrupt. Countries with greater natural resource abundance and with greater trade openness are perceived to be more corrupt.

Our findings suggest why fighting corruption in sub-Saharan Africa has been so difficult. Long-predetermined historical and cultural characteristics appear to have a significant impact on whether a country is perceived to be corrupt, and it is not just government policy that matters. However, we believe that this finding should be seen in a positive rather than in a negative light. That is, even though long-predetermined historical and cultural characteristics which cannot be changed have an important effect in determining whether perceived corruption is higher or lower, this does not mean that countries in sub-Saharan Africa should be discouraged from pursuing sound policies. Indeed, one area for future research may be to examine whether a consistent pursuit of sound policies has a significant impact on whether a country is perceived to be more or less corrupt.[6] Unless countries persevere with good policies it will not be possible to study this potential effect. This means that pursuing sound policies is particularly important in sub-Saharan Africa.

Throughout the chapter we shall use a widely accepted definition of corruption, according to which it is the abuse of public roles or resources for private benefit [Johnston (1996)].

It is important to note that, given the strictly subjective nature of the corruption scores, in discussing empirical results, whenever we refer to corruption we mean perceived corruption.

The chapter is organised as follows. The next section provides a review of the two papers more closely related to our study, insofar as they consider the largest set of explanatory variables for the causes of corruption. Section 2.3 outlines some theories and the results of further empirical studies on the

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[6] Note that in that case, a country's more recent history (in terms of what policies governments pursued say one, two, or even ten years ago) would be included as a factor in explaining perceived corruption. Recent history is *not* included in factors constituting "destiny", as our definition of "destiny" includes only *long-predetermined* history, such as whether a country was colonised.

determinants of corruption. This section also derives the hypotheses that we consider relevant for determining corruption. Section 2.4 provides information and a critical discussion on current practices in measuring (perceptions of) corruption, focusing on our selected measure. Section 2.5 describes the data and Section 2.6 presents the econometric analysis. The results (including sensitivity analyses) are discussed in Section 2.7. Finally, Section 2.8 provides some concluding remarks and suggests directions for further research.

2.2 Related Literature

The past few years have seen the emergence of a growing body of literature analysing the causes and determinants of corruption (see, for example, Svensson (2005) and Lambsdorff (2006) for a general survey on this literature). The growing number of empirical studies has investigated the correlation between a large set of variables and perceived corruption.[7] These studies have differed in their measures of corruption, samples, and more importantly, conditioning sets.

Typically, each study tends to be concerned with a specific factor, or small group of factors, that is suspected of determining corruption levels [such as the effect of gender on corruption, as in Swamy et al. (2001), or of the different features of the electoral system, as in Persson, Tabellini and Trebbi (2003)]. These studies include explanatory variables, other than the ones that constitute their main source of interest, but they are typically not concerned with the relative importance of these control variables in explaining corruption levels.

[7] Note that these studies use measures of perceived corruption. Therefore, in the context of empirical results, whenever we refer to corruption, we mean perceived corruption.

Also, these studies tend to include different control variables (for example, some studies omit variables on colonial heritage, some omit measures of democracy). There are two exceptions, namely, Treisman (2000) and Serra (2006). The objective of both these papers, albeit using different methodologies, is to determine the set of explanatory variables, given data limitations, which provides the most complete picture of the causes of corruption.

Treisman (2000) derives 14 hypotheses about the causes of cross-national variation in corruption from the theoretical literature in political science and economics. Treisman analyses several indices of perceived corruption for the 1980s and 1990s, using worldwide cross-country regressions. The main dependent variable is Transparency International's annual Corruption Perceptions Index (CPI) for 1996, 1997 and 1998. Treisman also checks the robustness of the results using an index from Business International for the early 1980s (also used in Mauro (1995), for example). Of the 14 hypotheses on the determinants of corruption, six find support. Perceived corruption is found to be lower in countries with Protestant traditions, British heritage, greater economic development, greater openness to imports and a long uninterrupted exposure to democracy. Federal states are perceived as more corrupt.

Treisman (2000) acknowledges problems of endogeneity of several of his explanatory variables with corruption, and uses the technique of instrumental variables to address this. However, he is unsuccessful in finding suitable instruments, except for his measure of economic development (income), where latitudinal distance from the Equator is used as an instrument. In particular, no suitable instrument is found for openness to imports.

Due to the measure of corruption used, Treisman (2000) excludes a large number of sub-Saharan African countries from his sample. Also, the corruption index employed does not permit any time-series analysis. Although Treisman performs three separate single-year regressions, we believe there are gains to using a corruption measure that permits the use of panel data.

The aim of Serra (2006) is to identify any truly robust determinants of perceived corruption among the various factors identified by previous empirical studies as significantly related to perceived corruption. In other words, they address the question: how much confidence should we have in the conclusions of cross-country perceived corruption regressions? The methodology used is Levine and Renelt's (1992) variant of Leamer's (1983, 1985) Extreme-Bounds Analysis (EBA).

Given that EBA is not a methodology routinely used in the literature, we provide a brief outline. See Leamer (1983) and Levine and Renelt (1992) for more details. The EBA performs OLS regressions of the form $C = \beta_M M + \beta_I I + \beta_Z Z + u$, where C is the level of perceived corruption in each country, M is the variable of interest, I is a set of variables always included in the regression, and Z is a subset of variables chosen from a pool of variables identified by past studies as potentially important explanatory variables of corruption.

EBA involves varying the subset of Z-variables included in the regression to find the widest range of coefficient estimates on the variable of interest, M, that standard hypothesis tests do not reject. If the extreme upper bound and extreme lower bound of β_M (defined as the estimated coefficients corresponding to the highest (lowest) value of β_M plus (minus) twice its standard error) are significant at the 5% level and have the same sign, then variable M is considered robust to specification changes. That is, under EBA, an explanatory variable is found to be robust only if its estimated coefficient remains statistically significant and maintains the same sign in all the regressions run with different sets of control factors.

It is important to note that even if an M-variable is found to be robust, this result is only valid if there are no doubts about the causality of the partial correlation identified by the EBA.

The analysis is based on cross-country data covering 62 countries (both developed and developing). The main dependent variable is the Graft Index by Kaufmann, Kraay and Zoido-Lobaton (1999a) for 1998 and the average value of the CPI for the period 1997-1999 is used as a sensitivity check. Serra (2006) tests the robustness of 16 variables, for a total of 28 proxies (more than one measure is often used), measuring economic policies, sociocultural issues and institutional design. Income per capita is the only I-variable, and the Z-variables are restricted to three, so that the number of explanatory variables is restricted to a maximum of five. Also, due to potential multicollinearity concerns, for every M-variable, the pool of variables from which the Z-variables are chosen is restricted by excluding variables that, a priori, might measure the same phenomenon. For each M-variable the test relies on a total of 299 regressions (except for the I-variable, where 377 regressions are estimated).

Serra's (2006) results show that five variables are robustly related to perceived corruption. Perceived corruption is lower in richer countries, where democratic institutions have been preserved for a long continuous time, where the population is mainly Protestant, where there is a higher level of political stability and in countries with a British heritage. These results strongly support those of Treisman (2000). However, one weakness of EBA is that it does not solve the problem of causality. We believe that it is a serious weakness when studying corruption, as many of the variables that affect corruption are also likely to be affected by corruption. Another weakness of EBA is that the upper and lower bounds of β_M depend on the subset of *Z*-variables included, which is by definition limited to a few variables (in this case only three). We believe that it is better to examine robustness of variables by including extra explanatory variables that theory suggests belong in the model, rather than relying on the arbitrariness of EBA.

One general weakness that is common to both Treisman (2000) and Serra (2006), and indeed to the rest of the empirical literature on the determinants of corruption, is not testing whether their results are robust to taking into account the ordinal nature of the corruption measures.

As noted above, although there is a growing literature that uses cross-country regressions to search for empirical linkages between the level of perceived corruption in a country and a variety of economic policy, political and institutional factors, most studies tend to consider only a small number of explanatory variables in attempting to establish a statistically significant relationship between perceived corruption and a particular variable of interest. Therefore, rather than reviewing the other related papers in this section, we do so in the following section where we explore some of the theories and the results of further empirical evidence on the causes of corruption.

2.3 The Causes of Corruption: Theories and Some Empirical Evidence[8]

The key questions we want to answer are: (1) Why do government officials in some countries misuse public office for private gain more frequently and/or for larger bribes than officials in other countries; and (2) What is the relative importance of "destiny" - long-predetermined historical and cultural factors (which cannot be changed or influenced) - compared to policies in the economic and governance arenas (which can be changed). The answers are not straightforward. A widely accepted benchmark model specifying the causes of corruption does not yet exist. In this section we explore a set of factors that have been found, either theoretically or empirically, to have a significant impact on a country's level of corruption.

Colonial Heritage

Young (1995) states that *"Overall, colonial legacy cast its shadow over the emergent African state system to a degree unique among the major world regions."* Thus, it is not surprising that the legacy of colonial rule is thought to be a significant factor in explaining variations in the intensity and prevalence of corruption. Some features of former British colonies appear to render them less vulnerable to corruption than the French, Belgian, Portuguese or Spanish former

[8] Rent-seeking is sometimes used interchangeably with corruption and there is a large area of overlap. But, while corruption involves the misuse of public power for private benefit, rent-seeking derives from the economic concept of "rents", i.e. earnings in excess of all relevant costs.

colonies. These features include a tradition of free press, durable legal institutions, emphasis on education and the impartiality of the British civil service. This appears to suggest that colonial regimes left an institutional legacy that has shaped the subsequent form and extent of corrupt practices.

Although there are still no studies that analyse primarily the impact of colonialism on the level of corruption, variables of colonial heritage enter as control variables in some studies investigating the causes of corruption. Swamy et al. (2001), Treisman (2000) and Serra (2006) show that former British colonies exhibit lower levels of perceived corruption than other countries.

Legal System

The type of legal system in place in a country is an important factor when considering the causes of corruption, because the probability of being caught and punished for engaging in corrupt practices will differ according to the effectiveness of different legal systems. Legal systems differ in the formulations and the original intent of the law, thus differing in the degree of protection and the opportunities for appeal offered to private property owners harmed by corrupt officials. La Porta et al. (1997b, 1999) argue that common law systems differ on this dimension from civil law systems. The common law tradition developed in England in the 17th century, as an attempt by Parliament and the aristocracy to limit the power of the sovereign in regulating and expropriating them. A common law system can be viewed as intending to limit rather than strengthen the state. Common law developed from precedents established by judges. Civil law systems (in their Napoleonic, Bismarckian, or other forms) developed more as an instrument used by the sovereign for building institutions to increase the power of the state. Civil law is mainly legislation created with the purpose of finding a just solution to a dispute, rather than following a set of procedures. La Porta et al. (1997b, 1999) hypothesise that the greater protections of property against the state in common law systems improve several aspects of government performance, including reducing corruption.

Religion

Differences in religious affiliations may be used as a proxy for the cultural determinants of different countries. Religion may affect the perceived costs of corrupt actions through two different dimensions, hierarchy and influence between church and state.

La Porta et al. (1997a, 1999) identify the Catholic, Muslim and Greek Orthodox religions as *"hierarchical"*. They claim that countries with these religious traditions exhibit inferior government performance to that of largely Protestant countries. In terms of corruption, one might think that a society in which people are accustomed to a greater level of hierarchy in religion will tend to transpose this to other arenas, thus making challenges to office-holders rarer than in cultures that have more egalitarian or individualistic religions, such as Protestantism. Lipset and Lenz (2000) argue that *"the Protestant ethos is more conducive to norm adhering behaviour"*, mainly due to its emphasis on individual responsibility for moral conduct, as well as its generally intolerant attitude towards human failing. La Porta et al. (1997a, 1999) find evidence that hierarchical religion has a positive correlation with perceived corruption.

The doctrines of the Muslim and Catholic religions are more interventionist than Protestantism, and historically they grew to support state power, indeed becoming state-sponsored religions. Unlike religions in which the state and church are closely linked, the institutions of the Protestant church may play a role in monitoring and denouncing abuses by state officials.

A strong association between Protestantism and perceived corruption has been obtained by several studies. Using a sample of up to 64 countries, Treisman (2000) obtains a highly significant negative impact of the percentage of Protestants in the total population on perceived levels of corruption. This result is corroborated by Lipset and Lenz (2000), Sandholtz and Koetzle (2000), Paldam (2001), Gerring and Thacker (2005) and Serra (2006).

Ethnolinguistic Fractionalisation

The borders of African states were determined through a series of negotiations between European powers following the 1884-1885 Berlin Conference. As these frontiers were not generally guided by concerns for the identity of indigenous states, societies or ethnic groups, the resulting borders split up ethnic groups. This in turn meant exacerbating already existing high levels of ethnic and linguistic diversity. According to Easterly and Levine (1997), 14 of the 15 most heterogeneous societies in the world are in Africa.

Ethnically fractionalised societies may lead to a very damaging form of corruption. With each ethnic group being potentially allocated a region (or ministry) in the power structure, they will be more likely to yield independent bribe-takers. This is important because different groups do not internalise the effects of their actions on other groups or on society as a whole, therefore, resulting in more bribes per unit of output as well as less output [Shleifer and Vishny (1993)]. Moreover, each distinct group may try to seize as great a share of rents as they can in order to avoid competing groups from doing so, until there are no more rents left. Mauro (1995) demonstrates the empirical association between ethnic fragmentation and high perceived corruption.

It may also be that leadership, which Tanzi (1998) suggests is associated with less corruption, is more likely to flourish in more ethnically homogeneous societies.

Economic Development

There tends to be a strong negative correlation between GDP per capita and a country's score on corruption indices. However, the causal relationship between corruption and economic development is not yet well established. Is a country poor because of corruption, or is it corrupt because it is poor?

Misuse of public office is more likely to be exposed in more economically developed countries, as economic development increases education, literacy and depersonalised relationships [Treisman (2000), Tanzi (2000)]. Furthermore, the social stigma facing corrupt officials if exposed might be greater in a more economically developed country.

In the specific case of rapid economic growth due to oil and mineral discoveries, the accrual of a majority of the revenue directly to the government may exacerbate the incidence of rent-seeking behaviour, as claimed by Khan (1994) for the case of Nigeria. On the other hand, economic growth driven by the acquisition of human capital would be likely to generate fewer easily appropriable rents.

In the literature on corruption there are two opposing views as to the effect of corruption on economic growth. Some authors [Leff (1964), Huntingdon (1968)] suggest that corruption might raise economic growth. It is argued that this would operate through two types of mechanisms. Firstly, by offering bribes that would act as speed money, individuals would be able to avoid bureaucratic delays. Secondly, the ability to levy bribes would act as an incentive for government employees to work harder, especially in the case where bribes act as a piece rate. The opposing view, as exemplified by Shleifer and Vishny (1993), argues that corruption would tend to lower economic growth. In particular, Rose-Ackerman (1978) warns that it is difficult to limit corruption to areas where it might be *"economically desirable"*. Murphy, Shleifer and Vishny (1991) provide empirical evidence that countries where talented people are allocated to rent-seeking activities tend to exhibit slower growth rates. Mauro (1995) provides evidence that perceived corruption lowers investment, thereby lowering growth. Keefer and Knack (1995) find that a variable of institutional quality, which incorporates perceived corruption, exerts a significant negative impact on growth.

Several studies have attempted to disentangle the simultaneous relationship between corruption and economic development. All these studies use the technique of instrumental variables to address the problem of potential endogeneity between corruption and income. Studies such as Hall and Jones (1999), Kaufmann, Kraay and Zoido-Lobaton (1999b), Kaufmann, Kraay and Mastruzzi (2005), Acemoglu, Johnson and Robinson (2001) and Easterly and Levine (2003) identify the causal effects running from better governance to higher per capita income in the very long run. Kaufmann and Kraay (2002) report a strong positive causal effect running from better governance to higher per capita income and a weak and even negative causal effect from per capita income to governance. However, the result on the causal effect from income to governance is refuted by Lora (2002). Treisman (2000) also finds strong evidence that the process of economic development reduces the level of perceived corruption in a country.

Level of public sector wages

There has been some debate on whether the wages paid to civil servants are important in determining the degree of corruption. One may differentiate between corruption due to greed and corruption due to need [Tanzi (1998)]. If the wage level is low relative to the minimum required for a "decent" living, then it can be assumed that there is some level of corruption due to need. For example, Gould (1980) notes that in Zaire, as civil service salaries are well below the poverty line, there is a widespread perception that civil servants must cheat in order to survive. Lindauer et al. (1988) quote the following finding from the 1982 Report of Public Service Salaries Review Commission for Uganda: "*the civil servant had either to survive by lowering his standard of ethics, performance and dutifulness or remain upright and perish. He chose to* *survive*." However, regardless of the wage level, some civil servants may be corrupt due to their moral characteristics, or because some bribes may be "irresistible". Therefore, these two types of corruption are not mutually exclusive. Furthermore, even in the case where higher wages could reduce the incidence of corrupt acts, it is still possible they could lead to higher bribes being demanded by those civil servants who continue to be corrupt.

A number of recent theoretical papers has suggested that ensuring an honest civil service may be prohibitively expensive [Besley and McLaren (1993), Flatters and McLeod (1995)]. These models build on the work of Becker and Stigler (1974). The prediction is that high pay constitutes an incentive to be less corrupt. However, the wage necessary to eliminate corruption is high when bribe levels are high or the probability of detection and fines are low. In this case, Besley and McLaren (1993) argue that it may be cost-effective for governments to pay a wage at which nobody behaves honestly (*"capitulation wages"*) and rely on monitoring of tax inspectors as a means of raising revenues, rather than raise wages to the high levels required to deter corruption. On the other hand, Ul Haque and Sahay (1996) argue that raising wages to deter corrupt behaviour may be cost-effective by attracting better human capital to the government sector.

Van Rijckeghem and Weder (2001) examine the effect of pay in the civil service on corruption. Using data on 31 developing countries for the period 1982-1994, they find that in a cross-country regression the differential between wages in the civil service and in manufacturing is a significant determinant of perceived corruption.[9] The economically and statistically significant relationship they find implies that a rather large increase in wages is required to eradicate corruption solely by raising wages.[10]

In some countries public sector wages are low relative to those in the private sector because of an inflated number of people working for the government. In these situations it is not realistic to recommend that these countries implement a policy of simply increasing civil servant wages without reducing the size of the civil service. Moreover, for many governments a reduction in the number of public employees would be incompatible with their objectives, or would be politically difficult.

Gender

The possibility of systematic differences in behavioural characteristics across gender has been the focus of a considerable number of studies over the past three decades. The general conclusion of this literature is that women are more community-oriented and selfless than men. The hypothesis that men are more individually-oriented than women has been demonstrated in a wide variety of institutional contexts, through both experimental and survey-based studies. The following results, summarised in Dollar, Fisman and Gatti (2001), have been established: women are more likely to exhibit "helping" behaviour [Eagly and Crowley (1986)]; exhibit generosity and altruism [Eckel and Grossman (1998), Andreoni and Vesterlund (2001)]; vote based on social issues [Goertzel

[9] However, the same explanatory variable turns out to be insignificant in a panel set-up.
[10] Doubling the civil service (relative to manufacturing) wage improves the ICRG corruption index (which ranges from zero to six) by the order of 0.5 points.

(1983)]; score higher on "integrity tests" [Ones and Viswesvaran (1998)] and take stronger stances on ethical behaviour [Glover et al. (1997), Reiss and Mitra (1998), Dodson and Carroll (1991)]. These results imply that women will have higher standards of ethical behaviour and thus be less likely to sacrifice the common good for personal material gain. This may be particularly relevant for the potentially beneficial role women may have in government, since one of the most significant difficulties faced by public bureaucracies is designing institutions that discourage their agents from acting opportunistically at the expense of the public.

Given the prevalence of the perceptions outlined above [see also, World Bank (2001)], there is, however, little work done to evaluate the underlying idea that increased female participation leads to more honest government. Kaufmann (1998) presents a scatter plot showing a cross-country correlation between perceived corruption and an index of women's economic and social rights. Kaufmann emphasises the need for a more detailed investigation of the suggestive findings that having more women in the labour force and politics could be an effective force for good governance. Using different measures of perceived indices of corruption, Swamy et al. (2001) and Dollar, Fisman and Gatti (2001) present empirical cross-country evidence that higher levels of women's participation in public life are associated with lower levels of perceived corruption. Swamy et al. (2001) also show that perceived corruption is less severe when women comprise a larger proportion of the labour force. In addition, Swamy et al. (2001) reinforce their cross-country results by using micro-data (from the World Values Surveys and an enterprise survey in

Georgia) to show that women are less involved in bribery and are less likely to condone bribe-taking.

Democracy

In recent years, economic explanations of corruption have been the most cited and probably also the most influential for policy formulations. However, corruption has also attracted much attention from other social sciences, in particular from political scientists. To understand corruption, political factors cannot be ignored. Political science has approached the phenomenon of corruption in terms of regime type and searched for its causes in authoritarian versus democracy and in development-oriented regimes versus neo-patrimonial rule.

In conventional political science, the causes of corruption were thought to be in the "democratic deficit". Thus, the basic and practical argument on corruption was that it could only be reversed by democratising the state.

There is another relatively large political science approach to the study of corruption that focuses on the informal aspects of power. This is the "neo-patrimonial" or "politics of the belly" approach that originated in the 1980s from French scholars, with a main focus on Africa. It stresses that African politics are radically different from politics elsewhere, arguing that the state is merely a façade that covers the realities of deeply personalised political relations, clientelism and political corruption [Hope and Chikulo (2000), Bayart (1993), Bratton and van de Walle (1994)]. The effect of regime type on corruption is arguably very strong in the case of the neo-patrimonial mode of rule.[11] According to Coolidge and Rose-Ackerman (2000), neo-patrimonial states are characterised by rent-seeking behaviour by officials at the highest government levels. This will produce excessive state intervention in the economy, inefficient rent-extracting monopolies, too big governments, privatisations that benefit the ruling elite, non-transparent and contradictory regulations on taxation and investments, excessively short-term investments and slow economic growth.

The analytical and descriptive literature on the "politics of the belly" provides illustrations and explanations to the deep causes of corruption in such countries and gives a motive for calling for democratisation. However, empirical research on the effects of democratisation on corruption is considerably less developed and the evidence less conclusive. The linkages between corruption and democracy are not obvious. In recent years some empirical studies have explored the possible correlation between corruption and democracy. Paldam (2002) finds that, in general, perceived corruption will decrease with increasing levels of democracy. However, both variables interact strongly with the level of transition from a poor to a rich society, thus casting some doubt as to the independent effect of democracy on the level of corruption. Ades and Di Tella (1999) fail to find beneficial and significant effects of political rights on perceived corruption. Treisman (2000) finds that the current degree of democracy in a country makes almost no difference to how corrupt it is perceived to be. What matters is whether or not a country has been

[11] On the authoritarian-democratic scale, it is in-between the centrally controlled autocratic regimes and the consolidated democratic regimes.

consecutively democratic for at least 40 years.[12] Sandholtz and Koetzle (2000) find that the strength of democratic institutions correlates negatively with the level of perceived corruption, as does a longer experience with democratic rule. Serra (2006) finds that countries that have maintained democratic institutions for a long continuous time have lower levels of perceived corruption.

More recently, some studies have tried to provide a more intricate picture of democracy. They have examined the impact on corruption levels of certain features of democracy, rather than just looking at whether democracy reduces corruption. There is evidence that presidential systems fare worse with respect to perceived corruption as compared with parliamentary systems [Gerring and Thacker (2004), Lederman et al. (2005), Kunicova (2006)]. Persson, Tabellini and Trebbi (2003) relate corruption to different features of the electoral system. They find that larger voting districts (and, therefore, lower barriers to entry) are associated with lower perceived corruption, whereas larger shares of candidates elected from party lists (thus, less individual accountability) are associated with higher perceived corruption. Finally, electoral systems of proportional representation are associated with higher perceived corruption than plurality rule with single-member districts [Persson, Tabellini and Trebbi (2003), Kunicova and Rose-Ackerman (2005)].

International openness and trade

It can be argued that a protectionist trade policy is one of the causes of corruption. Exposure to foreign competition may be used to measure the extent

[12] Even so, the corruption dividend is small.

to which domestic firms enjoy rents, as competition from foreign firms reduces the rents enjoyed by the former, thus reducing the rewards from corruption. Corruption will be higher in countries where domestic firms are sheltered from foreign competition by natural or policy induced barriers to trade, with economies dominated by a few number of firms, or where antitrust regulations are not effective in preventing anti-competitive practices.

According to Ades and Di Tella (1999), countries that are more open to foreign trade (which they define as imports as per cent of GDP) tend to be perceived as less corrupt. Treisman's (2000) results suggest that greater exposure to imports lowers perceived corruption (although this relationship is not always significant). Wei (2001) also tests whether countries with a greater openness to trade exhibit less corruption. Wei separates a country's openness, defined as the sum of exports and imports as per cent of GDP, into two parts. The first part, *"natural openness"*, is defined as the fraction of openness that can be explained by largely unchangeable factors such as geography, language and population size. The remainder is called *"residual openness"*, which potentially includes trade policies. Wei finds that *"naturally"* more open countries exhibit lower perceived corruption even after taking into account their levels of development. *"Residual openness"* is found not to be important once *"natural openness"* is accounted for.

Aid

In Africa more than in any other region, engagement with the international community has come in the context of aid and debt. Sub-Saharan

African countries have been among the world's largest recipients of aid, receiving about one third of all aid disbursed [OECD (2005a)].

Theory cannot unambiguously determine what the impact of aid will be on the quality of governance. On the one hand, aid could be associated with improved governance. For example, foreign aid can be used to improve training and increase salaries for public employees. Increased salaries can be used to attract more competent public officials, and to reduce the demand for bribes [Van Rijckeghem and Weder (2001)]. Aid sometimes finances programmes intended to strengthen the legal and justice system and other responsibilities of the public sector.[13] On the other hand, aid may worsen governance in the recipient countries. Foreign aid can weaken the state bureaucracies of recipient governments. For example, often the most skilled civil servants are hired by donor organisations, which pay salaries many times greater than those offered by the recipient country's government, thereby stealing scarce talent from the civil service [World Bank (1998c), Brautigam (2000)].

The World Bank (1989) has reported that the rapid increase in foreign exchange resources, mainly due to large concessional flows, has greatly expanded the opportunities for malfeasance. The fungibility of aid resources may well be an important factor for this to occur. For example, if a government would have undertaken a donor-financed project in the absence of that financing, then donor funds simply finance, at the margin, something else that may be undesirable. Theoretically, imposing conditionalities on incremental

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[13] Sweden's aid agency dedicated huge resources over 15 years to building Tanzania's auditing capacity. However, this had no impact on public sector accountability as the Auditor General's office fails to use auditing firms to audit government expenditures [Brautigam (2000)].

spending could solve the fungibility problem. However, this is easier said than done. In practice, it is difficult to know what the government would have done in the absence of that donor financing. Moreover, the multiplicity of donors further complicates the analysis. Therefore, it is very difficult to preclude switching of donor funds. In an extreme case, the fungible aid funds may be used to finance expenditure projects on which corrupt governments may find it easier to collect bribes.

More importantly, foreign aid represents a potential source of rents, with adverse effects on the incidence of corruption. Moreover, as rents available to those controlling the government increase, the resources devoted to obtaining political influence increase – as the returns to acquiring political connections and lobbying skills increase, talent is increasingly reallocated from productive to redistributive activities [Knack (2001)].

The empirical findings to date on the impact of aid on corruption have also been ambiguous. Alesina and Weder (2002) find weak evidence that aid causes perceived corruption to increase. Knack (2001) finds that higher aid levels erode bureaucratic quality and the rule of law, but that aid levels are not significantly related to perceived corruption. Tavares (2003) finds strong support for the argument that aid decreases perceived corruption. Svensson (2000) develops a game-theoretic rent-seeking model to explore the relationship between the widespread level of corruption and other types of rent-seeking activities and concessional assistance. He provides some preliminary evidence in support of the hypothesis that foreign aid and windfalls are, on average, associated with higher perceived corruption in countries that are more likely to suffer from competing social groups.

It should be noted that aid to Africa is not only to governments. Many donors channel their aid through the proliferating Non-Governmental Organisations (NGOs), both indigenous and foreign. In 2003-2004 donors channelled about 13% of their worldwide aid through NGOs, with the US estimating that more than one third of its development assistance goes to NGOs [OECD (2005a)]. Given the increasing reliance by the major aid donors on NGOs to implement their programmes, particularly for poverty relief and state reconstruction, this percentage is expected to be higher in Africa.

Other Variables:

Economic rents are likely to arise in the case of natural resources, such as oil, whose supply is limited by nature and whose extraction cost is much lower than its market price. Since abnormal profits are available to those who extract the natural resources, officials who allocate extraction rights are likely to be offered bribes. Ades and Di Tella (1999) and Leite and Weidmann (1999) suggest that in countries with large endowments of valuable natural resources corruption may offer greater potential gains to officials who allocate rights to exploit such resources. Although Ades and Di Tella (1999) fail to find a consistent and significant impact of natural resource abundance on perceived corruption levels. Leite and Weidmann (1999) do show that the extent of perceived corruption depends on natural resource wealth, as measured by a country's exports of fuels and minerals as a share of GDP.

Viewing corruption as an illegal activity, one can follow Becker's (1968) suggestion that the probability of committing a crime depends primarily on the probability of being caught and the penalty imposed. Moreover, the deterrent value of the penalty depends crucially on the ability and willingness of the authorities to enforce the relevant regulations, as well as the level of acceptance by society of the judgements rendered by the country's institutions. Therefore, it follows that countries with political instability are unlikely to generate the political muscle necessary to adequately empower judicial institutions. Also, when a country lacks transparent rules and procedures it is unlikely that the required widespread understanding and support is generated. In a political climate of instability, corrupt officials may also want to appropriate as many rents as possible while they are in office.

Finally, a reduction in the size of the public sector and in the direct involvement of the state in economic activity is likely to decrease opportunities for rent-seeking activities.

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From the above discussion, we postulate the following hypotheses regarding the causes of corruption in sub-Saharan Africa.

Corruption will be lower in countries with the following characteristics:

H1: Less ethnically divided;

H2: Former UK colonies;

H3: Common law systems;

H4: Greater percentage of Protestants;

H5: Relatively small endowments of natural resources;

H6: More economically developed;

H7: Democratic and politically stable;

H8: Greater quality of legal and political institutions;

H9: Greater openness to trade;

H10: Lower state intervention in the economy (in the form of regulation, taxation, or state commercial activity);

H11: Higher relative government wages;

H12: Greater participation of women in the labour force;

H13: Smaller aid receipts.

In terms of our fundamental question of whether corruption in sub-Saharan Africa is "destiny" or policy driven, for the purposes of our empirical analysis we assume that hypotheses H1 to H5 broadly represent "destiny", whereas hypotheses H6 to H13 provide an indication of policy.

2.4 Measuring Corruption

Given our empirical focus on corruption, it is imperative to have some way of measuring this concept. Without an indicator that measures corruption it is difficult to be able to ascertain what its causes (or indeed its effects) are. So in order to know whether a particular factor leads corruption to be higher or lower, we need to have a means of quantifying corruption.

However, measuring corruption is by no means a trivial matter. The working definition of corruption typically invokes some notion of illegality. and despite the fact that bribery can take place in the private sector, usually focuses on the use of public office for private gain. There are obvious difficulties in measuring illegal (and because of that, secretive) activities. In addition, there are different types of corruption that may occur and an indicator of one type of corruption should not be necessarily be expected to be a good proxy for other types of corruption. For example, corruption can be petty or grand and it may be desirable to have indicators that distinguish between these two types of corruption.[14] Also, the incidence of corruption from a household perspective differs from the corruption related to doing business. It may also be desirable to be able to distinguish between the incidence and level of corruption, which may be driven by different factors.

Notwithstanding the difficulties in measuring corruption, several indicators that attempt to measure some facets of corruption are available. In particular, they have become more widespread as the increasing awareness of the importance of governance in general and corruption in particular has been accompanied by an increase in the supply of such indicators, be it by commercial firms or non-governmental organisations.

The indicators of corruption are typically based on polls of experts or surveys of entrepreneurs or citizens in general, who assign scores to countries in terms of the degree to which corruption is perceived to exist among public officials and politicians and the degree to which business transactions involve

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[14] Petty corruption typically involves low-level officials extracting small sums of money through extortion, theft, bribery or misuse of private property. On the other hand, grand corruption occurs when high-level officials use their power to grant contracts or extract large sums of money for their personal or political enrichment. Either or both forms of corruption may be infrequent or systemic.

corruption or "questionable" payments. Therefore, these are indices of *perceived* corruption. This is an important point, as the subjective nature of corruption measures will have implications in terms of the conclusions and assertions that may be made in empirical studies using these measures. This is discussed in more detail in Section 2.4.2.

The sources of these subjective indices are commercial agencies (such as the Economist Intelligence Unit, Political Risk Services and Business and Environmental Risk Intelligence), non-governmental organisations (such as Freedom House) and international organisations (such as the World Bank). The surveys/polls produced by commercial agencies are costly and their clients are typically banks, multinational companies and other international investors, who use the data and information to make business and investment decisions.

More recently, two composite indices - drawing on a number of existing polls and surveys from perception-based sources as described above - have been created. The first composite index has been compiled by the non-governmental organisation Transparency International (TI) and is called the Corruption Perceptions Index (CPI). The source of this index varies from year to year, as does the coverage of countries. The latest CPI 2007 is based on 14 surveys and expert assessments from 12 institutions. It covers 180 countries. The second composite index has been derived by Kaufmann, Kraay and Zoido-Lobaton (1999a, 1999b), and subsequently, Kayfmann, Kraay and Mastruzzi (2005) – it was initially called Graft, but has since been renamed Control of Corruption (CC). This index is one of six governance indicators, known as the Worldwide

Governance Indicators (WGI).[15] They have a broader definition of corruption than TI and include most cross-country indices reporting scoring of countries on some aspect of corruption. The latest CC 2006 is based on 33 surveys and expert assessments from 30 institutions. It covers 212 countries. Both the CPI and CC are freely available. Although the CPI is widely disseminated among policymakers and academics, as well as receiving substantial media coverage, the WGI have become increasingly quoted and used.[16] This may be due to the fact that it includes several governance indicators, rather than just focussing on corruption. By incorporating judgements of several independent sources, the CPI and CC indices are presumably less subject to measurement error than the remainder. Fortunately, as detailed in Mauro (1995), the data for the various corruption indices, including measures of various aspects of bureaucratic efficiency, are highly correlated.

2.4.1 Selected Measure of Perceived Corruption[17]

As the focus of this study is sub-Saharan Africa, the choice between the corruption indices hinges primarily on the availability of data for the countries in that region. The coverage of sub-Saharan Africa by TI's annual CPI indices is far from ideal – it ranges from none in 1995, to two countries in 1997, and to a maximum of 39 countries in 2007. Note that, given the availability of data for the explanatory variables, the most recent feasible year should be no later than

[15] The full set of governance indicators is: Voice and Accountability; Political Stability; Government Effectiveness; Regulatory Quality; Rule of Law; and Control of Corruption.
[16] For example, the Millennium Challenge Account uses the CC indicator to make decisions on aid allocation. This is discussed in Chapter 4.
[17] When discussing measures of perceived corruption, we refer interchangeably to corruption indicators, corruption indices and corruption measures.

2002 or 2003 at most, for which the CPI has data on 18 and 24 countries, respectively. The CC index covers the years 1996, 1998, 2000, 2002, 2004 and 2006. It covers 33 sub-Saharan African countries in 1996 and 46 in the later years. Using this index entails the same problems on coverage of explanatory variables as the CPI index.

Perhaps the greatest limitation of using either the CPI or the CC composite index is that neither is comparable over time, as the polls and surveys used to construct them vary over time. As stated in Lambsdorff (2005), "*... as pointed out repeatedly in our annual framework document, year-to-year comparisons of a country's score do not only result from a changing perception of a country's performance but also from changes in the samples and the methodology. With differing respondents and slightly differing methodologies, a change in a country's score may also relate to the fact that different viewpoints have been collected and different questions been asked. The CPI primarily provides an annual snapshot of the views of business people, with less of a focus on year-to-year trends. Such changes in methodology are primarily due to changes in the list of sources that enter into this composite index. When new sources are used and old and dated sources are deleted from the list of sources* ***it is arduous to identify valid time series information.*** " (Emphasis added.)

Thus, using the CPI or CC would inhibit any attempts at averaging over time and/or using panel data. In contrast, the corruption index in the publication International Country Risk Guide (ICRG) produced by Political Risk Services (PRS) is available for a large number of countries and for a long period, comparable over time.

The PRS group has been producing the ICRG scores since 1982. The ICRG provides assessments of political, financial and economic risks (based on a set of 22 components/variables) in a large number of both developed and developing countries.[18] Each risk component is assigned a numerical value to represent its risk assessment (score). The components within each category of risk are added to provide a risk score for each risk category (political, financial and economic). The risk scores for these categories are then combined using a formula to provide a country's overall, or composite, risk score. The ICRG model permits users to tailor it to provide a risk assessment more geared towards their particular interests by changing the weighting of the components. It should be noted that, of the three major categories of risk, only the components of the political risk index report subjective assessments of the factors influencing the business environment in a particular country. The financial and economic risk assessments are made on the basis of objective data, such as inflation and GDP.

Corruption in Government is one of the (12) political risk components in ICRG. This corruption index measures perceptions of corruption within the political system. Such corruption *"distorts the economic and financial environment, reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and introduces an inherent instability in the political system. The most common form of corruption met directly by business is financial corruption in the form of demands for special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans."* This

[18] Further details can be found at http://www.prsgroup.com.

measure is also concerned with *"actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favour-for-favours', secret party funding, and suspiciously close ties between politics and business."* The major risk arising from corruption is that a major political scandal provokes a *"popular backlash, resulting in a fall or overthrow of the government, a major reorganizing or restructuring of the country's political institutions, or, at worst, a breakdown in law and order, rendering the country ungovernable."* [Howell (2001)]

The technique that ICRG employs to measure corruption (and the remainder political risk components) is to poll its worldwide network of experts. Therefore, it is a measure of perceptions of corruption. An initial assessment is made by country experts. The assessments are guided by a checklist of specific issues which are taken into account in the provision of initial scores. The initial scores are then subject to a peer review by a panel of region and subject specialists, to ensure coherence and comparability across countries.

The ICRG corruption index is scored from zero to six, where low scores indicate *"high government officials are likely to demand special payments"* and *"illegal payments are generally expected throughout lower levels of government"* in the form of *"bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans"* [Keefer and Knack (1995)]. It is important to note that the experts polled assign scores rounded to the nearest 0.5. This means that the ICRG corruption index is a discrete score with half digits from zero to six, and that there are 13 possible outcomes.

ICRG produces monthly scores. As PRS is a commercial organisation, it sells its ICRG assessments to commercial subscribers for considerable fees. For example, an annual subscription to PRS's ICRG on CD-ROM (which includes 12 months of previously published data) currently costs US $4,595.

However, it is possible to obtain a subset of the ICRG indicators at substantially lower prices. Stephen Knack and Phillip Keefer [Keefer and Knack (1995, 1998)] compiled a data set using ICRG data, which is distributed by the Institutional Reform and Informal Sector (IRIS) Centre at the University of Maryland. The dataset includes computed annual average scores for corruption in government[19] and is available for 140 countries and for the time period 1982-1997 (comparable over time).[20,21] It should be noted that, as the annual average scores are given, this means that a range of many different values for the corruption index is possible (so that more than the original 13 possible outcomes are possible). It is unfortunate that the data ends in 1997,[22] but nonetheless, it is available for 37 African countries, 32 of which sub-Saharan. The potential number of observations is thus 512. This is especially important, as we want to test a large number of hypotheses and include a variety of explanatory variables.

[19] Described in detail by Keefer and Knack (1995).
[20] The other variables included are Rule of Law, Bureaucratic Quality, Ethnic Tensions, Repudiation of Contracts by Government, and Risk of Expropriation.
[21] Very recently, a further subset of ICRG scores has become available, the ICRG's Researcher's Data Set. This data set has annual averages of the subcomponents of the ICRG Political Risk scores, available for all 140 countries covered by ICRG until the last full calendar year. Although it is sold at a fraction of the price charged to commercial subscribers, it is still substantially more expensive than the IRIS data set.
[22] This is discussed further in Chapter 5.

2.4.2 Critical Discussion of the Selected Measure of Perceived Corruption

Although it has been possible for several sources to provide some indicator of perceptions of corruption in a country, it is essential to recognise the limitations of such corruption measures. In particular, these limitations should be kept in mind when interpreting results of empirical analyses that use these measures. If care is not taken in acknowledging these limitations, the usefulness of corruption indicators for researchers, policy-makers, investors and donors will be reduced. It is important to reduce the misuse of corruption indicators and, consequently, to contribute towards incentives for improvements in their construction and, therefore, usefulness.

Given that we will use the PRS ICRG measure for corruption, we will focus our discussion on that particular indicator, although we will also make more general observations where appropriate.

Firstly, we start by presenting some of the advantages of our selected corruption measure. As previously stated, the ICRG corruption measure is based on polls of experts. The main benefit of this technique is that polls of experts are explicitly designed for cross-country comparability. By having an effective benchmarking process, polls of experts do not suffer from the disadvantage of surveys, where questions can be interpreted in context- or culture-specific ways, thereby making it more difficult to make cross-country comparisons.[23]

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[23] It should be noted that the reliability of polls depends on the expertise/ability of the experts. The PRS ICRG indicators are, as stated previously, subject to a centralised review of all country scores, which is carried out before they are finalised. That, and the fact that PRS is a commercial firm whose (almost 30-year-old) success depends on its commercial subscribers, provides an indication that the information it provides is useful. (According to PRS, more than
Footnote continues on next page.

Another of the benefits/advantages of the ICRG corruption measure is that it is representative, in that it covers a very large and broad sample of developed and developing countries.[24] This means that it is less likely that the corruption indicator for developing countries, in general and sub-Saharan African countries in particular, suffers from a "curse of inclusion" bias, in the sense they receive worse scores than they might otherwise have received if they were not being implicitly compared with countries in which corruption might be lower.

PRS ICRG uses a consistent methodology from year to year, and its indicators are comparable over time (indeed, that is one of its features that is much valued by its commercial subscribers). Therefore, unlike the majority of indicators from other sources, comparability across countries and time is maximised.

Despite these advantages, there are some non-negligible problems/disadvantages with corruption indicators in general and our selected indicator in particular.

One of the problems with these measures of corruption is that they are subject to margins of error. This is because there are unavoidable uncertainties with measuring corruption (there is an inherent difficulty in measuring such a complicated and multifaceted concept), and so indicators of corruption are

80 per cent of the world's largest multinationals ranked by *Fortune* magazine use its data and information to make investment decisions.)

[24] Kaufmann, Kraay and Zoido-Lobaton (1999a) construct a coverage index that measures, for each of the source of governance measures, differences between the distribution of included countries across classifications of income and region and the distribution of all countries in the world across these categories. Only five of the 13 sources of governance data are representative according to this measure. Of the sources that measure corruption, PRS ranks first in terms of being the most representative source.

subject to measurement errors.[25] Measurement errors mean that the indicators may not always be used reliably to differentiate between levels of corruption across countries. Existing corruption indicators differ in their transparency in terms of measurement errors. Unfortunately, PRS ICRG does not provide estimates of the sizes of those measurement errors.[26] On the other hand, Transparency International's CPI provides the number of surveys on which the score is based, as well as an estimated confidence interval depending on the estimated degree of measurement precision. The World Bank Institute's Governance Indicators is explicit about the unavoidable uncertainty inherent in measuring different aspects of governance – estimates of margins of error are provided and the importance for users of taking the measurement errors into account are emphasized. In addition, Kaufmann, Kraay and Mastruzzi (2006) call for *"other producers of governance indicators to be similarly transparent about the imprecision of all types of measures of governance."*

It is worth highlighting the fact that measurement error is not unique to these perceptions-based indicators of corruption – measurement error also exists in objective measures, such as measures of income (where actual income deviates from reported income). As Kaufmann, Kraay and Mastruzzi (2007) state, *"this imprecision is not a consequence of our reliance on subjective or perceptions data on governance – rather imprecision is an issue that should be squarely addressed in all efforts to measure the quality of governance."* So, it is

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[25] It should be noted that this is also true of other indicators of governance and institutional quality. For more on this see Kaufmann, Kraay and Mastruzzi (2004).

[26] Indeed, it seems that PRS ICRG entirely ignores margins of error for its governance and investment climate indicators (at least in its discounted-price data sets of annual averages). Note that we were unable to ascertain whether PRS ICRG provides any information of the accompanying margins of error of its indicators to its commercial subscribers.

important to be upfront about this limitation. One point to note is that if the measurement errors are not systematically related to country characteristics, it may be less of a concern when looking at variations in corruptions across countries, the same being true across time.

One criticism of expert assessments produced by commercial firms is that these focus exclusively on the business environment faced by foreign investors. This is problematic if the scores are capturing the component of the business environment for foreign investors that is uncorrelated with true governance, or if respondents give favourable corruption scores to rich countries simply because they are rich (the "halo" effect). Kaufmann, Kraay and Mastruzzi (2006) address the issue of whether perception errors are correlated among expert assessments of corruption.[27] Considering their five major data sources provided by commercial agencies (of which PRS is one) and their only very large cross-country survey of firms, Kaufmann, Kraay and Mastruzzi (2006) find that for corruption the expert assessments are on average more correlated with the survey than with each other, which is inconsistent with shared prejudices.[28] So the experts producing the assessments do not appear to share a common set of preconceptions or prejudices about cross-country patterns of corruption.

Another criticism of using subjective information from polls of experts is that the indicators may reflect an ideological bias of the institution compiling the

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[27] The exercise is performed for the full set of governance indicators (Voice and Accountability; Political Stability; Government Effectiveness; Regulatory Quality; Rule of Law; and Control of Corruption). We focus the discussion on the corruption indicator.

[28] The same is found for Political Stability; Government Effectiveness; and Rule of Law. Although the results for Voice and Accountability and Regulatory Conflict are not as strong, the authors argue that *"the role of shared prejudices in expert assessments is at most minor"*.

scores. However, Kaufmann, Kraay and Mastruzzi (2003) show that there is no evidence of such an ideological bias in polls of experts (including PRS ICRG) measuring corruption.[29]

An important factor to bear in mind when using corruption indicators, such as the PRS ICRG, to examine changes across time and countries is that these are subjective measures of corruption and, as such, are effectively ordinal indices. That is, a country which has a score of one in the PRS ICRG corruption indicator cannot be said to be twice as 'clean' as a country that has a score of two. Similarly, a one-point difference between country A scoring 2 and country B scoring 3, and between country C scoring 4 and country D scoring 5 is not necessarily the same. That is, one country can be considered more corrupt than another, but it is not possible to ascertain specifically how much more corrupt it is.

However, although the PRS ICRG corruption indicator is ordinal, we believe it is perceived as having some cardinal value. Our belief is based on two main reasons. Firstly, the ICRG corruption indicator and 11 other components are added up to construct a broader index of ICRG political risk. Adding them in that way would not be valid if they were only ordinal. In addition, ICRG calculates a composite political, financial, and economic risk score, for which the political risk score contributes 50% of the composite score, while the financial and economic risk scores (based on objective data) each contribute

[29] Note that Kaufmann, Kraay and Mastruzzi (2003) find that only one of their sources of polls of experts, the Heritage Foundation, does show an ideological bias, but only in relation to the governance indicators of Regulatory Quality and Rule of Law. In any case, they point out that the statistical evidence even in this case suggests that the importance of ideological bias is quite modest in magnitude.

25%. If the political risk variables (one of which is corruption) had no cardinal value, this would not be valid. So this indicates that PRS ICRG believes that the index makes sense as a cardinal measure. It is useful to note that the ICRG corruption measure is sold (at quite a substantial price) to companies who use the information to inform decisions about whether or not to invest in given countries. It could be argued that the companies who pay substantial amounts of money must also attach some cardinal value to this measure – the fact that the commercial company that sells this information to other commercial companies at a substantial price has been successful for almost 30 years at doing so could provide an indication as to the value that their customers obtain from their data. At this point, it is important to note that it is obviously in the best interest of PRS ICRG (and other commercial agencies) to overemphasise the inherent cardinality of their subjective measures in order to be able to sell their information at high prices. In addition, it could also be argued that companies may actually only use the ordinal information, i.e., they may only want to know which countries are relatively riskier/more corrupt, and in the extreme may even just be interested in whether countries are above or below a certain threshold.

Secondly, there are many precedents in the academic literature where corruption indices have been used and interpreted as a cardinal variable. Perhaps one of the better known examples is Mauro (1995), who finds that high levels of perceived corruption hinder investment and growth. More specifically, Mauro (1995) finds that an improvement (of one-standard deviation) in the corruption index is associated with an increase in the investment rate of 2.9 per cent of GDP. Other examples of where corruption indices have been treated as cardinal variables include Serra (2006) and Svensson (2000).

Notwithstanding beliefs that there is cardinal value to the corruption index, we believe it is appropriate to conduct checks on our results obtained when assuming cardinality, in order to see whether these results are broadly maintained when taking into account the ordinal nature of the corruption index. A result of qualitatively similar results would provide some evidence as to the validity of treating the corruption index as cardinal.

2.4.3 Examination of the Selected Measure of Perceived Corruption

Although the next section describes the data used in this chapter, it is useful to examine in some more detail the ICRG corruption measure. Firstly, in order to facilitate the interpretation of the regression results, but mainly to increase comparability with other studies, we transform the ICRG corruption index so that 0 = least corrupt; 10 = most corrupt. This is carried out in the following way:

$$\text{Rescaled Corruption Index} = 10 - \frac{10}{6} \times \text{Original Corruption Index.}$$

This is simply a linear transformation of the scale of the dependent variable, the corruption index, and as such only has a linear impact on the estimated coefficients, without altering their significance or the measures of fit of the Ordinary Least Squares (OLS) regression.

The following figure plots the evolution of the corruption index through time for the sub-Saharan African countries in our sample. The figure illustrates some interesting points. Firstly, there appear to be three main patterns of change in the corruption index, namely, no change, one step change (that is, when a country has a certain score for some years and then has a different score for the other years in the time period) and variation (that is, a country has several different scores over the time period). Note that there are some countries that exhibit a 'quasi' one-step change, in the sense that the transition from one corruption score and the step change includes an intermediate score, e.g., South Africa. Note also that even when there is variation, there tends to be at least two years with the same corruption score. Secondly, the corruption scores tend to be clustered around the values equivalent to the integers (0, 1, ..., 6) of the originally scaled corruption index (which translate into 0, 1.7, 3.3, 5, 6.7, 8.3, 10, in terms of the rescaled corruption index). This seems to suggest that the experts assigning the scores may have an inherent difficulty in distinguishing between small differences in corruption levels. This reinforces the need to check the robustness of results obtained when treating the corruption measure as having cardinal value, by using appropriate econometric approaches for when the dependent variable is ordinal. This also suggests that results from studies in the empirical literature on the determinants of corruption that do not perform this robustness check should be viewed with caution.

Figure 2.1: Evolution of perceived corruption by sub-Saharan African country, 1982-1997 (part 1)

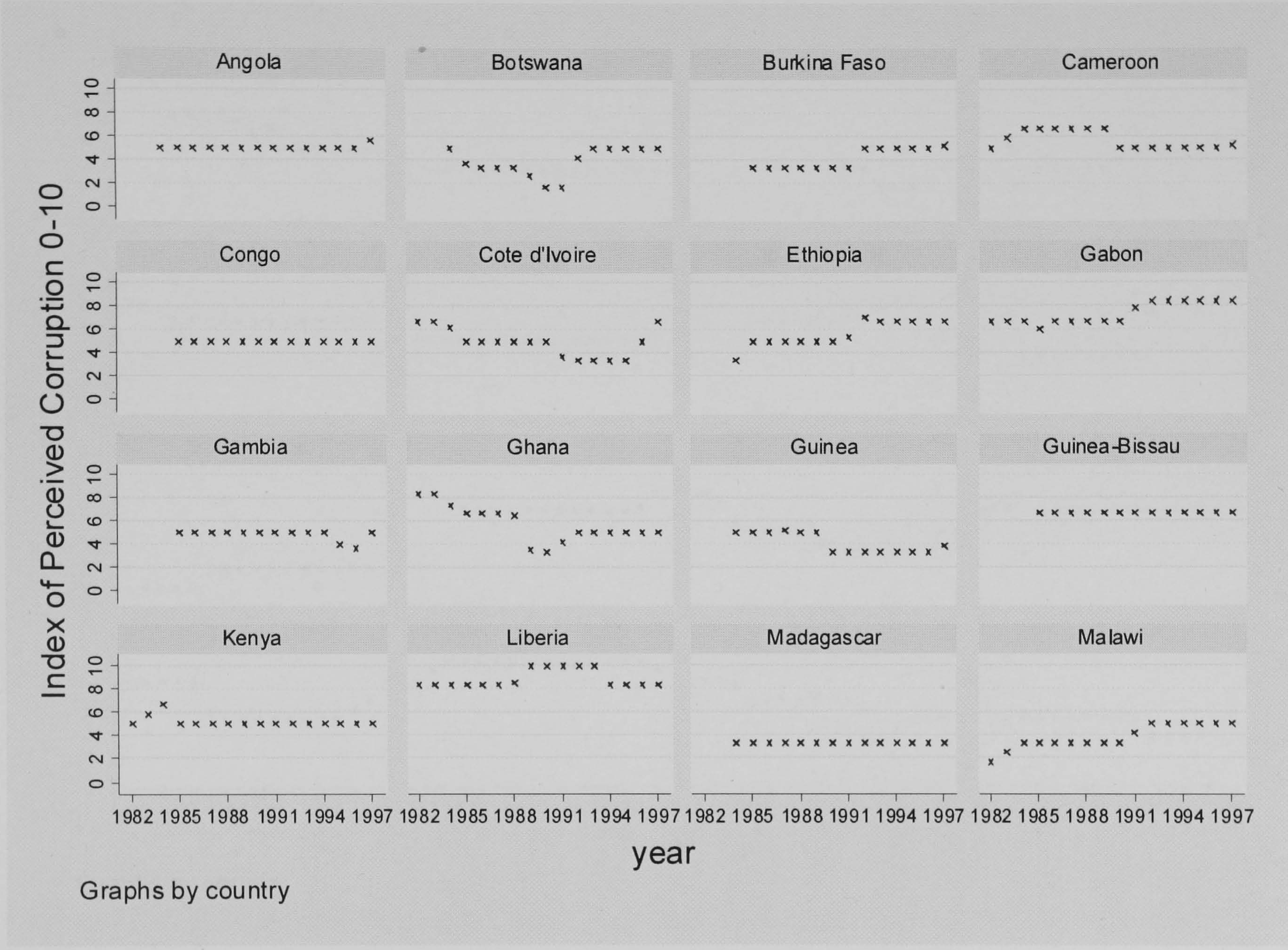


Figure 2.1: Evolution of perceived corruption by sub-Saharan African country, 1982-1997 (part 2)

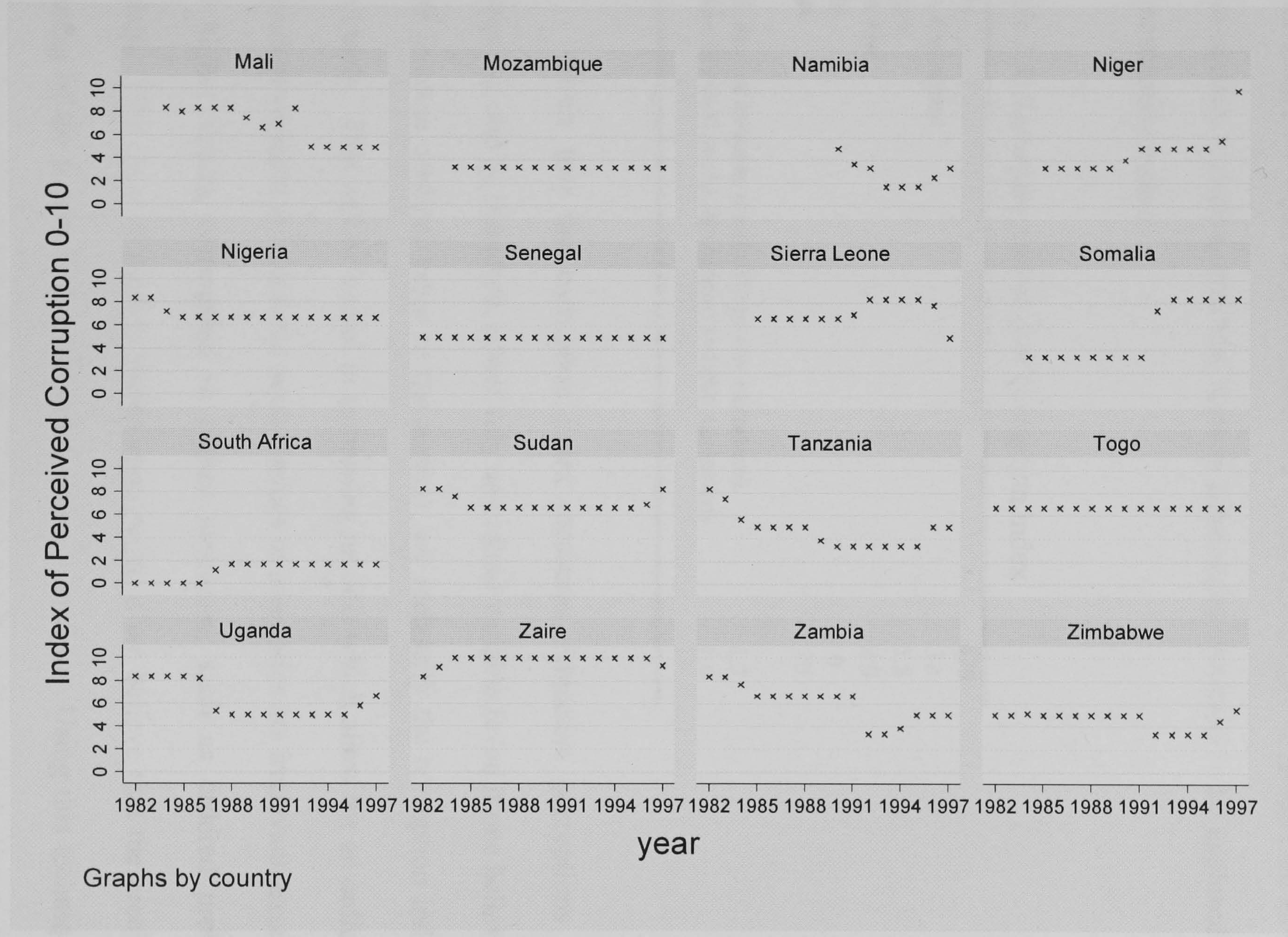


Table 2.1 provides the summary statistics for the corruption index. In spite of the existence of countries where the corruption index does not vary much over time, the between- and within-country variations of the corruption index shows the times-series variation is of the same order of magnitude as the cross-section variation, and that there is time-series variation to be explored in the corruption index.

Table 2.1: Summary statistics of corruption index

Obs.	470
No. Countries	32
Mean	5.5
Std. Dev	2.0
Min	0
Max	10
Std. dev. of country means (between variation)	1.7
Mean of country std. deviations (within variation)	1.0

Given that the corruption index measures subjective perceptions of corruption, and is, therefore, effectively an ordinal variable (even if one believes there is some cardinal value to the scores), we reclassify the corruption index into bands. This will be useful in estimating models which allow for an ordinal dependent variable in which the actual values or categories are irrelevant, except that higher values correspond to higher outcomes, such as ordered probit models. This class of models seems appropriate if we believe that the precise meaning of the scores in the corruption index is unclear. Using this technique also serves to perform a check on the argument that there is cardinal value to the corruption index. These issues are discussed further in Section 2.6.

In deciding into how many bands to categorise the corruption index, we adopted the following approach. As noted above, an inspection of the data shows that the values of the corruption index tend to be clustered around the values equivalent to the integers of the corruption index as originally scaled. We create seven equidistant bands, whereby each band contains one of the higher frequency values. These are shown in the following table:

Table 2.2: Creating bands/response categories for the corruption index

Original Score	**Rescaled Score**	**Cut-off points**[30]	**Interval**	**Bands**
6	0	1.4	[0, 1.4]	1
5	1.7	2.9	(1.4, 2.9]	2
4	3.3	4.3	(2.9, 4.3]	3
3	5	5.7	(4.3, 5.7]	4
2	6.7	7.1	(5.7, 7.1]	5
1	8.3	8.6	(7.1, 8.6]	6
0	10	10	(8.6, 10]	7

Greater perceived corruption

Figure 2.2 presents a histogram of the corruption index in the seven selected bands/response categories. Given that category 1 has a very low frequency (1%), we merge categories 1 and 2, so that we retain a total of six ordered response categories.[31]

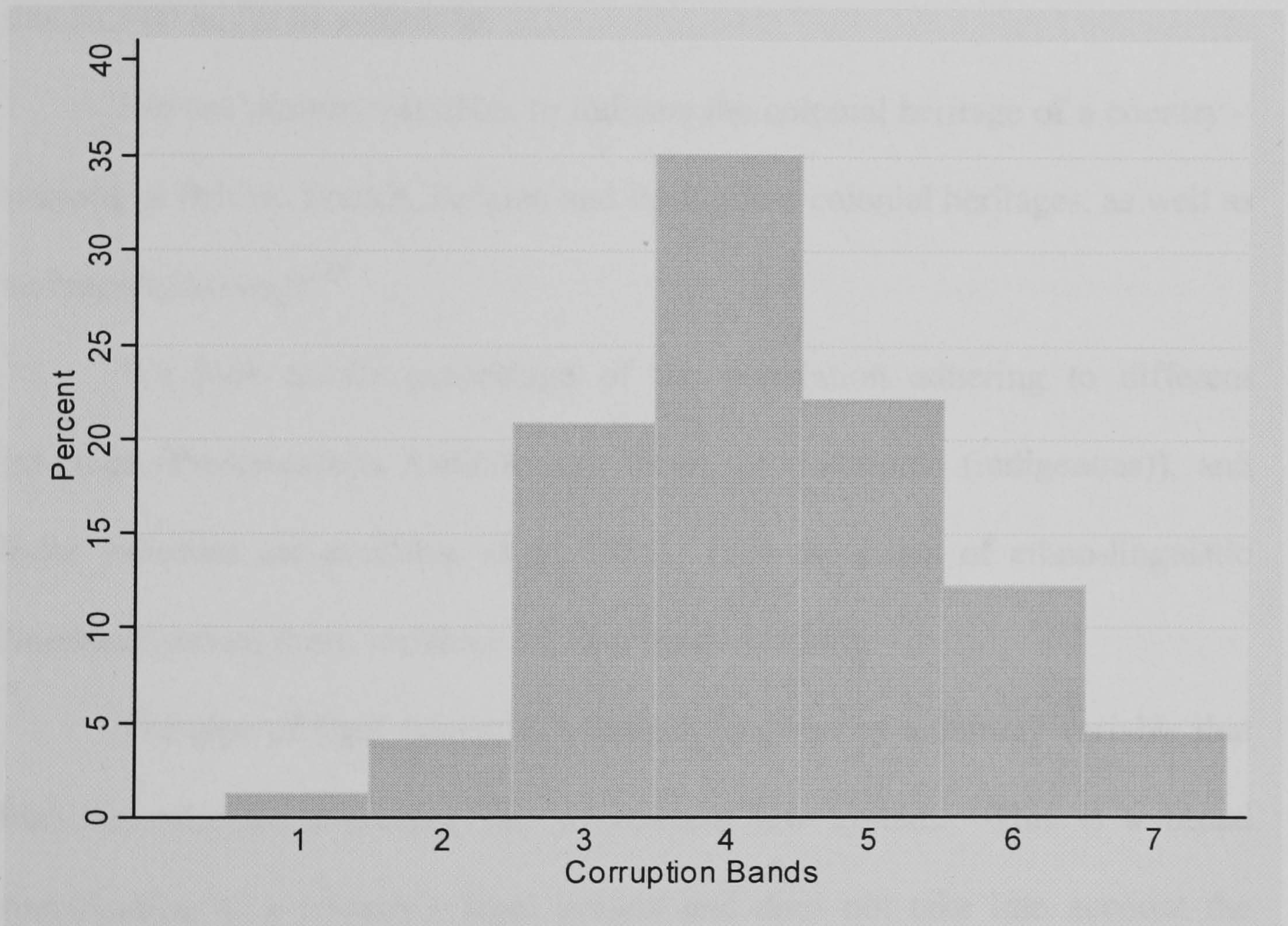
[30] The cut-off points were calculated as follows: cut-off for band i = $\frac{10}{7}i$, i-=1,...,7.

[31] Note that post-reclassification, the bands are as follows:

1	**2**	**3**	**4**	**5**	**6**
[0, 2.9]	(2.9, 4.3]	(4.3, 5.7]	(5.7, 7.1]	(7.1, 8.6]	(8.6, 10]

Note that the approach we adopted to categorise the corruption index into different bands represents just one of several other possibilities, and does not change the qualitative results. For example, the corruption index could have been divided into two (low, high), or three (low, medium, high) or five bands (very low, low, medium, high, very high).

Figure 2.2: Histogram of the corruption index



2.5 Data

Table 2.3 gives a brief description, including the sources they come from, of the variables used in this chapter to test the (frighteningly numerous) hypotheses posited in Section 2.3. We provide a brief summary, and where appropriate, further explanation, of the main variables used in the empirical specifications.

ELF60 is the index of ethnolinguistic fractionalisation as of 1960 (and, therefore, time-invariant). It measures the probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group. AVELF GUNN1, GUNN2, ROBERTS AND MULLER are used as alternative measures, as well as instrumental variables to control for measurement errors that ELF60 might be subject to.

We use dummy variables to indicate the colonial heritage of a country – we look at British, French, Belgian and Portuguese colonial heritages, as well as no colonial heritage.[32]

We look at the percentage of the population adhering to different religions (Protestantism, Catholicism, Islam, or traditional (indigenous)), and these variables are available as of 1985. Like the index of ethno-linguistic fractionalisation, these variables are also time-invariant.

The type of legal system in a country is given by a dummy variable that indicates whether a country has a common law system. This is a broad specification of a country's legal system and does not take into account the differences between different types of civil law systems (eg, French, German) and that some countries may exhibit legal systems that are neither "pure" common nor civil law.[33]

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[32] Note that only two countries in our sample have no colonial heritage, namely Ethiopia (ignoring the 1936-1941 Italian occupation during World War II). and Liberia.
[33] Note that most former British colonies tend to have a common law system, and there are just three 'divergent' cases. That is, "just common law" countries are Liberia, Democratic Republic

Footnote continues on next page.

The World Bank provides data on fuel, mineral and metal exports as per cent of merchandise exports. Unfortunately, although the country coverage of these data is excellent, the time series is plagued by missing values for most sub-Saharan African countries. To overcome this problem we use these data to construct a measure of natural resource abundance that ranges from 1 to 4, where higher values represent greater natural resource abundance. In particular, countries with less than 25% of merchandise exports from fuel, minerals and metals are coded 1, countries between 25 and 50% are coded 2, countries between 50 and 75% are coded 3, and countries with greater than 75% are coded 4.

Given the relative stability of natural resources for most countries in the sample, missing values are interpolated by examining the value of the constructed resource abundance score immediately before and after the missing data. This constructed measure is then used to create a dummy variable for each of the categories and for two further dummy variables indicating whether countries have less (more) than 50% of merchandise exports from fuel, minerals and metals.

We are confident in our constructed variable, as results are broadly unchanged when we replace it with a variable compiled by Fearon and Laitin (2003). Using data from the World Bank from 1960 onwards on fuel exports as a percentage of merchandise exports, they created a dummy variable indicating, for each year, whether countries had fuel exports greater than 33% of total exports. Firstly, they linearly interpolated missing data from 1960 to 1980.

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of Congo and Namibia (although Namibia has a 'quasi' British heritage given its link to South Africa). We have no observations for "just British heritage".

Then they created the aforementioned dummy variable. This variable was then extended forward for each country for the most recent years if these lacked data, and backwards for missing years prior to 1960, *"on the assumption once countries come 'on line' for oil production they generally stay there (this assumption was checked to a significant extent by going through the data and making country-specific inquires where we had doubts or concerns)."* Finally, they carried out country-specific research for a few countries with missing data.

As a measure for economic development, we use GDP per capita, adjusted for purchasing power.

Data on democracy comes from the Polity IV Project [described in detail in Gurr, Jaggers and Marshall (2003)], which provides information on the authority characteristics of states in the world for purposes of comparative and quantitative analysis. It is a widely used resource for monitoring and studying regime changes and the effects of regime authority. Polity IV includes constructed annual measures for both institutionalised democracy (DEMOC) and autocracy (AUTOC). These measures are *"composite indices derived from the coded values of authority characteristic component variables"*, according to pre-determined formulas (Gurr, Jaggers and Marshall (2003). A composite indicator, POLITY, which is derived by subtracting the AUTOC value from the DEMOC value, provides a single regime score that ranges from -10 (full autocracy) to +10 (full democracy).[34] In order to facilitate interpretation of this variable, we rescale it, so that it ranges from 0 (strongly autocratic) to 10 (strongly democratic).

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[34] Note that the two scales (DEMOC and AUTOC) do not share any categories in common.

In order to proxy for political stability, we use a measure of the durability of a regime. This is provided by the variable DURABLE from the Polity IV project. This provides a running measure of the durability of the regime's authority pattern for a given year, that is, it gives the number of years since the last substantive change (defined as a 3-point change in the POLITY score) in authority characteristics. It should be noted that this measure of political stability places, in terms of durability of regimes, "good" and "bad" (in terms of democracy/autocracy) regimes on a par. That is, what is being measured is how long a regime lasts. As an alternative measure, we use the incidence of civil war (dummy variable that indicates whether a country experienced a civil war in a given year).

As a measure of the quality of legal and political institutions, we use an index on the rule of law from ICRG. This (subjectively) measures the degree to which the citizens of a country are willing to grant to the established institutions the authority to make and implement laws and adjudicate disputes. This variable is measured on the scale 0-6, where higher scores indicate: *"sound political institutions, a strong court system, and provisions for an orderly succession of power."* Lower scores indicate: *"a tradition of depending on physical force or illegal means to settle claims"* [Keefer and Knack (1995)].

To measure openness to trade, the value of the sum of exports and imports of goods and services as a share of GDP is used. We also use two alternative measures, namely imports as a share of GDP, and the Sachs and

Warner (1995) trade openness variable[35] (including the updates by Easterly, Levine and Roodman (2004), as the openness index created by Sachs and Warner is only available until 1992). It should be noted that the Sachs and Warner openness measure has limited variation within sub-Saharan African countries, as it tends to cluster around "not open" until the late 1980s to early 1990s. The variable imports as per cent of GDP has the advantage that it isolates the effect of exports of natural resources. (The variable sum of exports and imports will tend to be correlated with the natural resources variable.) However, in practice, the use of the variable on imports or the sum of exports and exports makes little difference to the regression results.

General government spending as per cent of GDP is used as a proxy for state intervention in the economy. An attempt is made to use the output of state-owned enterprises as per cent of GDP to check the robustness of the results obtained using general government spending. Unfortunately, this drastically reduces the number of observations in the regressions, and, therefore, the results obtained are not reliable.

One of the hypotheses we posited in Section 2.3 was that increased female participation in the labour force and government could lead to lower levels of corruption. We use a measure of female labour force participation (as per cent of total labour force). Unfortunately, we are unable to use a measure of female political participation, which would better permit ascertaining whether

[35] A country is classified as open if it satisfies all of the following criteria: (i) average tariff rates are less than 40%; (ii) nontariff barriers cover less than 40% of trade; (iii) black market premium less than 20% relative to the official exchange rate, on average; (iv) the country is not classified as Socialist and (v) the government does not monopolise major exports.

there are systematic behavioural differences across gender that impact on the levels of perceived corruption. This is further discussed in Section 2.7.5.

The measure of aid that we use is total development aid (both bilateral and multilateral aggregate aid) as per cent of GDP of the recipient country. In the literature of aid effectiveness [see, for example, Collier and Dollar (2002), Hansen and Tarp (2001), Addison, Mavrotas and McGillvray (2005)], the measure Aid/GDP is generally accepted as being the appropriate measure to capture the "importance" of aid. We are interested in ascertaining the importance of aid in the economy and how it impacts on perceived corruption, so this measure seems appropriate for our purposes.[36]

As a measure of public sector wages, we use a variable of government wages and salaries (as per cent of total government expenditure) that is available from the World Bank (2005b). The coverage of this variable for sub-Saharan Africa is particularly poor, as it is plagued by missing observations. As we are unable to find a suitable alternative measure, the hypothesis we had posited in Section 2.3 that corruption is lower in countries with higher relative government wages cannot be adequately tested. More detail is provided in Section 2.7. Nevertheless, we include this variable in the tables below.

Table 2.4 provides descriptive statistics.[37] For ease of reference, we divide the variables into time-varying and time-invariant. Table 2.5 presents

[36] In Chapter 4 we examine the impact of perceived corruption on aid receipts by sub-Saharan African countries. In that chapter we focus on bilateral aggregate aid receipts, and as such the measure of aid differs from the total aid measure (which includes multilateral, as well as bilateral aid) used in this chapter.

[37] For completeness and ease of reference we include the corruption measure, which was already examined in the previous section.

average corruption scores for specific categories of the main explanatory variables. Table 2.6 reports the correlations between the main variables.

Table 2.3: Description and sources of data

Code	Description	Source
AID	Aid (% GNP)	World Bank (2005a)
AID_NET DISBURSEMENTS	Natural logarithm of Total Official Development Assistance – net disbursements (2000 US$)	OECD (2005a)
AREA	Surface area (square km)	World Bank (2005a)
AVELF	Average value of Elf60, Muller, Roberts and Gunn 1 and 2.	
CIVIL	Dummy=1 for countries that experienced a civil war	Until 1992: Bates After 1992: SIPRI Yearbooks.
CL_N	Measure of civil liberties, with 1 representing the highest degree of freedom and 7 the lowest. Transformation: 1-lowest; 7-highest degree of freedom.	Freedom House (2005)
CORRUPT	ICRG measure of Corruption Originally, 0-most corrupt; 6-least corrupt. Transformation: 0-least corrupt; 10-most corrupt	Keefer and Knack (1998)
DMBELG	Dummy=1 if the country was a Belgian colony	Bates
DMFRNC	Dummy=1 if the country was a French colony	Bates
DMNO	Dummy=1 if the country was never a colony	Bates
DMPORT	Dummy=1 if the country was a Portuguese colony	Bates
DMUK	Dummy=1 if the country was a UK colony	Bates
DURABLE	Regime durability: The number of years since the most recent regime change.	Gurr, Jaggers and Marshall (2003)
ELF60	Index of ethnolinguistic fractionalisation, 1960. Measures the probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group.	Easterly and Levine (1997)
FEMALE	Labour force, female (% of total).	World Bank (2005b)
GOVREV	Government revenues (% GDP)	World Bank (2005b)
GUNN1	Gunnemark1: per cent of the population not speaking the official language.	Easterly and Levine (1997)
GUNN2	Gunnemark2: per cent of the population not speaking the most widely used language.	Easterly and Levine (1997)
ILLIT	Illiteracy rate, adult total (% of people aged 15 and above).	World Bank (2005a)
INDEP	Number of years as an independent country since 1900	CIA (2005)

Code	Description	Source
IMORT_INFANT	Mortality rate, infant (per 1,000 live births)	World Bank (2005a)
INSTAB	Degrees of governmental instability as measured by the occurrence and success of coup attempts. This ordered categorical variable takes a value of 2 if there was a successful coup; a value of 1 if an unsuccessful and/or attempted or plotted coup; and a value of 0 otherwise.	Bates
IMPORTS	Imports as % GDP	World Bank (2005a)
LANDLOCK	Dummy=1 if a country is landlocked.	Bates, CIA (2005)
LATITUDE	Latitudinal distance from the equator	CIA (2005)
LAW	Dummy=1 if Common Law System.	La Porta et al. (1997b), CIA (2005)
LGDP_PC_PPP	Natural Logarithm of Real (PPP) GDP per capita, 2000 US$	World Bank (2005a)
MULLER	Probability of two randomly selected individuals speaking different languages.	Easterly and Levine (1997)
OIL_FL	Dummy=1 if Fuels, ores and metals exports (% of merchandise exports) more than 33%.	Fearon and Laitin (2003)
OPEN	Dummy=1 if country is open	Sachs and Warner (1995)
PCTCATH	Percentage of population adhering to Catholicism, 1985.	Bratton and van de Walle (1997)
PCTMUSL	Percentage of population adhering to Islam, 1985.	Bratton and van de Walle (1997)
PCTPROT	Percentage of population adhering to Protestantism, 1985.	Bratton and van de Walle (1997)
PCTTRAD	Percentage of population adhering to traditional religions, 1985.	Bratton and van de Walle (1997)
POLITY2_N	Measure of democracy. Originally, ranged from −10 (strongly autocratic) to +10 (strongly democratic). Transformation: 0 (strongly autocratic); 10 (strongly democratic).	Gurr, Jaggers and Marshall (2003)
POPULATION	Population (millions).	World Bank (2005a)
PR_N	Measure of political rights, with 1 representing the highest degree of freedom and 7 the lowest. Transformation: 1-lowest; 7-highest degree of freedom.	Freedom House (2005)
PR_CL_N	Average of political rights and	Freedom House (2005)

Code	Description	Source
	civil liberties, with 1 representing the highest degree of freedom and 7 the lowest. Transformation: 1-lowest; 7-highest degree of freedom.	
RESOURCES_UNDER50	Dummy=1 if Fuels, ores and metals exports (% of merchandise exports) less than 50%.	Constructed variable using World Bank (2005a)
RESOURCES_OVER50	Dummy=1 if Fuels, ores and metals exports (% of merchandise exports) more than 50%.	Constructed variable using World Bank (2005a)
ROBERTS	Probability that two randomly selected individuals do not speak the same language.	Easterly and Levine (1997)
RULE	ICRG measure of rule of law Scale 0-6, with higher values indicating sound political institutions.	Keefer and Knack (1998)
STATE_AC	State-owned enterprises, economic activity (% GDP)	World Bank (2005a)
TEGDP_J	Total Government Expenditure (% GDP)	World Bank (2005a)
TRADE_GDP	Trade (imports + exports) as % GDP	World Bank (2005a)
TROPICAL	Dummy=1 if absolute value of "LATITUDE" less than 23.	Constructed variable from CIA (2005)
WAGE	Government wages and salaries (% of Total Government Expenditure)	World Bank (2005b)

Table 2.4: Summary statistics of main variables

Variable	Obs.	Mean	Std. Dev	Min	Max
TIME-VARIANT:					
CORRUPT	470	5.5	2.0	0	10
RESOURCES_OVER50	512	0.4	0.5	0	1
POLITY2_N	504	3.4	2.8	0.5	9.5
DURABLE	504	14.9	17.6	0	105
RULE	470	2.6	1.1	0	6
TEGDP_J	462	15.6	6.9	4.4	54.5
FEMALE	512	43.0	5.4	27.0	50.9
WAGE	219	29.2	10.1	5.6	60.7
LGDP_PC_PPP	466	7.3	0.8	6.2	9.3
TRADE_GDP	465	61.0	29.0	6.3	161.2
AID	469	14.2	14.2	0	87.1
POP	512	14.7	18.8	0.7	117.7
IMORT_INFANT	512	106.6	33.4	48	195
TIME-INVARIANT:					
ELF60	480	0.7	0.2	0.1	0.9
DMUK	512	0.4	0.5	0	1
DMNO	512	0.1	0.3	0	1
PCTPROT	512	19.7	22.0	0	88
LAW	480	0.5	0.5	0	1
TROPICAL	512	1.0	0.2	0	1
LANDLOCK	512	0.3	0.4	0	1
AREA	501	645211.5	603065.4	11300	2505810

Table 2.5: Average perceived corruption for different 'cuts' of data

	0	1
DMUK	5.7	5.2
DMNO	5.4	6.4
LAW	5.2	5.6
RESOURCES_OVER50	5.0	6.3

	Below average	Above average
ELF60	4.9	5.8
PCTPROT	5.9	4.6
POLITY2_N	5.7	5.1
DURABLE	5.6	5.3
RULE	6.3	4.6
LGDP_PC_PPP	5.5	5.4
TRADE_GDP	5.3	5.7
TEGDP_J	5.8	5.1
FEMALE	5.8	5.3
AID	5.6	5.3
WAGE	5.2	5.5

Table 2.6: Correlations between main variables

	CORRUPT	ELF60	DMUK	DMNO	PCTPROT	LAW	RESOURCES_OVER50	POLITY2_N	DURABLE	RULE
CORRUPT	1									
ELF60	0.2472*	1								
DMUK	-0.1293*	-0.007	1							
DMNO	0.1419*	0.067	-0.2837*	1						
PCTPROT	-0.3397*	0.034	0.4008*	0.1942*	1					
LAW	0.1167*	0.2499*	0.8180*	0.089	0.5698*	1				
RESOURCES_OVER50	0.3049*	0.1766*	-0.1832*	0.2029*	0.070	0.067	1			
POLITY2_N	-0.2507*	-0.1477*	0.1451*	0.080	0.2178*	0.1784*	0.045	1		
DURABLE	-0.1080*	0.1761*	-0.035	0.1438*	-0.016	0.070	0.073	-0.1683*	1	
RULE	-0.4884*	-0.1233*	0.1216*	0.022	0.1422*	-0.016	-0.0986*	0.2001*	0.054	1
TEGDP_J	-0.2194*	-0.006	0.078	0.2874*	0.3687*	0.1770*	0.3068*	0.2362*	0.1173*	0.1355*
FEMALE	-0.2115*	-0.1863*	0.019	-0.1192*	0.1137*	-0.049	-0.043	0.045	-0.1358*	0.1415*
WAGE	0.035	0.119	-0.2766*	0.1963*	-0.1631*	-0.2478*	-0.1615*	-0.087	-0.012	0.030
LGDP_PC_PPP	-0.2099*	0.029	0.030	0.1174*	0.3900*	0.1422*	0.2772*	0.2805*	0.3376*	0.1912*
TRADE_GDP	-0.071	-0.040	-0.038	0.1057*	0.1704*	0.053	0.4215*	0.2603*	0.0984*	0.2737*
AID	-0.1446*	-0.2613*	0.004	-0.1086*	-0.2245*	-0.050	-0.2768*	0.081	0.039	-0.0955*
TROPICAL	0.4077*	-0.1584*	-0.2037*	0.058	-0.3289*	-0.1737*	0.1357*	-0.2912*	-0.3424*	-0.014
LANDLOCK	-0.1022*	-0.040	0.1958*	-0.1141*	0.2408*	0.085	-0.077	0.1186*	-0.1196*	0.1517*
AREA	0.1628*	0.1518*	0.0197	-0.0428	-0.0153	0.1344*	0.1016*	0.0445	-0.0735	-0.1489*
POP	0.0966*	0.2673*	0.2328*	0.0541	0.1034*	0.2188*	0.0125	-0.0439	-0.0893*	-0.1060*
IMORT_INFANT	0.2389	-0.0960*	-0.2208*	0.0874*	-0.4874*	-0.2352*	0.0425	-0.2476*	0.0306	-0.2741*

Table 2.6: Correlations between main variables (cont.)

	TEGDP_J	FEMALE	WAGE	LGDP_PC_ PPP	TRADE_GDP	AID	TROPIC AL	LANDL OCK	AREA	POP	IMORT_ INFANT
TEGDP_J	1										
FEMALE	0.081	1									
WAGE	-0.020	0.077	1								
LGDP_PC_PPP	0.4129*	-0.1619*	-0.097	1							
TRADE_GDP	0.5365*	0.040	-0.1777*	0.4401*	1						
AID	-0.1158*	0.1689*	-0.1856*	-0.4094*	-0.011	1					
TROPICAL	-0.087	0.1919*	0.099	-0.4902*	0.0955*	0.1026*	1				
LANDLOCK	0.059	0.3652*	0.079	-0.1733*	-0.1240*	0.023	0.1064*	1			
AREA	0.0063	-0.2584*	-0.0691	0.0201	-0.1966*	-0.2045*	-0.1730*	-0.0183	1		
POP	-0.1714*	-0.2611*	-0.0442	-0.1916*	-0.2739*	-0.2464*	-0.1930*	-0.1343*	0.4232*	1	
IMORT_INFANT	-0.2098*	-0.0981	0.0784	-0.5541*	-0.2637*	0.4815*	0.2747*	0.0095	-0.1606*	-0.2175*	1

* significant at the 5% level

2.6 Analysis and Estimation Issues

In Section 2.3 we postulate a series of hypotheses regarding the causes of corruption in sub-Saharan Africa. We adopt the following procedure to test those hypotheses. We begin by considering a baseline specification, consisting of the most "exogenous" group of variables, i.e., the long-predetermined historical, geographical, cultural and ethnic characteristics. We then sequentially add further groups of variables. First, we add a measure of economic development, then, we add a group of variables characterising the level of democracy and political instability, followed by the quality of legal and political institutions. Finally, we include variables capturing public policy.

We compile a panel data set[38] covering 32 sub-Saharan African countries over the period 1982-1997.[39] Panel data sets for economic research possess several major advantages over conventional cross-sectional or time-series data sets.[40] First, they permit controlling for unit heterogeneity.[41] Second, panel data provide a large number of data points, give more informative data, more variability, increasing the degrees of freedom and reducing the collinearity among explanatory variables, thus improving the efficiency of econometric estimates. Third, they are better able to identify and measure effects that are simply not detectable in pure cross-sections or pure time-series data. Fourth,

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[38] A panel, or longitudinal or cross-section-time-series, data set is one that follows a given sample of units over time, thus providing multiple observations on each unit in the sample.

[39] The countries in the sample are: Angola, Botswana, Burkina Faso, Cameroon, Congo (Republic), Cote d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Democratic Republic of Congo (formerly Zaire), Zambia, Zimbabwe.

[40] See, for example, Greene (2000), Hsiao (1986), Baltagi (1995).

[41] Heterogeneity across units is an integral part, indeed often the central focus, of the analysis.

panel data models allow for the construction and testing of more complicated behavioural models than purely cross-section or time-series data.

There are three main data analysis/estimation issues we would like to highlight. Firstly, it is important to note that we are considering a substantial number of hypotheses, and, therefore, explanatory variables. This is especially significant given the number of observations available in our estimation samples, due in part to our focus on sub-Saharan Africa. So we have a problem of losing degrees of freedom as we control for many explanatory variables simultaneously, and there is the risk that there may not be enough variation in the data that would permit ascertaining the impact of the different factors. On the other hand, the problem of not controlling for several explanatory factors and only looking at each hypothesis individually (or with a very limited number of other explanatory variables), is that there is the risk of omitted variable bias. As the hypotheses we posited in Section 2.3 derive from a set of factors that have been found, either theoretically or empirically, to have a significant impact on a country's level of corruption, and we have a panel data set, we prefer the risks of controlling for a substantial number of factors rather than the risks of omitted variable bias.

Secondly, many of the variables are likely to be endogenous – they may cause corruption and corruption may cause them. The standard technique to correct for endogeneity is instrumental variables or two-stage least squares. However, this requires the identification of suitable instruments. A good instrumental variable should be *both* highly correlated with the endogenous explanatory variable and uncorrelated with the dependent variable. However, there is an acknowledged difficulty in finding suitable instruments. Indeed, we are not always successful in finding good instruments. In addition, results are typically very sensitive to the choice of instruments. Therefore, we also use an alternative approach to IV in addressing endogeneity issues. This alternative approach consists of using lagged values of the potentially endogenous explanatory variables instead of IV. That is, we use lagged values in place of the contemporaneous values of the potentially endogenous variables. Insofar as lagged values of these variables are predetermined with respect to current perceived corruption, we should be able to address the causality issue.[42]

The third issue relates to the estimation techniques based on different treatments of the dependent variable, perceived corruption. As we discuss in Section 2.4, the corruption measure we use is based on subjective perceptions and, despite the widespread belief in the literature that its scores have cardinal value, it is an ordinal variable. So in order to test the robustness of our results, we perform a sensitivity analysis on our main results by estimating the models treating the dependent variable as ordinal rather than cardinal.

When the dependent variable cannot be treated as continuous and instead takes on a finite/discrete number of outcomes, qualitative response models should be used. In addition, if the multinomial-choice variable is inherently ordered, then this ordinal nature of the dependent variable must be taken into account. Even if we do not believe there is cardinal value to the corruption

[42] We have defined "destiny" as including *long-predetermined* historical, natural and cultural conditions which cannot be altered. So our definition excludes previous policies adopted by governments. Had we defined a broader notion for historical conditions, these could include policies from previous years/periods. In that case, the use of lagged, or out-of-sample values, could also potentially help to distinguish the broader concept of "destiny" from policy-induced determinants of corruption.

index (and therefore the actual values are irrelevant), it is true that higher values correspond to higher outcomes,[43] i.e., we do not believe that the ordering of the scores is irrelevant. Therefore, an ordered probit model is appropriate. Note that if we believed the ordering was irrelevant (as is the case, for example, in choice of occupation), the multinomial logit model would be appropriate. The ordered probit model for the dependent variable y, "perceived corruption in bands", (conditional on explanatory variables) can be derived from a latent variable model. Let y be an ordered response with values $\{0,1,...,J\}$, where J is a known integer. Assume that a latent variable y^* is determined by

$$y^* = \mathrm{x}\beta + e, \quad e|\mathrm{x} \sim \mathrm{Normal}(0,1)$$

where β is $K \times 1$ and x does not contain a constant. Define

$$\begin{array}{ll} y = 0 & \text{if } y^* \le \alpha_1 \\ y = 1 & \text{if } \alpha_1 < y^* \le \alpha_2 \\ \cdot & \\ \cdot & \\ \cdot & \\ y = J & \text{if } y^* > \alpha_J \end{array}$$

where $\alpha_1 < \alpha_2 < ... < \alpha_J$ are unknown cut-off points or threshold parameters. The conditional distribution of y given x can be derived and the probability of each outcome/response computed as a linear function of the explanatory variables and the set of thresholds. The parameters α and β can be estimated by maximum likelihood.[44]

In these models, the estimated coefficients β are of limited interest. What are of interest are the marginal effects of the regressors on the response

[43] In the case of the originally-scaled variable, a country with a higher value corresponds to a country perceived as "cleaner"/more honest, whereas in the case of the rescaled variable, a country with a higher value is a country perceived as more corrupt.
[44] Note that if e has the standard logistic distribution we have the ordered logit model.

probabilities. Note that in these non-linear models, the magnitude of the change in the outcome/response probability for a given change in one of the explanatory variables depends on the levels of all the explanatory variables.

We focus on estimating linear regression models and present some estimates of non-linear models as a robustness check. We estimate static models (that is, we model a contemporaneous relationship between perceived corruption and the explanatory variables). The empirical corruption literature focuses on static models for several reasons. Firstly, most papers in the literature tend to have only cross-section data. Secondly, even if panel data is available, the typical problem encountered is that most of the factors that are thought to affect corruption levels tend to be time-invariant, or to change slowly over time. So the estimators used for dynamic models (such as the Arellano-Bond estimator) would not be appropriate in this context.

Firstly, as our point of departure, we estimate our models using the average of perceived corruption over the period 1982-1997, using ordinary least squares (OLS). We do so for reasons of comparability with other studies. These estimates can be interpreted as representing aggregate correlations over the long term. Unfortunately, given the limitations in terms of observations and the number of explanatory variables, it is not possible to derive robust conclusions from the estimation of this model.[45] We then estimate our specifications using a pooled sample of observations. By estimating a pooled model we are increasing the number of observations (as we have observations for multiple years for each country in the sample). This also allows for the

[45] Note that estimating a model that uses averages over time (in this case, over the period 1982-1997) for each country is effectively estimating a Between Groups (BG) model.

comparison of our results with those papers that have data for several countries and years and that estimate pooled models. We then re-estimate each specification, explicitly taking into account the panel nature of the data set. We estimate a random effects (RE) model.

Consider the following model, $y_{it} = \beta' x_{it} + \alpha_i + \mu_{it}$, $i = 1,...,N; t = 1,...,T$, where i denotes the cross section dimension (countries), t denotes the time series dimension (years) and x_{it} is a vector of K regressors. μ_{it} denotes the vector of disturbance terms, which is assumed to be uncorrelated with the x_{it}'s. The α_i denote the time-invariant unobservable country-specific effect. Their inclusion in the model ensures that unobserved country heterogeneity, that is, heterogeneity of countries that is not fully captured by the explanatory variables, is accounted for. Whether the individual effect is correlated with explanatory variables is the substantive assumption that distinguishes between the RE and the fixed effects (FE) models. In the RE model, α_i is assumed to be uncorrelated with the x_{it}'s, whereas in the FE model α_i is correlated with the x_{it}'s.

FE models may be estimated by pooled Ordinary Least Squares (OLS) on the deviations from the group means (i.e., on time-demeaned data)[46] – this estimator is called the within-group (WG) estimator. Note that any potential correlation of the explanatory variables with the time-invariant individual country effects is avoided by wiping them out of the equation to be estimated.

[46]Time-demeaned equation: $\left(y_{it} - \bar{y}_{i\bullet}\right) = \beta'\left(x_{it} - \bar{x}_{i\bullet}\right) + \left(\mu_{it} - \bar{\mu}_{i\bullet}\right)$. The overbar denotes time averages.

One disadvantage is that the coefficients of time-invariant variables cannot be estimated.

RE models may be estimated by Generalised Least Squares (GLS). The GLS estimator is simply the pooled OLS estimator of the quasi-demeaned data.[47] Note that RE models can also be estimated using the WG estimator (although if α_i is uncorrelated with the x_{it}'s the WG estimator is consistent but not efficient, whereas the GLS estimator is consistent and efficient). The GLS estimator takes into account the variation within, as well as between countries, therefore, exploring the cross-sectional and time-series dimensions of the data. Its efficiency, however, holds only if the countries' unobserved heterogeneity is uncorrelated with their observed characteristics.

Our choice between the RE and FE models is based on the Hausman test.[48] All the regressions presented fail to reject the hypothesis that the coefficients estimated by GLS and WG do not systematically differ from each other (Hausman specification test). Therefore, it can be assumed that the individual country effects can be treated as random effects and that the coefficients of the GLS estimator are free from unobserved heterogeneity bias.

[47] Quasi time-demeaned equation: $y_{it} - \lambda \bar{y}_{i\bullet} = \beta' \left(x_{it} - \lambda \bar{x}_{i\bullet} \right) + \varepsilon_{it}$, where ε_{it} is a white noise error and $\lambda = 1 - \sqrt{\dfrac{\sigma_\mu^2}{\sigma_\mu^2 + T\sigma_\alpha^2}}$.

[48] Note that some authors, such as Lloyd, Morrissey and Osei (2001), prefer to consider the Hausman test as a test for efficiency against consistency. Briefly, this is because the WG estimator may be used to estimate a RE model as well as a FE model, even though it is a consistent but inefficient estimator of the RE model, whereas GLS is both a consistent and efficient estimator of the RE model.

2.7 Regression Results

It will come as no surprise to anyone who studies Africa that the greatest difficulties typically arise from missing data. Indeed, our choice of corruption index is guided by the availability of adequate coverage for sub-Saharan Africa for a reasonable period of time. We encounter some problems with the variable used to measure the endowment of natural resources in a country (fuels, ores and metals exports as per cent of exports). To solve this problem, we construct a measure using available data.

The other variable that presents problems is the measure of government wages and salaries, as it is plagued with missing observations. In particular, including the wage variable reduces the number of observations from a minimum of 385 when all hypotheses except the wage hypothesis are considered to 183 when the wage hypothesis is also accounted for. Although this appears to be a reduction from a minimum of 28 countries to 24 countries, a closer inspection reveals that a further five countries only have observations for *at most* four of the original 16 years. Given that our data set already only includes 32 of the 48 countries in sub-Saharan Africa, we are particularly wary of reducing our sample size to effectively 19 countries.

We try to solve the problem of missing data for the wage variable by using an alternative measure. Van Rijckeghem and Weder (2001) use a wage variable that is the ratio of government wages to manufacturing wages. Although this cross-national data set on government employment and wages is available from the World Bank's website, it provides no information on government relative to manufacturing wages for sub-Saharan African countries.

Rauch and Evans (2000) are the only other source of data on relative wages. They conducted a survey with experts in 35 less developed countries that included a question on the level of civil-service wages relative to comparable private sector employment. Unfortunately, their data set only includes four sub-Saharan African countries.

Given that we are unable to find an alternative measure for the wage variable, we include it in our final regression (column [7] of the results tables) as a means of providing some indication as to the potential impact of civil-service wages on a country's level of corruption and for the sake of completeness. However, we focus our discussion of the results mostly excluding the result on the wage hypothesis, i.e., on regression [6].

Although we present results for the models estimated using the average of perceived corruption over the period 1982-1997 as a starting point, the main discussion of results, including robustness checks and detailed information on instrumental variables, is given in the discussion of the pooled model in Section 2.7.2. This is because, given the small number of observations, the results of the former models are not very reliable and therefore do not form the basis for our conclusions.

2.7.1 Cross-section on 1982-1997 Averages

As our starting point, we estimate our models using the average of perceived corruption over the period 1982-1997, using ordinary least squares (OLS). Although, given the relatively small initial sample of 32 sub-Saharan African countries we lose degrees of freedom thus worsening the efficiency and reliability of our estimates, we perform this estimation on country averages for comparability with other studies in the literature. These estimates can be interpreted as representing aggregate correlations over the long term. In particular, we are motivated by the fact that the existing empirical work tends to group sub-Saharan Africa, and indeed sometimes even the whole of Africa, into a dummy variable in world-wide cross-country regressions. However, as we are well aware of the limitations in terms of observations and number of explanatory variables, we do not rely on these results to form the basis of robust conclusions.[49]

The results are presented in Table 2.7. Two strong correlations emerge – countries with a British heritage are perceived as less corrupt, whereas those with a common law system are perceived as more corrupt. This result is counter-intuitive, as a country's common law legal system and British colonial experience are highly correlated. The number of "divergent" cases where a country has a common law system but no British heritage, or where a country has just a British heritage but no common law system is very small in our sample.[50] More details on how an attempt is made to draw a distinction between these highly correlated variables are given in Section 2.7.2. Three other variables are significant in all regressions, yet lose their significance when alternative measures are used. Political stability, as measured by the number of

[49] We also experiment with earlier versus later period averages (averages over 1982-1989 for the former, and over 1990-1997 for the latter), and test whether the coefficients would be equal across the two period averages. Our results show that the coefficients for the two period averages are not statistically different (we fail to reject the hypothesis that the coefficients from the different periods are equal). Therefore, we only present results for the overall average of the period 1982-1997.

[50] "Just common law": Liberia, Democratic Republic of Congo and Namibia (although Namibia has a 'quasi' British heritage given its link to South Africa). We have no observations for "just British heritage".

years since the last regime change, is no longer significant when measured by either the number of civil wars or when measured by the occurrence and success of coup attempts. Trade ceases to be significant when either the Sachs and Warner index of openness or imports as a per cent of GDP measure is used instead of exports and imports as per cent of GDP. Finally, when government revenues as per cent of GDP are used as an indication of state intervention, the coefficient exhibits the expected (positive) sign but is insignificant. Although no other variables are consistently significant across all specifications, their coefficients tend to exhibit the expected signs (with the exception of "never a colony", which is always positive).

We attempt to address the problems of endogeneity between corruption and income, trade and aid by using instrumental variables. Unfortunately, all the instruments we use (whether a country is tropical, landlocked, its size, population, infant mortality)[51] perform very badly. The alternative approach of controlling for the possibility of endogeneity bias by using lagged values for income, trade and aid yields insignificant coefficients for all these variables.[52] This is independent of whether the lag is one period (that is, using averages over the preceding period 1966-1981), or whether it is the year preceding the initial year of the period (that is, using the values for the year 1981). Thus, we are unable to fully address the endogeneity problems.

[51] More details on the instruments used can be found in Section 2.7.3.
[52] Insofar as lagged values of these variables are predetermined with respect to current perceived corruption levels, we should be able to address the causality issue.

Whilst estimating this model provides a starting point, it is plagued by limitations, and does not allow for the determination of which factors might affect perceived corruption in sub-Saharan African countries.

Table 2.7: Determinants of Perceived Corruption – Cross-country on 1982-1997 averages

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Ethnolinguistic fractionalisation	1.447	1.506	1.914	1.322	2.340*	2.356*	3.053
	[1.608]	[1.358]	[1.319]	[1.260]	[1.169]	[1.257]	[2.819]
Former British Colony	-2.804***	-3.186***	-2.812***	-2.353***	-2.792***	-2.781***	-3.591**
	[0.699]	[0.605]	[0.512]	[0.742]	[0.807]	[0.857]	[1.480]
Never a colony	0.211	0.413	0.301	0.459	0.977	0.953	0.339
	[0.506]	[0.543]	[0.626]	[0.606]	[0.605]	[0.664]	[1.221]
Protestants (%)	-0.036	-0.031	-0.034***	-0.038***	-0.020*	-0.020*	-0.018
	[0.025]	[0.020]	[0.009]	[0.010]	[0.010]	[0.011]	[0.022]
Common law system	3.687***	3.976***	3.838***	3.564***	3.638***	3.620***	3.556**
	[0.645]	[0.679]	[0.580]	[0.790]	[0.836]	[0.902]	[1.095]
Natural resources	0.797	0.926	0.516	0.531	0.311	0.295	0.368
	[0.649]	[0.632]	[0.404]	[0.427]	[0.491]	[0.532]	[0.725]
Log (GDP per capita)		-0.399	0.455	0.435	0.303	0.266	0.56
		[0.562]	[0.382]	[0.390]	[0.385]	[0.587]	[0.469]
Democracy			-0.255	-0.256	-0.195	-0.19	-0.197
			[0.166]	[0.169]	[0.179]	[0.201]	[0.236]
Political stability			-0.081***	-0.068**	-0.089***	-0.088***	-0.110**
			[0.022]	[0.025]	[0.020]	[0.022]	[0.041]
Rule of law				0.154	0.077	0.077	0.046
				[0.169]	[0.169]	[0.178]	[0.270]
Trade (% GDP)					0.027*	0.027*	0.009
					[0.012]	[0.014]	[0.020]
Government expenditure (% GDP)					-0.096**	-0.097**	0.004
					[0.034]	[0.035]	[0.120]
% Females in labour force					-0.049	-0.047	-0.043
					[0.030]	[0.034]	[0.043]
Aid (% GNP)						-0.004	0.034
						[0.039]	[0.043]
Government wage							-0.035

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
							[0.046]
Constant	4.168***	6.885	2.503	3.576	5.42*	5.624	3.584
	[1.173]	[4.285]	[2.113]	[2.295]	[2.632]	[3.701]	[3.495]
Observations	29	28	28	28	28	28	24
Adjusted R^2	0.431	0.347	0.657	0.646	0.727	0.707	0.673

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

2.7.2 OLS Results, Pooled Data

We now explore the fact that we have observations for multiple years for each country in the sample. Estimates from the regressions performed using OLS on the pooled data are presented in Table 2.8. Note that, following the literature, and in order to make comparisons with the existing empirical studies, we are assuming that the measure of perceived corruption has cardinal meaning, so that we refer to the magnitude of coefficient estimates in the discussion of results, rather than to simply their sign and significance (as would be appropriate given the ordinal nature of the corruption index). Section 2.7.4 contains a sensitivity analysis that takes into account that the corruption measure is an ordinal variable, and shows that the results are qualitatively similar.

Of the variables included in the baseline regression, only the dummy for former UK colonies, the percentage of Protestants,[53] natural resource abundance and the legal system are consistently individually significant. The first three also exhibit the expected signs on their coefficients. As was the case in Section 2.7.1, not only does a country with a common law system appear to be perceived as more corrupt, but this variable is also the one that has the greater magnitude in determining perceived corruption. A country that has a common law system has a corruption score between 3.1 and 3.9 points higher than a country that does not, *ceteris paribus*. This suggests that caution is needed in stating that legal systems *per se* determine corruption levels - the way that institutions work may depend fundamentally on the political and cultural setting into which they were introduced.

[53] This is true even controlling for the percentage of the population that was Muslim, Catholic or adhering to traditional (or indigenous) religion.

In order to ascertain whether colonial heritages other than the British were associated with greater or lower perceived corruption, we run the baseline regression including dummies for French, Belgian and Portuguese colonial heritages. The British heritage dummy remains significant but the remainder are never significant, therefore, suggesting something specific about former British colonies.

Although legal system and colonial experience are highly correlated, the overlap is not perfect. Drawing a distinction between the highly correlated common law and British heritage variables involves considering the "divergent" cases, in which a country has just a common law system but no British heritage or in which a country has just British heritage but no common law system. We use these variations to attempt to distinguish between the effects of being a former British colony and having a common law legal system. Following Treisman (2000), we run regressions considering such distinctions, and although with the small number of "divergent" cases significance is reduced, the results do appear to suggest that countries with both common law and British heritage probably have lower perceived corruption and that those with only a common law have higher perceived corruption. We must emphasize the fragility of these results, as they depend on a small number of "divergent" cases – only three in our sample of 32 countries. A more refined study of how certain aspects of legal practice relate to corruption in government is needed. Nonetheless, our results do suggest that a country's political and cultural setting may significantly condition the way that institutions work. A legal system based on judicial precedents and which gives judges broad discretion may reduce corruption in a country with an effective system of enforcement, whereas it may foster corruption in a country that lacks a strong tradition of procedural justice, or in a country where the judges themselves are corrupt.

The fact that a country has never been a colony does not appear to decrease perceived corruption. In fact, the coefficient is always positive, being significant in columns [4] through [6]. Re-estimating the models with the observations used in column [6] yields results broadly similar to those in columns [4]-[6]. As it does not seem very intuitive that a lack of colonial heritage should increase perceived corruption, we try verifying this result by estimating the models using a variable that measures years of independence instead of the "never a colony" dummy. The results suggest that, in fact, the longer a country has been independent, the less likely it is to be perceived to be corrupt. It is important to bear in mind the limitations of these variables. As we noted earlier, there is very little variation across countries in the variable "no colonial heritage". The same is true of the variable "years of independence", as most sub-Saharan African countries became independent in the early 1960s.

The coefficient of ethnolinguistic fractionalisation has the expected sign and is significant at the conventional levels in all regressions except [5] (and [7], although as explained above, we only include these results for the sake of completeness and not to derive conclusions). However, it is significant at the 12% level. This is confirmed when alternative measures are used (namely, GUNN1, GUNN2, AVELF).[54] In any case, the impact on perceived corruption levels of an ethnically diverse population is not very strong.

Countries where fuel, metals and minerals constitute more than 50% of exports tend to have higher perceived corruption – between 0.6 and 1 point higher – than those countries with low natural resource abundance. This result is robust to using an alternative measure of natural resource abundance [Fearon and Laitin (2003)]. In Treisman (2000) and Serra (2006), the impact of natural resources on perceived corruption disappears when economic development and democracy are controlled for. Similarly, Ades and Di Tella (1999) fail to find a consistent and significant impact of natural resource abundance on perceived corruption levels. However, Leite and Weidmann (1999) do show that the extent of perceived corruption depends on natural resource wealth. This discrepancy in results may be related to the sample of countries included in each study. In particular, Leite and Weidmann (1999) appears to be the study including the greatest number of sub-Saharan African countries.[55]

A striking result in Table 2.8 is the correlation between economic development and perceived corruption. Not only is the coefficient only significant and with the expected negative sign in column [2], its effect is very

[54] We also use ROBERTS and MULLER. However, due to the lower data availability, there is a significant reduction in the number of observations.

[55] The main dependent variable used by Treisman (2000) is TI's CPI for 1997, which includes only two sub-Saharan African countries and for 1998 (includes 15 sub-Saharan African countries). In order to check his results, Treisman also uses a corruption index from Business International for the early 1980s (includes only 10 countries from sub-Saharan Africa). Ades and Di Tella (1999) include only three sub-Saharan African countries in their 1980s regressions and none in their 1990s regressions. Serra (2006) selects a sample of 62 countries based on data availability for her 28 variables. Therefore, although she uses the Kaufmann Kraay and Zoido-Lobaton. (1999a) Control of Corruption measure, which covers 33 sub-Saharan African countries in 1996 and 46 in 1998, she also uses the CPI average for 1997-1999, which includes at best 16 countries from sub-Saharan Africa.

small, only -0.4. This implies that, *ceteris paribus*, a doubling of GDP per capita – say from that of Zimbabwe to that of Botswana – would lead to a drop in the corruption score of 0.4 points – which would bring Zimbabwe down to the Republic of Congo's score. The magnitude of this significant result is consistent with Serra (2006) and Treisman (2000). The coefficient on income per capita loses significance and has a positive sign as soon as measures of democracy and political instability are included.

An obvious question is the direction of causation. By increasing the probability of identifying and punishing illicit rent appropriation and thereby lowering government officials' incentives to behave dishonestly, it may be argued that economic development exerts a control on corruption. However, corruption may also slow down economic development [see, for example, Mauro (1995)]. In order to tackle this endogeneity problem, we use instrumental variable estimation in the next sub-section, as well as lagged values of the endogenous economic development variable in Section 2.7.4.

The measure of democracy in a country is always significant and with the expected impact on perceived corruption levels, signalling that more democratic countries tend to be perceived as less corrupt. A country relatively more democratic (one standard deviation increase) is perceived to be 0.32-0.48 points less corrupt. In order to check the robustness of this result we use an alternative measure of democracy, namely, a measure of political rights from Freedom House. This measures the degree of political freedom in a country, on a scale of 1-7, where higher values denote less freedom. We rescale this variable so that higher values denote more freedom.[56] The result of more democratic countries being perceived to be less corrupt is not robust to the use of an alternative measure of democracy. We also experiment with a composite measure of political rights and civil rights (from Freedom House). The results are still insignificant. Treisman (2000) finds that the *current* level of democracy in a country does not impact perceived corruption, but that if a country has been consecutively democratic for at least 40 years then there is a small dividend in terms of perceived corruption reduction. Unfortunately, there is no country in our sample with a continuous period of 40 years of democracy. We experiment with shorter periods of consecutive democratic institutions. Our results considering a period of 10, 20 or 30 years of continuous democracy are insignificant at conventional levels. It is important to bear in mind that Botswana is the only country in our sample with a long record of democracy.

More politically stable (as measured by the durability of the regime) countries tend to be perceived as less corrupt. To test the robustness of this result we experiment with another measure of political instability, the incidence of civil wars. Once again, the results are not confirmed.

The quality of legal and political institutions, as measured by an index on the rule of law, has a significant impact on the level of perceived corruption. A one standard deviation increase in the rule of law index decreases perceived corruption by between 0.28 and 0.35 standard deviations.[57] Given the strong

[56] We perform a linear transformation, where Rescaled variable=8-Original variable.
[57] Note that by using the standardized, or beta, coefficients in our discussion of the results we are able to abstain from the units of measurement of the explanatory variables and, therefore, are better able to compare the magnitudes of their impact on the dependent variable. See Wooldridge (2003) for further details. However, note that we report the magnitude of *Footnote continues on next page.*

correlation between the rule of law and perceived corruption, we also try including measures of education and civil and human rights. To the extent that formulation, implementation and public knowledge of written codes and laws reduces corruption, a more educated population may be less tolerant of corruption. Furthermore, a society with greater respect for civil liberties and human rights will provide the means for the population to expose corrupt behaviour. In principle, a more educated and active civil society could help to reduce corruption by being less tolerant to corrupt practices, thereby having greater incentives and means to expose that type of behaviour. Greater civil liberties and respect for human rights, though never significant, tend to decrease perceived corruption.

As a measure of the education of the population, two alternative variables are available, namely, the illiteracy rate of the total adult population (aged 15 and above), and the average years of schooling attained by the total adult population. However, due to the large number of sub-Saharan African countries that lacks observations for the average years of schooling attained, the former measure has to be used. The percentage of illiterate population is never significant and tends to exhibit the wrong sign.

The estimates in Table 2.8 suggest a relationship between greater openness to trade (as measured by imports and exports as per cent of GDP) and higher perceived corruption. This result is at odds with the theoretical and empirical literature. In order to check our result we use two alternative measures of openness to trade, namely, imports as a per cent of GDP and the

coefficients for comparison with other studies, as given the ordinal nature of the corruption index it is best to look only at sign and significance.

Sachs and Warner index of openness to trade. The correlation between imports and perceived corruption levels in a country is also strongly positive. In contrast, open economies exhibit lower levels of perceived corruption. These results are not incompatible, although they may seem so at first. Measures of exports and imports relates to quantities of trade, whereas the Sachs and Warner index relates to policy stances. For example, sub-Saharan African countries with large endowments of natural resources where these constitute a large proportion of exports will typically fail the Sachs and Warner criteria of lack of government monopoly over major exports. Also, a larger trade flow may increase the opportunities for both the solicitation of bribes by corrupt government officials, as well as the offer of bribes by the trade partner. In particular, bribing of foreign officials was not considered illegal prior to the OECD's Anti-Bribery Convention that came into effect in 1999.[58] A notable exception is the US, where bribing foreign officials has been illegal since the 1974 Foreign Corrupt Practices Act.

However, openness to trade is clearly endogenous. Openness to trade and the consequent exposure to foreign competition may constrain corruption, but corrupt officials may create rent-seeking barriers to trade. In order to tackle this endogeneity problem, we use instrumental variable estimation in the next sub-section, as well as lagged values of the endogenous trade variable in Section 2.7.4.

An increase of ten percentage points in general government total expenditure as per cent of GDP decreases perceived corruption by around 0.3

[58] In some countries, such as Portugal, bribing foreign officials was actually tax-deductible.

points. We use the output of state-owned enterprises as per cent of GDP to check the robustness of the results obtained using general government spending. Unfortunately, this drastically reduces the number of observations in the regressions and, therefore, the results obtained are not reliable. We also try using government revenues as a proportion of GDP. The coefficient is never significant, although it has the expected positive sign in regression [5].

A possible explanation for an uncertain effect of government size on corruption relates to competition between government officials and their perceived balance between risk and reward. When bureaucrats have overlapping enforcement areas, then clients have a choice of which bureaucrat to approach [Rose-Ackerman (1999)]. This introduces competition and reduces the monopoly power of any one bureaucrat. This, in turn, reduces the bureaucrats' ability to demand large payoffs. Of course, even with low bribe levels, corruption may still be considered rampant if there are overwhelming numbers of corrupt bureaucrats. Also, lower levels of reward may induce some officials to remain honest. Note, however, that this is more likely to be the case when the risks of being corrupt are greater. These risks are greater when there is effective monitoring, a high probability of being caught, as well as a high likelihood of being punished.

The results in columns [5] and [6] show that a ten percentage points increase in the percentage of the labour force that is female is associated with a decrease in perceived corruption of around 0.4, and a standard deviation increase is associated with a decrease in perceived corruption of 0.12-0.13 standard deviations. This effect is important. Women in Africa work predominantly in agriculture,[59] and have less access to productive assets and complementary factors of production such as credit and education. Greater equality in the access to education and production factors would increase the share of labour force that is female, thus not only helping to reduce corruption, but also increasing growth rates.[60] Therefore, the impact of increased participation in the labour force may be direct or indirect.

To the extent that the definition of corruption used in this study is the misuse of public office for private gain, it would be extremely interesting to have data on women's political participation (i.e. percentage of women in parliament) and test whether this variable also decreases perceived corruption. This is discussed further in Section 2.7.5, including the limitations of using this variable instead of a variable measuring female political participation.

The importance of aid, as measured by aid as per cent of GDP, has an insignificantly negative correlation with perceived corruption. When total aid flows, as measured by aid net disbursements in constant 2000 US$,[61] are used instead, the coefficient becomes significant (at 1%) and remains negative. Using data on total aid commitments also yields a significant and negative coefficient.[62] It would also be interesting to obtain data on the breakdown of aid

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[59] According to the World Bank (2000), in sub-Saharan Africa in 1980, 74% of female labour was employed in agriculture, 5% in industry and 21% in services.
[60] The World Bank (2000) estimates that growth rates could be as much as 0.8 percentage points higher.
[61] Net disbursements measure the disbursements of grants and highly concessional loans (loans with a grant element of at least 25%) minus amortization.
[62] Commitments represent donors' intentions (that is, they are the amount the donor agrees to make available to the recipient during the relevant time period), whereas disbursements represent the actual amount of aid donors transfer to recipients (that is, the amount of the commitment actually spent during the relevant time period). As we are interested in aid as a potential source of rents, data on disbursements are a more appropriate measure. Note, however, that, as would be expected, the two are highly correlated.

to governments and to NGOs, as we would expect aid to governments to represent a greater source of rents, and, therefore, have a greater impact on corruption. There is also the issue of endogeneity with aid – countries that rely heavily on aid may be more corrupt, but donors may choose to allocate aid to recipients that are less corrupt. Given that we specifically look at the impact of perceived corruption on aid receipts by sub-Saharan African countries in Chapter 4, it is important to assess the causal relationship between aid and perceived corruption. Accordingly, in order to address this endogeneity problem, we use instrumental variable estimation in the next sub-section, as well as lagged values of the endogenous aid variable in Section 2.7.4.

In sum, we find seven robustly significant variables – British heritage, Protestant tradition, natural resource abundance, common law system, rule of law, openness to trade and female labour force. We find that economic and political explanations add to long-predetermined historical and cultural ones, as the adjusted R^2 increases from 0.43 in column [1] to 0.56 in column [6]. Performing OLS on the pooled data using just the seven robustly significant variables (where they maintain sign and significance) indicates that these variables account for 56% of the variation in the corruption index (see Table 2.9).

Table 2.8: Determinants of Perceived Corruption – OLS, Pooled model

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Ethnolinguistic fractionalisation	1.321***	1.376***	1.418***	0.65*	0.614	0.982**	-0.804
	[0.424]	[0.384]	[0.399]	[0.361]	[0.388]	[0.405]	[0.542]
Former British Colony	-2.631***	-3.082***	-2.863***	-2.064***	-2.179***	-2.071***	-1.807***
	[0.290]	[0.267]	[0.269]	[0.276]	[0.307]	[0.308]	[0.351]
Never a colony	0.011	0.449	0.44	0.662*	0.833**	1.02***	-0.471
	[0.277]	[0.361]	[0.388]	[0.395]	[0.384]	[0.388]	[0.417]
Protestants (%)	-0.038***	-0.034***	-0.034***	-0.041***	-0.036***	-0.027***	-0.058***
	[0.006]	[0.005]	[0.005]	[0.004]	[0.005]	[0.006]	[0.010]
Common law system	3.48***	3.893***	3.806***	3.301***	3.352***	3.122***	3.521***
	[0.277]	[0.273]	[0.273]	[0.275]	[0.302]	[0.303]	[0.385]
Natural resources	0.748***	0.953***	0.791***	0.699***	0.617***	0.556***	0.353
	[0.164]	[0.161]	[0.143]	[0.135]	[0.158]	[0.166]	[0.279]
Log (GDP per capita)		-0.4***	0.096	0.191	0.107	0.212	0.466**
		[0.145]	[0.133]	[0.126]	[0.135]	[0.163]	[0.207]
Democracy			-0.162***	-0.163***	-0.164***	-0.105***	-0.232***
			[0.028]	[0.025]	[0.028]	[0.035]	[0.049]
Political stability			-0.045***	-0.036***	-0.041***	-0.019**	-0.001
			[0.006]	[0.006]	[0.006]	[0.009]	[0.014]
Rule of law				-0.477***	-0.495***	-0.57***	-0.796***
				[0.067]	[0.072]	[0.077]	[0.120]
Trade (% GDP)					0.01***	0.007**	0.002
					[0.003]	[0.003]	[0.005]
Government expenditure (% GDP)					-0.028**	-0.032**	0.029
					[0.013]	[0.012]	[0.025]
% Females in labour force					-0.042***	-0.044***	-0.04*
					[0.012]	[0.013]	[0.022]
Aid (% GNP)						-0.005	0.008
						[0.007]	[0.019]

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Government wage							0.016*
							[0.010]
Constant	5.114***	7.89***	5.356***	6.051***	8.312***	7.291***	5.954***
	[0.571]	[1.225]	[1.120]	[1.124]	[1.178]	[1.318]	[1.668]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	435	409	409	409	396	385	183
Adjusted R^2	0.431	0.402	0.525	0.572	0.596	0.557	0.706

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.9: Robustly Significant Determinants of Perceived Corruption – OLS, Pooled model

Ethnolinguistic fractionalisation	-
Former British Colony	-1.471***
	[0.208]
Never a colony	-
Protestants (%)	-0.048***
	[0.004]
Common law system	2.751***
	[0.234]
Natural resources	0.636***
	[0.148]
Log (GDP per capita)	-
Democracy	-
Political stability	-
Rule of law	-0.670***
	[0.063]
Trade (% GDP)	0.005**
	[0.002]
Government expenditure (% GDP)	-
% Females in labour force	-0.020***
	[0.006]
Aid (% GNP)	-
Government wage	-
Constant	8.354***
	[0.604]
Time dummies	Yes
Observations	443
R^2	0.56
Adjusted R^2	0.533

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

2.7.3 IV Results, Pooled Data

Having identified potential problems of endogeneity between (perceived) corruption and income, trade and aid, in this sub-section we provide more information on our attempt to find convincing instruments so that we can perform instrumental variables (IV), or two-stage least squares, estimation. A good instrumental variable should be highly correlated with the endogenous explanatory variable and should not directly influence the dependent variable. In addition, we check the two key indicators of instrument quality, as suggested by Bound, Jaeger and Baker (1995), namely, the partial R^2 and the F-statistic of the instrument [Staiger and Stock (1997) suggest a rule of thumb threshold between 10 and 25]. Bound, Jaeger and Baker (1995) show that if a set of potential instruments is weakly correlated with the endogenous explanatory variable, then even a small correlation between the potential instruments and the error can seriously bias IV estimates.

One instrument that has been considered to cause economic growth but is not likely to cause (perceived) corruption is a country's latitudinal distance from the Equator. Gallup, Sachs and Mellinger (1999) find that location and climate have large effects on income levels and income growth, through their effects on transport costs, disease burdens, and agricultural productivity, among other channels. In particular, they find that countries located closer to the Equator exhibit lower income levels. Treisman (2000) also uses latitudinal distance from the Equator as an instrument. This instrument has the added benefit of having no missing observations. We construct a dummy variable equal to 1 if the absolute value of a country's latitude is smaller than 23 degrees. Countries for which this variable is 1 are considered to be tropical countries.

Our instruments for trade also draw upon geographical characteristics. Following Frankel and Romer (1999) and Alesina, Spolaore and Wacziarg (2000), we use as instruments whether a country is landlocked and its area.

Since geography should not inherently be correlated with (perceived) corruption, these are valid instruments. We experiment with two instruments for aid, namely, population as in Svensson (2000), and infant mortality as in Knack (2001).

Estimates from the regressions performed using IV on the pooled data are presented in Table 2.10.[63] The key indicators of instrument quality are very favourable for our instruments for income and trade. Firstly, the partial R^2 are considerable, ranging from 0.11 to 0.35. Secondly, the F-statistics produce values adequately above the 10-25 range. A standard test for overidentified restrictions fails to reject the null hypothesis that the instruments and the error term are not correlated. Thus the chosen variables are valid instruments in a statistical sense. Also, the Hausman test rejects the null hypothesis that the coefficients in the OLS and the IV regressions do not systematically differ from each other. Population turns out to be a weak instrument for aid, as the F-statistic is only 6.28. Also, the test for overidentified restrictions rejects the null hypothesis that the instruments and the error term are not correlated (the p-value is 0.05). It is not entirely surprising that population is a weak instrument for aid – there are inherent problems with this variable, as population data is likely to be plagued with measurement error, especially for countries such as those in sub-Saharan Africa, where census reports may not accurately reflect the true population (due, for example, to problems such as the lack of adequate resources for undertaking census, or lack of adherence to international standards in census-taking). In addition, there are problems with an inherent 'population

[63] Note that the results when population is used as an instrument are not included in the table. This is because population turns out to be a weak instrument. More detail is given in the text.

bias', whereby smaller countries receive proportionately more aid, for example because donors want to *"show the flag"* [Knack (2001)]. In contrast, the key indicators of instrument quality are favourable for our alternative instrument for aid, infant mortality, with a partial R^2 of 0.11, and an F-statistic of 31. In addition, the Hausman test rejects the null hypothesis that the coefficients in the OLS and the IV regressions do not systematically differ from each other.

So in our discussion on the IV estimation for income, trade and aid we refer to the results obtained when infant mortality, rather than population, is used as an instrument for aid. Note that, as before, we report the results for the regressions including wages for completeness, although we do not consider them in our discussion of the results for the reasons already mentioned.

The results for instrumented income are quite striking. The coefficients are always significant and negative. The IV coefficients are always more negative than the OLS coefficients from Table 2.8, which are biased upward. This upward bias means that OLS will underestimate the impact of economic development on perceived corruption levels. This result is consistent with Treisman (2000). If it can be shown that countries perceived as less corrupt have greater income levels, then establishing a causal relationship of income on perceived corruption provides evidence that there is indeed a virtuous cycle between economic development and perceived corruption – less corrupt countries will enjoy greater income levels, which will in turn help to lessen corruption.

Our results for instrumented trade show that there is a strong positive correlation between trade and perceived corruption. Also, the IV coefficients are larger than the OLS coefficients, which is not what we would expect. Countries that are corrupt for reasons other than trade tend to have lower income levels and worse institutions, which lower trade openness. This would lead to a negative correlation between trade and the error term in an OLS regression and thus to upward bias in the OLS estimates of trade's effects. The difference in the coefficients could be due to measurement error in the trade variable that creates attenuation.

Although our result on the impact of trade on perceived corruption is at odds with intuition and other empirical results, it is worth noting that Rigobon and Rodrik (2004) find that trade openness is bad for democracy.[64] They find that trade's estimated negative impact on democracy is very significant and that it is a very robust result. They suggest that *"openness in general tends to weaken democratic institutions, perhaps because openness exacerbates distributional conflicts."*

Our results for instrumented aid show that there is a significant and negative impact of aid on levels of perceived corruption. As the IV coefficients are always more negative than the OLS coefficients, OLS underestimates the impact of aid on perceived corruption levels. This is consistent with the view that donors direct less aid to countries that are (perceived to be) more corrupt. This is consistent with both intuition and with the results in Chapter 4, where we find a negative correlation between a country's level of perceived corruption and the aid it receives from bilateral donor countries (although we do not find a

[64] Rigobon and Rodrik (2004) do not perform instrumental variable estimation. Instead, they rely on a novel approach called Identification through Heteroskedasticity. This approach achieves identification by exploiting plausible differences in the variances of error terms across sub-samples of the data.

causal effect of perceived corruption on aid receipts).[65] It should be noted that, while the variable infant mortality satisfies the requirements for not being a weak instrument, in Chapter 4, where we look at the determinants of aid receipts, it does not enter the specification modelled – when it is tried as an explanatory variable to proxy for recipients' poverty, it is insignificant (without affecting any other coefficient).

Regarding the other variables, protestant tradition, democracy and political stability cease to be significant for all regressions. As in the OLS case, when government expenditure is replaced by government revenues it is no longer significant. Ethnolinguistic fractionalisation is now significant in all specifications.

In sum, results obtained from IV estimation suggest that nine variables significantly impact the level of perceived corruption in a country – Ethnolinguistic fractionalisation, British heritage, natural resource abundance, common law system, income per capita, rule of law, openness to trade, aid and female labour force.

[65] Note that this negative correlation is also true of total, i.e., bilateral and multilateral, aid flows also scaled by GDP.

Table 2.10: Determinants of Perceived Corruption – IV, Pooled model

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Instrumented variables:	-	*Income*	*Income*	*Income*	*Income, trade*	*Income, trade, aid*	*Income, trade, aid*
Ethnolinguistic fractionalisation	1.321***	1.778 ***	1.694 ***	1.188 ***	1.298 ***	1.425***	-0.401
	[0.424]	[0.384]	[0.396]	[0.439]	[0.484]	[0.498]	[1.135]
Former British Colony	-2.631 ***	-3.001 ***	-2.913 ***	-2.348 ***	-3.1 ***	-2.564***	-0.523
	[0.290]	[0.291]	[0.275]	[0.304]	[0.368]	[0.397]	[1.018]
Never a colony	0.011	0.308	0.998 ***	1.308 ***	2.16 ***	1.922***	
	[0.277]	[0.314]	[0.202]	[0.258]	[0.357]	[0.430]	
Protestants (%)	-0.038 ***	-0.016 **	-0.021 ***	-0.024 ***	-0.012	-0.015**	-0.071***
	[0.006]	[0.007]	[0.006]	[0.006]	[0.008]	[0.007]	[0.021]
Common law system	3.48 ***	3.402 ***	3.483 ***	3.073 ***	3.677 ***	3.127***	1.798
	[0.277]	[0.326]	[0.295]	[0.302]	[0.332]	[0.410]	[1.193]
Natural resources	0.748 ***	1.357 ***	1.179 ***	1.167 ***	0.534 ***	0.364*	0.492
	[0.164]	[0.193]	[0.164]	[0.165]	[0.196]	[0.193]	[0.612]
Log (GDP per capita)		-1.76 ***	-1.178 ***	-1.294 ***	-1.208 ***	-1.696***	-1.749**
		[0.166]	[0.227]	[0.218]	[0.248]	[0.368]	[0.702]
Democracy			-0.079 **	-0.066 **	-0.098 **	-0.016	-0.089
			[0.033]	[0.031]	[0.038]	[0.060]	[0.111]
Political stability			-0.022 ***	-0.012 *	-0.03 ***	-0.009	0.048*
			[0.007]	[0.007]	[0.007]	[0.016]	[0.027]
Rule of law				-0.344 ***	-0.437 ***	-0.496***	-0.810***
				[0.085]	[0.102]	[0.107]	[0.206]
Trade (% GDP)					0.036 ***	0.035***	-0.019
					[0.006]	[0.008]	[0.027]
Government expenditure (% GDP)					-0.04 **	-0.041**	0.124
					[0.020]	[0.020]	[0.078]
% Females in labour force					-0.081 ***	-0.039**	0.039
					[0.016]	[0.019]	[0.051]
Aid (% GNP)						-0.080**	-0.229**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
						[0.032]	[0.093]
Government wage							-0.012
							[0.022]
Constant	5.114 ***	17.397 ***	13.781 ***	15.489 ***	17.155 ***	19.323***	20.240***
	[0.571]	[1.349]	[1.561]	[1.553]	[1.860]	[2.194]	[4.560]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	435	400	400	400	387	376	174
Hausman test (p-value)	-	0	0	0	0	0	0
First Stage Regression:							
Income							
Partial R^2		0.348	0.189	0.205	0.242	0.11	0.244
F-statistic		240.656	58.897	72.909	49.702	108.381	31.227
Trade							
Partial R^2					0.267	0.228	0.195
F-statistic					35.626	36.688	9.15
Aid							
Partial R^2						0.11	0.138
F-statistic						31.046	11.541
Overidentification test (p-value)		0.481	0.458	0.84	0.559	0.662	0.811
Instruments	-	tropical; landlock; area	tropical; landlock; area	tropical; landlock; area	tropical; landlock; area	tropical; landlock; area; infant mortality	tropical; landlock; area; infant mortality

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

2.7.4 Sensitivity Analyses: Nature of Dependent Variable and Endogenous Explanatory Variables

In this sub-section we perform two types of sensitivity analyses to the results obtained for the pooled model. We examine whether the results change when the ordinal nature of the corruption index is taken into account and an ordered probit model is estimated, and when the endogeneity of the income, trade and aid variables is addressed by using lagged values of these variables (instead of IV estimation).

We use the corruption index reclassified into six categories[66] and estimate ordered probit models, which allow for a dependent variable in which the actual values are irrelevant, except that higher values correspond to higher outcomes. Table 2.11 presents the results for the sensitivity analyses for specification [6].[67] From Table 2.11 we can see that the ordered probit estimates turn out to be qualitatively very similar to the OLS estimates. This seems to indicate that the results we obtained when treating the (perceived) corruption measure as having cardinal meaning, as is done widely in the literature, are valid in the sense that the coefficient estimates exhibit the same sign and significance.

It should be noted that in these models, the estimated coefficients β are of limited interest. What are of interest are the marginal effects of the

[66] We had originally coded the corruption index into seven categories. In order to avoid cells with low frequency, we subsumed categories 1-2 into band 1 and retained the remaining in ascending order up to band 6. See Section 2.4.3 for more details.

[67] Results for all specifications are included in Appendix 2.A.

regressors on the response probabilities.[68] The marginal effect indicates the change in the share of countries belonging to a stated perceived corruption band when the explanatory variable increases by one unit (except for dummy variables, where the marginal effect corresponds to a change from 0 to 1).[69] Put another way, the marginal effect indicates the change in the probability of belonging to a stated perceived corruption band when the explanatory variable increases by one unit. For simplicity, in Table 2.11 we present only the marginal effects for category/band 4 of the corruption measure for specification [6].[70] For example, having been a former British colony lowers the probability of a country having a perceived corruption score in band 4 by 40 percentage points.[71]

In Section 2.7.3, in order to control for potential endogeneity of income, trade and aid, we conducted instrumental variables estimation on the pooled model. However, in practice it is difficult to find good instruments, and in addition, the results obtained using IV are typically very sensitive to the choice of instrument (as indeed, was the case for our instrument for aid).

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[68] Note that in these non-linear models, the magnitude of the change in the outcome/response probability for a given change in one of the explanatory variables depends on the levels of all the explanatory variables.

[69] In calculating marginal effects the non-dummy explanatory variables are evaluated at their sample means.

[70] Note that results for the other categories/bands can be found in Appendix 2.A.

[71] Note that if the corruption index had a smaller number of scores (say, if the scores were the integers between zero and six), then it would be interesting to look at the marginal effects for each response and compare them with the coefficient estimates obtained from OLS, to see whether the assumption of constant marginal effects was valid. However, as explained in the text, the corruption index (which is reported monthly) is a discrete score with half digits, so it has 13 possible outcomes. Moreover, as we have annual averages, the corruption index can take on an even wider range of scores/outcomes. Therefore, comparing the marginal effects of the bands we have created with the OLS estimates is not as informative. For example, in comparing a country in band 2 with a country in band 3, we could be comparing scores of 3 and 5.7, or 4.3 and 4.4, or several other combinations.

Therefore, it is appropriate to check the robustness of those results using an alternative procedure. In order to control for the possibility of endogeneity bias, in this sub-section we use variables for income, trade and aid lagged for one year.[72] Insofar as lagged values of these variables are predetermined with respect to current perceived corruption levels, we should be able to address the causality issue. For example, we control for the possibility of endogeneity bias (that donors give more aid to countries perceived as less corrupt), by using aid variables lagged for one year, as the current perceived corruption level will not influence the magnitude of previous year aid flows. If the estimation results of using lagged values are qualitatively the same as those from using IV, then we are able to robustly conclude we have been able to ascertain the causal effect.

On the basis that current perceived corruption levels are not a determinant of past values of income, aid or trade, from Table 2.11 we can see that the results obtained by IV estimation for income and aid are not substantiated by using lagged values instead.[73] The only result that is robust is that trade openness causes an increase in perceived corruption.[74] Neither lagged income nor lagged aid is significantly correlated with perceived corruption levels, whereas lagged trade openness tends to be positively and significantly correlated. This seems to suggest that whereas windfalls from increased income or aid are dissipated quite quickly, rents from trade take

[72] This approach has been used, for example, by Morrissey et al. (2006), and Gupta et al. (2003).
[73] The estimated coefficient on lagged income is positive for specification [6], but it is negative for specification [2] and insignificant for the other specifications.
[74] This result is robust to using the variable imports as a per cent of GDP.

longer to dissipate and that over time they continue to impact on perceived corruption levels.[75]

Table 2.11 also includes the ordered probit estimates when lagged values for income, trade and aid are used. They confirm the results obtained by OLS, including the existence of the causal effect of trade on perceived corruption.

In terms of the other explanatory variables, British heritage, protestant tradition, common law system, natural resource abundance, rule of law and female labour force are significant for all specifications. When alternative measures for government expenditure, democracy and political stability are used, these cease to be significant in all specifications.

In sum, results obtained from sensitivity tests of both treating the corruption measure as having only ordinal meaning, and using lagged values for potentially endogenous explanatory variables, suggest that seven variables significantly impact the level of perceived corruption in a country – British heritage, protestant tradition, natural resource abundance, common law system, rule of law, openness to trade, and female labour force.

[75] We also experimented with a two-year lagged trade value, which was also positively and significantly related to perceived corruption.

Table 2.11: Determinants of Perceived Corruption – Sensitivity analysis on the pooled model for specification [6]

	OLS Pooled model	IV Pooled model	OLS Pooled model with lags[a]	Ordered Probit model	Ordered Probit Model with lags[a]	Ordered Probit model Marginal Effects for category 4	Ordered Probit Model with lags Marginal Effects for category 4[a]
Ethnolinguistic fractionalisation	0.982**	1.406 ***	1.015**	1.053***	1.083***	0.268***	0.271***
	[0.405]	[0.479]	[0.413]	[0.385]	[0.399]	[0.099]	[0.100]
Former British Colony	-2.071***	-2.714 ***	-2.058***	-3.173***	-3.166***	-0.400***	-0.392***
	[0.308]	[0.372]	[0.304]	[0.689]	[0.680]	[0.056]	[0.056]
Never a colony	1.02***	1.948 ***	1.033***	0.891**	0.896**	0.169***	0.164***
	[0.388]	[0.380]	[0.392]	[0.355]	[0.359]	[0.038]	[0.037]
Protestants (%)	-0.027***	-0.014 *	-0.027***	-0.025***	-0.025***	-0.006***	-0.006***
	[0.006]	[0.007]	[0.006]	[0.005]	[0.005]	[0.001]	[0.001]
Common law system	3.122***	3.269 ***	3.106***	4.074***	4.079***	0.265***	0.252***
	[0.303]	[0.335]	[0.298]	[0.717]	[0.710]	[0.096]	[0.094]
Natural resources	0.556***	0.376 *	0.539***	0.482***	0.453***	0.119***	0.110***
	[0.166]	[0.199]	[0.166]	[0.149]	[0.151]	[0.037]	[0.037]
Log (GDP per capita)[a]	0.212	-1.597 ***	0.281*	0.175	0.236	0.045	0.059
	[0.163]	[0.242]	[0.163]	[0.148]	[0.150]	[0.038]	[0.038]
Democracy	-0.105***	-0.036	-0.106***	-0.099***	-0.100***	-0.025***	-0.025***
	[0.035]	[0.043]	[0.035]	[0.032]	[0.032]	[0.009]	[0.009]
Political stability	-0.019**	-0.015	-0.041***	-0.019**	-0.019**	-0.005**	-0.005**
	[0.009]	[0.013]	[0.009]	[0.008]	[0.008]	[0.002]	[0.002]
Rule of law	-0.57***	-0.468 ***	-0.579***	-0.524***	-0.541***	-0.133***	-0.135***
	[0.077]	[0.113]	[0.077]	[0.074]	[0.074]	[0.023]	[0.023]
Trade (% GDP)[a]	0.007**	0.036 ***	0.007**	0.007**	0.006**	0.002**	0.002**

	OLS Pooled model	IV Pooled model	OLS Pooled model with lags[a]	Ordered Probit model	Ordered Probit Model with lags[a]	Ordered Probit model Marginal Effects for category 4	Ordered Probit Model with lags Marginal Effects for category 4[a]
	[0.003]	[0.007]	[0.003]	[0.003]	[0.003]	[0.001]	[0.001]
Government expenditure (% GDP)	-0.032**	-0.04 **	-0.029**	-0.026**	-0.022*	-0.007**	-0.005*
	[0.012]	[0.020]	[0.013]	[0.011]	[0.012]	[0.003]	[0.003]
% Females in labour force	-0.044***	-0.05 ***	-0.047***	-0.041***	-0.044***	-0.010***	-0.011***
	[0.013]	[0.016]	[0.013]	[0.012]	[0.012]	[0.003]	[0.003]
Aid (% GNP)[a]	-0.005	-0.061 ***	-0.003	-0.004	-0.003	-0.001	-0.001
	[0.007]	[0.012]	[0.006]	[0.006]	[0.006]	[0.002]	[0.001]
Government wage							
Constant	7.291***	18.938 ***	6.694***				
	[1.318]	[1.658]	[1.341]				
α_1				-4.415***	-3.975***		
				[1.196]	[1.216]		
α_2				-2.759**	-2.270*		
				[1.198]	[1.226]		
α_3				-1.151	-0.653		
				[1.202]	[1.232]		
α_4				0.030	0.502		
				[1.192]	[1.224]		
α_5				1.997	2.491*		
				[1.236]	[1.279]		

	OLS Pooled model	IV Pooled model	OLS Pooled model with lags[a]	Ordered Probit model	Ordered Probit Model with lags[a]	Ordered Probit model Marginal Effects for category 4	Ordered Probit Model with lags Marginal Effects for category 4[a]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	385	376	379	385	379	385	379
Adjusted R^2	0.557		0.559				
Log Likelihood				-403.613	-395.759		
McFadden R^2				0.294	0.295		
Adjusted McFadden R^2				0.234	0.234		

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
[a] The following explanatory variables are lagged 1 year: Log(GDP per capita); Trade (% GDP); Aid (%GNP).

2.7.5 Random Effects

Most empirical studies tend to focus on cross-section regressions, either looking at corruption indices for a given year or averaging over a number of years, while the few that have a panel set-up tend to simply pool the data.[76] We now explicitly take into account the panel nature of our data set. In particular, we estimate a random effects (RE) model, taking into account the variation within, as well as between countries.

The results are presented in Tables 2.12 and 2.13 (the latter presents the results for only those variables that are robustly significant). Some results are quite similar to those from OLS estimation on the pooled data. A country's British heritage, common law system, natural resource abundance, Protestant traditions and rule of law have a significant impact on perceived corruption. There are, however, some important exceptions. Democracy and political stability have lost significance. We have already established in the pooled model that these results are not very robust – changing the variable used to measure them results in a loss of significance. The coefficients on trade openness and the size of government now have the expected signs (negative and positive, respectively), although they are insignificant. There is no longer a significant relationship between the proportion of women in the labour force and the level of perceived corruption in a country. We have already noted that it would be extremely useful to have data on the political participation of women, as this would be a more pertinent variable to use in assessing the impact of gender on levels of perceived corruption. Unfortunately, as is the case with so

[76] A notable exception is Ades and Di Tella (1999).

many variables for sub-Saharan African countries, data on political participation of women [for example, from the Inter-Parliamentary Union (2005)] is typically available for only very few countries in our sample. Such a measure would be more meaningful than the proportion of women in the labour force, particularly in the context of sub-Saharan African countries, where there are difficulties in obtaining complete and reliable information on the labour force, especially due to the size of the informal sector and subsistence agriculture. In addition, women are disproportionately engaged in these activities, creating further measurement problems [Blackden and Bhanu (1999)]. Swamy et al. (2001) state that the proportion of female labour force can be seen as a partial measure of the overall concept of women's participation in public life. However, in the case of sub-Saharan Africa, given the definitional problems of labour force mentioned above, and the preponderance of recorded female labour in agriculture (where the scope for engaging in corrupt activities may be lower), this measure is likely to be a weak indicator for the impact of gender on perceived corruption levels.

We also attempt to address the problems of endogeneity between corruption and income, trade and aid by using instrumental variables. Unfortunately, the instruments we identified and are able to use successfully in the pooled model now perform very badly. All of the instruments (whether a country is tropical, landlocked, its size, population, and infant mortality) are weak – the F-statistics are never above 6 and the partial R^2 are typically around 0.001. The alternative approach of controlling for the possibility of endogeneity bias by using one year lagged values for income, trade and aid yields insignificant coefficients for all these variables. Therefore, although by using random effects we account for country heterogeneity, we are unable to fully address the problems of simultaneity.

Results obtained from estimating the RE model suggest that five variables significantly impact perceived corruption levels in a country, namely British heritage, natural resource abundance, common law system, Protestant tradition and rule of law. Estimating the RE model using just these five explanatory variables (where they maintain sign and significance) indicates that these variables account for around 50% of the variation in perceived corruption (see Table 2.13).

Table 2.12: Determinants of Perceived Corruption – Random Effects model

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Ethnolinguistic fractionalisation	1.612	1.411	1.455	1.045	0.586	0.705	0.905
	[1.257]	[1.344]	[1.024]	[1.011]	[0.892]	[1.022]	[1.579]
Former British Colony	-2.740***	-3.438***	-3.337***	-2.801***	-2.908***	-2.935***	-2.986**
	[0.917]	[0.854]	[0.661]	[0.691]	[0.684]	[0.750]	[1.433]
Never a colony	0.065	0.662	0.619	0.785	0.586	0.655	-0.838
	[1.058]	[1.608]	[1.204]	[1.394]	[1.264]	[1.431]	[1.507]
Protestants (%)	-0.035**	-0.032*	-0.032**	-0.040***	-0.038***	-0.034**	-0.033
	[0.018]	[0.018]	[0.014]	[0.014]	[0.013]	[0.015]	[0.025]
Common law system	3.583***	4.222***	4.145***	3.864***	3.970***	3.927***	3.903***
	[0.872]	[0.894]	[0.675]	[0.701]	[0.661]	[0.730]	[1.381]
Natural resources	0.657**	0.675**	0.695***	0.462*	0.473*	0.432*	-0.299
	[0.275]	[0.279]	[0.257]	[0.241]	[0.242]	[0.259]	[0.330]
Log (GDP per capita)		-0.063	-0.004	0.263	0.187	0.187	-0.208
		[0.310]	[0.264]	[0.259]	[0.267]	[0.298]	[0.492]
Democracy			-0.037	-0.037	-0.047*	-0.023	-0.058
			[0.028]	[0.027]	[0.028]	[0.032]	[0.042]
Political stability			-0.012***	-0.016***	-0.018***	-0.009	0.017
			[0.005]	[0.005]	[0.005]	[0.008]	[0.016]
Rule of law				-0.324***	-0.319***	-0.317***	-0.529***
				[0.068]	[0.072]	[0.075]	[0.109]
Trade (% GDP)					-0.002	-0.001	-0.001
					[0.003]	[0.003]	[0.008]
Government expenditure (% GDP)					0.005	0.005	0.009
					[0.016]	[0.016]	[0.026]
% Females in labour force					-0.055	-0.063	-0.085
					[0.034]	[0.038]	[0.070]
Aid (% GNP)						-0.009	-0.006
						[0.007]	[0.018]

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Government wage							-0.006
							[0.008]
Constant	4.036***	4.542**	4.367**	3.773**	7.068***	7.200***	11.688***
	[0.863]	[2.186]	[1.790]	[1.810]	[2.477]	[2.752]	[4.413]
Observations	435	409	409	409	396	385	183
Countries	29	28	28	28	28	28	23
Hausman test (p-value)	0.994	0.513	0.529	0.793	0.735	0.899	0.804
R^2	0.43	0.38	0.445	0.501	0.517	0.504	0.661

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.13: Robustly Significant Determinants of Perceived Corruption – Random Effects model

Ethnolinguistic fractionalisation	-
Former British Colony	-1.773***
	[0.609]
Never a colony	-
Protestants (%)	-0.054**
	[0.024]
Common law system	3.206***
	[0.600]
Natural resources	0.428*
	[0.247]
Log (GDP per capita)	-
Democracy	-
Political stability	-
Rule of law	-0.349***
	[0.063]
Trade (% GDP)	-
Government expenditure (% GDP)	-
% Females in labour force	-
Aid (% GNP)	-
Government wage	-
Constant	6.299***
	[0.345]
Observations	30
Countries	443
Hausman test (p-value)	0.679
R^2	0.496

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

The following table provides a summary of the variables that are robustly significant in explaining perceived corruption levels in sub-Saharan African countries. It shows the direction (sign) of the impact on perceived corruption of the explanatory variables robustly related to perceived corruption.

Table 2.14: Impact of robust variables on perceived corruption

	Cross-country 1982-1997 average model	**Cross-country 1982-1997 average model, with lagged values**	**OLS, Pooled Model**	**OP, Pooled Model**	**IV, Pooled Model**	**OLS, Pooled Model, with lagged values**	**OP, Pooled Model, with lagged values**	**Random Effects Model**	**Random Effects Model, with lagged values**
Ethnolinguistic fractionalisation					-				
Former British Colony	-	-	-	-	-	-	-	-	-
Protestants (%)			-	-		-	-	-	-
Common law system	+	+	+	+	+	+	+	+	+
Natural resources			+	+	+	+	+	+	+
Log (GDP per capita)					-				
Rule of law			-	-	-	-	-	-	-
Trade (% GDP)			+	+	+	+	+		
% Females in labour force			-	-	-	-	-		
Aid (% GNP)					-				

2.8 Concluding Remarks

The concept of exploring the heterogeneity of sub-Saharan African countries is particularly appealing, even more so in the context of a subject for which anecdotal evidence abounds and rigorous empirical analyses are, to our best knowledge, non-existent. However, corruption is hard to study empirically, as its many possible determinants interrelate in complicated ways. Problems are exacerbated by the lack of comprehensive data for many variables for several sub-Saharan African countries. Notwithstanding the fact that we are unable to fully explore the panel set-up, this study provides a few insights into the exploration of the causes of corruption in sub-Saharan Africa.

Our purpose in this study is not to provide definitive proof of the causes of corruption in sub-Saharan Africa. Rather, we aim to provide an initial round of hypothesis testing, to highlight a series of potentially compelling relationships that may spur further theoretical development and empirical testing to explore causal pathways more precisely than we are able to do here.

We would like to emphasise that perhaps the greatest difficulty has been the availability of data suitable for our purposes. Note that we by no means wish to undermine the importance and relevance of the data that does exist. Indeed, there is a wealth of data sets easily available, including freely and electronically available data, as well as data kindly provided by the authors of many important studies. However, data for sub-Saharan Africa is notoriously scarce. Our greatest concern regards not being able to use alternative measures of perceived corruption to check the robustness of our results. This concern forcefully inhibits us from drawing strong inferences from our study. However, we are able to provide a rough idea of the different effects that some variables have on perceived corruption.

The determinants of corruption in cross-country studies are usually investigated empirically under the assumption that it is possible to cardinally measure the extent to which corrupt activities take place. However, the very nature of corruption means that these illegal activities occur in a covert fashion, and therefore, concrete data on, for example, the amount of money a corrupt official demands (and is paid) in bribes, is not available. Instead, we have to rely on measures that subjectively measure *perceptions* of corruption. However, economists are likely to be sceptical with regards to a cardinal interpretation of subjective variables. We show that the least squares estimation that treats the corruption index as a cardinal variable offers qualitatively very similar results to the estimates from an ordered probit model. So, although the indices that attempt to measure corruption levels are, strictly speaking, of an ordinal nature, as they measure subjective perceptions, we show that the results obtained when treating the corruption index as having cardinal meaning are valid (in terms of sign and significance of coefficient estimates). This is a reassuring result, as the empirical corruption literature uses and interprets subjective corruption indices as a cardinal variable. However, caution suggests that care should be exercised when interpreting results, and one should avoid giving an inordinate weight to the magnitude of the coefficients – indeed one should focus on their sign and significance.

We find strong support for two arguments: Countries with a British heritage are perceived as less corrupt, while those with a common law system are perceived as more corrupt. We find weaker support for four further arguments: Countries with good quality institutions and a greater proportion of women in the labour force are perceived as less corrupt. Countries with greater natural resource abundance and with greater trade openness are perceived as more corrupt.

The long-predetermined historical and cultural legacies of a country appear to significantly influence current perceived corruption levels. Countries that were British colonies have significantly lower perceived corruption. On first thought, this could reflect the fact that most former British colonies have common law legal systems. However, as the common law legal system significantly increases perceived corruption in the regressions, it is more likely that the British heritage effect is linked to a distinct legal "culture" of procedural fairness governing the way the law is administered and enforced. As the results obtained so strongly indicate that having a common law system increases perceived corruption, it is worthwhile investigating this further. A possible explanation is that the informality of the British law, where practices are strongly based on unwritten rules, seems to be more subject to corruption than other traditions (where rules are explicitly defined) in countries that lack an effective system of enforcement and a strong tradition of procedural justice.[77] However, a more detailed and narrower specification of the legal system[78] and a study of how particular aspects of legal practice relate to government performance in general and corruption in particular are needed.

We find that a greater proportion of women in the labour force significantly reduces the level of perceived corruption in a country. However, as we noted previously, there are difficulties in obtaining complete and reliable information on the labour force, especially due to the size of the informal sector and subsistence agriculture in sub-Saharan African countries. Therefore, this result should be treated cautiously. A better measure of whether women do have different ethical values than men, which in turn leads them to be less corrupt, would be female participation in the political system. It could be that using a measure on the labour force instead is underestimating the true effect of the behavioural differences across gender. One must, however, also bear in mind that more democratic countries, with a tradition of fairness, pluralism and tolerance may also facilitate the entry and permanence of women in key political positions. If having a long tradition of democracy also reduces corruption, then the impact of increased female participation in politics may not be as large as expected. In any case, increasing female participation, both in the labour force and in government,

[77] Note, however, that drawing distinctions between the highly correlated common law and British heritage variables depends on a small number of "divergent" cases in our sample.
[78] For example, David and Brierly (1985) suggest that Botswana, Namibia, South Africa and Zimbabwe have legal systems that mix elements of common law and Romano-Dutch law.

may be valued for its own sake, for reasons of gender equality. If this brings positive spin-offs in terms of reducing corruption, then society benefits more.

Countries where natural resources account for over 50% of exports are perceived to be more corrupt. This is consistent with the hypothesis that rents cause corruption. The fact that natural resource abundance increases perceived corruption does not mean that fighting corruption in resource-rich countries is impossible. It does mean, however, that strategies/policies that specifically take into account the detrimental impact of rent-seeking activities when there is abundance of natural resources need to be developed. In particular, there is a need for increased transparency and accountability to reduce the risk of diversion or misappropriation of resources.

One example of such a strategy is the Extractive Industries Transparency Initiative (EITI), announced by the UK Prime Minister at the World Summit on Sustainable Development in Johannesburg, September 2002. The EITI aims to increase transparency in transactions between governments and companies within extractive industries. There are currently 20 countries in several stages of EITI implementation. Of these, 14 are in sub-Saharan Africa. Although the EITI is certainly a step in the right direction, it has limited power to detect and punish corrupt activities.

Although we find only weak evidence that democracy and political stability reduce perceived corruption, we do find stronger evidence that sounder institutions, indicated as a high score on rule of law, tend to be associated with lower perceived corruption. Previous studies have also failed to find a relationship between perceived corruption and whether a country is currently democratic. What seems to make a difference is whether a country has been democratic for decades. This suggests that the beneficial impact of sound political institutions should not be disregarded. Rather, countries should not be dismayed by the lack of immediate benefits, but persevere in building good institutions and promoting good governance.

Our result on trade openness is surprising. Unlike previous studies, we find that having a greater proportion of exports and imports in terms of GDP (or alternatively, just imports as per cent of GDP) increases perceived corruption. One possible explanation is that a greater volume of trade creates more opportunities for extracting bribes. It may be the case that sub-Saharan African countries are very vulnerable to volatile world market fluctuations and that when prices are low officials demand more or higher bribes. In any case, this result merits a closer investigation.

Our findings suggest why fighting corruption in sub-Saharan Africa has been so difficult. Long-predetermined historical and cultural characteristics appear to have a significant impact on whether a country is perceived to be corrupt, and it is not just government policy that matters. However, although policy decisions may have little impact on corruption or work very slowly, they do have an impact. The fight against corruption is by no means lost. Perseverance in sound policies is likely to pay off, even if it takes time.

Appendix 2.A

Table 2.A.1: Determinants of Perceived Corruption – OLS, Pooled model with lagged values for endogenous explanatory variables

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Ethnolinguistic fractionalisation	1.321***	1.391***	1.386***	0.629*	0.515	1.015**	-0.593
	[0.424]	[0.386]	[0.399]	[0.358]	[0.386]	[0.413]	[0.562]
Former British Colony	-2.631***	-3.087***	-2.846***	-2.047***	-2.166***	-2.058***	-1.735***
	[0.290]	[0.264]	[0.265]	[0.273]	[0.307]	[0.304]	[0.338]
Never a colony	0.011	0.438	0.44	0.657	0.827**	1.033***	-0.361
	[0.277]	[0.362]	[0.393]	[0.399]	[0.391]	[0.392]	[0.409]
Protestants (%)	-0.038***	-0.034***	-0.035***	-0.042***	-0.037***	-0.027***	-0.054***
	[0.006]	[0.005]	[0.005]	[0.004]	[0.005]	[0.006]	[0.009]
Common law system	3.480***	3.888***	3.784***	3.275***	3.365***	3.106***	3.429***
	[0.277]	[0.271]	[0.269]	[0.272]	[0.302]	[0.298]	[0.366]
Natural resources	0.748***	0.974***	0.810***	0.720***	0.613***	0.539***	0.347
	[0.164]	[0.163]	[0.144]	[0.136]	[0.162]	[0.166]	[0.277]
Log (GDP per capita), lagged 1 year		-0.396***	0.112	0.198	0.116	0.281*	0.514**
		[0.145]	[0.134]	[0.127]	[0.139]	[0.163]	[0.206]
Democracy			-0.168***	-0.167***	-0.174***	-0.106***	-0.213***
			[0.028]	[0.026]	[0.029]	[0.035]	[0.047]
Political stability			-0.045***	-0.036***	-0.041***	-0.019**	0
			[0.006]	[0.006]	[0.006]	[0.009]	[0.014]
Rule of law				-0.475***	-0.507***	-0.579***	-0.814***
				[0.067]	[0.073]	[0.077]	[0.117]
Trade (% GDP), lagged 1 year					0.010***	0.007**	0.003
					[0.003]	[0.003]	[0.005]
Government expenditure (% GDP)					-0.023*	-0.029**	0.019
					[0.014]	[0.013]	[0.025]
% Females in labour force					-0.043***	-0.047***	-0.043**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
					[0.012]	[0.013]	[0.021]
Aid (% GNP), lagged 1 year						-0.003	0.008
						[0.006]	[0.019]
Government wage							0.018*
							[0.010]
Constant	5.114***	7.714***	5.115***	5.870***	8.145***	6.694***	5.512***
	[0.571]	[1.239]	[1.125]	[1.136]	[1.205]	[1.341]	[1.704]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	435	405	405	405	391	379	182
Adjusted R^2	0.431	0.403	0.528	0.574	0.596	0.559	0.71

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.A.2: Determinants of Perceived Corruption – Ordered Probit model

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Ethnolinguistic fractionalisation	1.133***	1.157***	1.259***	0.743**	0.746**	1.053***	0.502
	[0.296]	[0.282]	[0.338]	[0.323]	[0.351]	[0.385]	[0.585]
Former British Colony	-2.769***	-3.723***	-3.642***	-3.171***	-3.330***	-3.173***	0.797***
	[0.418]	[0.646]	[0.671]	[0.680]	[0.695]	[0.689]	[0.292]
Never a colony	-0.182	0.306	0.304	0.561*	0.725**	0.891**	-0.577
	[0.240]	[0.259]	[0.308]	[0.340]	[0.344]	[0.355]	[0.377]
Protestants (%)	-0.025***	-0.023***	-0.028***	-0.035***	-0.030***	-0.025***	-0.037***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]	[0.005]	[0.009]
Common law system	3.299***	4.269***	4.366***	4.182***	4.294***	4.074***	
	[0.428]	[0.667]	[0.695]	[0.702]	[0.726]	[0.717]	
Natural resources	0.503***	0.675***	0.648***	0.591***	0.537***	0.482***	1.082***
	[0.118]	[0.116]	[0.119]	[0.120]	[0.143]	[0.149]	[0.242]
Log (GDP per capita)		-0.268***	0.063	0.164	0.088	0.175	0.27
		[0.103]	[0.111]	[0.110]	[0.121]	[0.148]	[0.225]
Democracy			-0.135***	-0.137***	-0.141***	-0.099***	-0.171***
			[0.024]	[0.023]	[0.027]	[0.032]	[0.047]
Political stability			-0.038***	-0.030***	-0.035***	-0.019**	0.01
			[0.005]	[0.005]	[0.006]	[0.008]	[0.013]
Rule of law				-0.420***	-0.442***	-0.524***	-0.930***
				[0.062]	[0.066]	[0.074]	[0.128]
Trade (% GDP)					0.009***	0.007**	0
					[0.003]	[0.003]	[0.005]
Government expenditure (% GDP)					-0.024**	-0.026**	-0.003
					[0.012]	[0.011]	[0.026]
% Females in labour force					-0.040***	-0.041***	-0.008
					[0.011]	[0.012]	[0.019]
Aid (% GNP)						-0.004	-0.019
						[0.006]	[0.019]
Government wage							0.022*

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
							[0.013]
α_1	-1.711***	-3.637***	-2.478***	-2.942***	-5.158***	-4.415***	-2.938
	[0.400]	[0.892]	[0.952]	[1.014]	[1.073]	[1.196]	[1.830]
α_2	-0.536	-2.382***	-0.977	-1.430	-3.608***	-2.759**	-1.340
	[0.401]	[0.895]	[0.960]	[1.001]	[1.062]	[1.198]	[1.737]
α_3	0.710*	-1.144	0.405	0.074	-2.015*	-1.151	0.444
	[0.403]	[0.895]	[0.967]	[1.011]	[1.064]	[1.202]	[1.743]
α_4	1.668***	-0.121	1.519	1.271	-0.842	0.030	1.679
	[0.408]	[0.889]	[0.971]	[1.001]	[1.053]	[1.192]	[1.731]
α_5	3.567***	1.662*	3.369***	3.263***	1.167	1.997	2.513
	[0.522]	[0.938]	[1.026]	[1.053]	[1.102]	[1.236]	[1.752]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	435	409	409	409	396	385	183
Log Likelihood	-544.204	-502.462	-459.863	-440.577	-415.473	-403.613	-194.994
McFadden R^2	0.198	0.196	0.264	0.295	0.316	0.294	0.333
Adjusted McFadden R^2	0.16	0.153	0.218	0.247	0.261	0.234	0.216

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
"Common Law" dropped in specification [7] to achieve convergence

Table 2.A.3: Determinants of Perceived Corruption – Ordered Probit model with lagged values for endogenous explanatory variables

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Ethnolinguistic fractionalisation	1.133***	1.166***	1.231***	0.723**	0.627*	1.083***	0.735
	[0.296]	[0.282]	[0.337]	[0.320]	[0.348]	[0.399]	[0.617]
Former British Colony	-2.769***	-3.733***	-3.640***	-3.170***	-3.333***	-3.166***	0.784***
	[0.418]	[0.636]	[0.660]	[0.669]	[0.685]	[0.680]	[0.304]
Never a colony	-0.182	0.29	0.296	0.547	0.700**	0.896**	-0.451
	[0.240]	[0.258]	[0.310]	[0.342]	[0.347]	[0.359]	[0.378]
Protestants (%)	-0.025***	-0.023***	-0.028***	-0.035***	-0.032***	-0.025***	-0.034***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]	[0.005]	[0.009]
Common law system	3.299***	4.265***	4.352***	4.164***	4.330***	4.079***	
	[0.428]	[0.657]	[0.683]	[0.691]	[0.719]	[0.710]	
Natural resources	0.503***	0.685***	0.660***	0.605***	0.523***	0.453***	1.098***
	[0.118]	[0.117]	[0.120]	[0.122]	[0.146]	[0.151]	[0.242]
Log (GDP per capita), lagged 1 year		-0.267***	0.07	0.165	0.094	0.236	0.414*
		[0.102]	[0.112]	[0.112]	[0.125]	[0.150]	[0.219]
Democracy			-0.139***	-0.139***	-0.150***	-0.100***	-0.154***
			[0.024]	[0.023]	[0.027]	[0.032]	[0.047]
Political stability			-0.038***	-0.029***	-0.035***	-0.019**	0.01
			[0.005]	[0.006]	[0.006]	[0.008]	[0.013]
Rule of law				-0.416***	-0.455***	-0.541***	-0.953***
				[0.062]	[0.067]	[0.074]	[0.130]
Trade (% GDP), lagged 1 year					0.009***	0.006**	0
					[0.003]	[0.003]	[0.005]
Government expenditure (% GDP)					-0.018	-0.022*	-0.01
					[0.012]	[0.012]	[0.026]

% Females in labour force					-0.041***	-0.044***	-0.016
					[0.011]	[0.012]	[0.019]
Aid (% GNP), lagged 1 year						-0.003	-0.008
						[0.006]	[0.018]
Government wage							0.026*
							[0.013]
α_1	-1.711***	-3.520***	-2.311**	-2.816***	-5.058***	-3.975***	-2.036
	[0.400]	[0.896]	[0.953]	[1.021]	[1.091]	[1.216]	[1.821]
α_2	-0.536	-2.260***	-0.805	-1.3	-3.511***	-2.270*	-0.36
	[0.401]	[0.900]	[0.962]	[1.016]	[1.080]	[1.226]	[1.731]
α_3	0.71*	-1.033	0.566	0.192	-1.920*	-0.653	1.463
	[0.403]	[0.900]	[0.971]	[1.020]	[1.082]	[1.232]	[1.734]
α_4	1.668***	-0.017	1.671*	1.38	-0.776	0.502	2.702
	[0.403]	[0.897]	[0.978]	[1.020]	[1.073]	[1.224]	[1.733]
α_5	3.568***	1.759*	3.516***	3.368***	1.266	2.491*	3.546**
	[0.522]	[0.949]	[1.037]	[1.069]	[1.124]	[1.279]	[1.748]
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	435	405	405	405	391	379	182
Log Likelihood	-544.204	-499.003	-456.737	-437.686	-411.604	-395.759	-191.523
McFadden R^2	0.198	0.196	0.264	0.295	0.315	0.295	0.338
Adjusted McFadden R^2	0.16	0.152	0.217	0.246	0.26	0.234	0.22

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
"Common Law" dropped in specification [7] to achieve convergence

Table 2.A.4: Determinants of Perceived Corruption – Ordered Probit model – Marginal Effects for specification [6]

Corruption Category/Band	[1]	[2]	[3]	[4]	[5]	[6]
Ethnolinguistic fractionalisation	-0.008*	-0.203***	-0.172**	0.268***	0.114**	0.001*
	[0.004]	[0.076]	[0.073]	[0.099]	[0.050]	[0.001]
Former British Colony	0.139**	0.572***	0.114**	-0.400***	-0.410***	-0.016**
	[0.066]	[0.059]	[0.045]	[0.056]	[0.133]	[0.008]
Never a colony	-0.002*	-0.103***	-0.239**	0.169***	0.172*	0.003*
	[0.001]	[0.022]	[0.113]	[0.038]	[0.100]	[0.001]
Protestants (%)	0.0002*	0.005***	0.004***	-0.006***	-0.003***	-0.0001*
	[0.0001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.0001]
Common law system	-0.203*	-0.592***	-0.148***	0.265***	0.611***	0.066**
	[0.107]	[0.048]	[0.052]	[0.096]	[0.131]	[0.031]
Natural resources	-0.003**	-0.086***	-0.089***	0.119***	0.058***	0.0004**
	[0.002]	[0.025]	[0.034]	[0.037]	[0.022]	[0.0002]
Log (GDP per capita)	-0.001	-0.034	-0.029	0.045	0.019	-0.000
	[0.001]	[0.028]	[0.025]	[0.038]	[0.016]	[0.000]
Democracy	0.001**	0.019***	0.016***	-0.025***	-0.011***	-0.0001*
	[0.0003]	[0.006]	[0.006]	[0.009]	[0.004]	[0.0001]
Political stability	0.0001**	0.004**	0.003**	-0.005**	-0.002**	-0.0001**
	[0.0001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.0001]
Rule of law	0.004**	0.101***	0.086***	-0.133***	-0.057***	-0.003**
	[0.002]	[0.017]	[0.019]	[0.023]	[0.013]	[0.002]
Trade (% GDP)	-0.0002**	-0.001**	-0.001**	0.002**	0.001**	0.0001**
	[0.0001]	[0.001]	[0.000]	[0.001]	[0.000]	[0.0001]
Government expenditure (% GDP)	0.0002**	0.005**	0.004**	-0.007**	-0.003**	-0.0002**
	[0.0001]	[0.002]	[0.002]	[0.003]	[0.001]	[0.0001]
% Females in labour force	0.0003*	0.008***	0.007***	-0.010***	-0.004***	-0.0002*
	[0.0002]	[0.002]	[0.002]	[0.003]	[0.001]	[0.0001]
Aid (% GNP)	0.000	0.001	0.001	-0.001	-0.000	-0.000
	[0.000]	[0.001]	[0.001]	[0.002]	[0.001]	[0.000]

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.A.5: Determinants of Perceived Corruption – Ordered Probit model with lagged values for endogenous explanatory variables - Marginal Effects for specification [6]

Corruption Category/Band	[1]	[2]	[3]	[4]	[5]	[6]
Ethnolinguistic fractionalisation	-0.007*	-0.208***	-0.179**	0.271***	0.122**	0.001*
	[0.004]	[0.078]	[0.075]	[0.100]	[0.054]	[0.001]
Former British Colony	0.128	0.583***	0.111**	-0.392***	-0.415***	-0.015**
	[0.061]	[0.062]	[0.046]	[0.056]	[0.132]	[0.007]
Never a colony	-0.002*	-0.102***	-0.241**	0.164***	0.178*	0.003*
	[0.001]	[0.022]	[0.115]	[0.037]	[0.103]	[0.001]
Protestants (%)	0.0002*	0.005***	0.004***	-0.006***	-0.003***	-0.0001*
	[0.0001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.0001]
Common law system	-0.185*	-0.605***	-0.154***	0.252***	0.623***	0.068**
	[0.101]	[0.049]	[0.053]	[0.094]	[0.131]	[0.032]
Natural resources	-0.002**	-0.081***	-0.084**	0.110***	0.057**	0.0003**
	[0.0001]	[0.025]	[0.034]	[0.037]	[0.023]	[0.0001]
Log (GDP per capita), lagged 1 year	-0.001	-0.045	-0.039	0.059	0.026	0.000
	[0.001]	[0.028]	[0.027]	[0.038]	[0.017]	[0.000]
Democracy	0.001**	0.019***	0.017***	-0.025***	-0.011***	-0.0001**
	[0.0003]	[0.006]	[0.006]	[0.009]	[0.004]	[0.0001]
Political stability	0.0001**	0.004**	0.003**	-0.005**	-0.002**	-0.0001**
	[0.0001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.0001]
Rule of law	0.003*	0.104***	0.089***	-0.135***	-0.061***	-0.003**
	[0.002]	[0.018]	[0.020]	[0.023]	[0.013]	[0.002]
Trade (% GDP), lagged 1 year	-0.0002**	-0.001**	-0.001**	0.002**	0.001**	0.0001**
	[0.0001]	[0.001]	[0.000]	[0.001]	[0.000]	[0.0001]
Government expenditure (% GDP)	0.0002**	0.004*	0.004*	-0.005*	-0.002*	-0.0002**
	[0.0001]	[0.002]	[0.002]	[0.003]	[0.001]	[0.0001]
% Females in labour force	0.0003*	0.009***	0.007***	-0.011***	-0.005***	-0.0002*
	[0.0002]	[0.003]	[0.002]	[0.003]	[0.001]	[0.0001]
Aid (% GNP), lagged 1 year	0.000	0.001	0.000	-0.001	-0.000	-0.000
	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Chapter 3

The Supply of Bribes - How Much Are Firms Willing to Pay?

3.1 Introduction

Corruption is a complex phenomenon, as it takes on various forms and operates in different contexts. Accordingly, the study of corruption has been multi-disciplinary and dispersed, ranging from stylised theoretical modelling to detailed descriptions of single corruption scandals. It has been studied as a political, economic, cultural or moral problem, and, in most cases, as a combination of these.[79]

Despite the voluminous literature on the subject,[80] the scope for research has by no means been exhausted. There is a tendency for the existing models to focus on the choice of whether or not to engage in corruption on the part of administrators or politicians. Frequently, the private sector's willingness to offer bribes is given less attention.[81] This appears to be quite puzzling, as one would assume that understanding the incentives for firms to offer bribes would prove helpful in devising counter-incentives. Furthermore, as it *takes two to tango*, one would think that if firms are unwilling to offer bribes, then the whole concept of a corrupt politician or government official would become redundant. Indeed, because it takes two to enter into a corrupt deal, the crime will not occur if at

[79]See Bardhan (1997) for a comprehensive review of the economic literature on corruption.
[80]There has been an increasing number of both academic and non-academic articles on corruption. Leiken (1997) reports that the number of media articles mentioning corruption in 1995 increased by four times since 1984. Glynn, Kobrin and Naim (1997) reach similar conclusions based upon the number of times corruption is mentioned in the financial press. Of course, this does not imply that useful analyses of corruption did not exist before this rise in interest - see Rose-Ackerman (1978), Klitgaard (1988, 1990), among others.
[81]Notable exceptions include Lui (1985), Beck and Maher (1986) and Lien (1986, 1987, 1990).

least one of the parties is deterred. Therefore, we feel that there is a need to study the decision-making process of firms that offer bribes. In particular, we are interested in examining the conditions that influence firms' decisions of the magnitude of bribes, and consequently, how the choices made by corrupt officials based on these bribes affect allocation efficiency. Our starting point is the widespread belief that *transparency* is one of the most fundamental aspects in combating corruption. It is important to distinguish between transparency in institutions, in terms of ensuring that government officials do not engage in corrupt practices and that the awarding processes are 'clean' and fair, and transparency in terms of *availability of information*. In this chapter we are concerned with this second aspect. Therefore, in order to assess the virtues of transparency as a deterrent to bribery, we explicitly consider the information structures of firms. Also, due to the essential illegal nature of corruption, we include in our study the possibility of punishments for corrupt firms (i.e., firms that offer bribes).

This chapter considers the case of corruption in the government contracting process. Corruption that is endemic in the way the government carries out its routine activities, such as tax collection, customs and inspections, is not considered. When the government is the buyer or contractor, there are several reasons for firms to bribe the government officials. Firstly, a firm may pay so that it is included in the pre-qualifying list of the bidders, as well as to reduce the size of the list. Secondly, it may pay to obtain inside information, such as maximum and minimum price thresholds, average offer prices and the selection criteria for the projects. Thirdly, the bribes may induce the government officials to structure the specifications of the public tenders in such a way that the bribing firm is the only qualified supplier. Fourthly, the firm may pay to be selected as the winner. Finally, once a firm has been selected, it may bribe to obtain a higher price or to reduce the required quality. This chapter is primarily concerned with the fourth aspect.

It is well known that corruption in government procurement contracts exists in both developed and developing countries, albeit at different degrees. Furthermore, this type of corruption occurs in public tenders that involve both domestic and international firms. Most large transborder bribery allegations are connected to foreign government contracts in several sectors, including military procurement, energy, telecommunications, construction and transportation. The following examples illustrate the occurrence of bribery in government procurement contracts, and hence the importance of developing appropriate tools for analysing this type of corruption.[82]

For the cumulative period from 1994 through the end of 2001, the US Government estimates that competition for over 460 contracts valued at over $210 billion may have been affected by bribery involving foreign firms. US firms are believed to have lost at least 115 of these contracts, worth approximately $35 billion, to foreign competitors offering bribes.[83]

In Paraguay, during the regime of President Alfredo Stroessner (1954-1989), corruption in the award of international construction contracts ranged

[82]The examples in the second and third paragraphs are taken from Rose-Ackerman (1999).
[83]"What the US Government can do to assist US companies with respect to transnational corruption", Eleanor Roberts Lewis, Chief Counsel for International Commerce, US Department of Commerce - American Bar Association Forum on the Foreign Corrupt Practices Act and the OECD Convention, 2002.

from 10 to 20% [Nickson (1996)]. During the 1970s in Indonesia, two German firms were accused of paying bribes of 20% of the value of the construction contract of a steel mill to a government official [Schwarz (1994)]. A major corruption scandal in Singapore involved a senior official of the Public Utilities Board being paid by several multinational firms to reveal confidential information about the proposals. Five international manufacturing firms implicated in the scandal were blacklisted, and the government official was sentenced to 14 years in prison.[84]

In Germany, bribes were paid in order to win contracts worth DM 2.5 billion for the construction of Terminal 2 of Frankfurt Airport (mainly in the procurement for communication electronics). According to the Frankfurt anti-corruption prosecutor, corruption led to an overcharge of 20 to 30%.[85] In Belgium, US $1.9 million in bribes may have been paid to senior members of the Flemish Socialist Party, in connection with a defence contract.[86] In Italy, successful bids in public tenders were 40 to 50% lower in 1997 than in 1992 (before the 'Mani Pulite', or Clean Hands, inquiries) [della Porta and Vannucci (1997)].

One of the most prominent cases of international bribery ever was the Lesotho Highlands Water Project, in which several western companies paid huge bribes to local managers in order to win contracts. The Lesotho Highlands Water Project was an US $8 billion infrastructure scheme, with five major dams,

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[84] "Singapore Exposes Tip of Corruption Iceberg-Efforts to Curb Bribery in the Award of International Contracts are in Their Infancy", *Financial Times*, 15th February, 1996.
[85] "German Airport Corruption Probe Deepens: Five Jailed and 20 Companies under investigation", *Financial Times*, 2nd July, 1996.
[86] "Tentacles of Defence Scandal Reaches Out for Claes", *Financial Times*, 19th October, 1995; "Belgians Seek to Arrest Dassault", *Financial Times*, 10th May, 1996.

200 kilometres of tunnels and a powerful hydroelectricity station to be completed by 2020. Three multinational companies (from Germany, France and Canada) were found guilty of bribery and fined a total of around US $3 million.[87]

In this chapter, we adopt the terms of demand and supply of bribes. By demand for bribes, we denote the government official's propensity to demand a payoff, or bribe. We denote a firm's willingness, or propensity, to offer bribes to government officials as the supply of bribes. The main issue we address is the role of information in the supply of bribes. The types of information that we focus on are information on rival firms and information on the nature of the government official.

Firms may not necessarily know whether a government official is corrupt or not. This uncertainty may occur because firms do not know the punishment that the official will suffer if he is caught engaged in corrupt dealings, or because firms do not know his moral scruples. Other justifications include firms trying to bribe a foreign government official, or a situation of political instability and a high political turnover, so that the corruptibility of a given official is unknown.

Firms competing for a government project may also not know each others' characteristics (e.g., cost and/or quality levels) with certainty. In fact, sometimes each firm may only have incomplete information about the identities of the other suppliers. More often, each firm can only observe its own cost level,

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[87] "Western contractors face bribery charge over Lesotho dam", *Financial Times*, 19th November, 1999; "World Bank to face fresh pressure to stamp out graft", *Financial Times*, 21st July, 2004.

with incomplete information about the cost levels of the other firms. Firms such as Boeing and Airbus, which operate in industries that are very concentrated, are likely to have more information on each other than firms in less concentrated industries. Likewise, firms that produce more homogeneous products are also less likely to have uncertainty regarding their rivals than firms that operate in markets of differentiated products.

The second issue that is addressed is the illegality of bribery. Corruption may be defined as the use of public office for private gains [Johnston (1996)], where an official entrusted with carrying out a task engages in some sort of malfeasance for private enrichment. The essential aspects of corruption are, therefore, that the bribee must necessarily be in a position of power, created either by market imperfections or an institutional position that grants him discretionary authority, and that there is an illegal or unauthorised transfer of money or an in-kind substitute. This illegal nature of corruption implies that individuals engaged in corrupt practices must be punished if they are found out. This fact needs to be incorporated into a model that examines firms' decisions in offering bribes. Indeed, as Becker (1968) stated *"when other variables are held constant, an increase in a person's probability of conviction or punishment if convicted would generally decrease, perhaps substantially, perhaps negligibly, the number of offences he commits."* It is necessary to quantify, or at least qualify, how the penalty incurred by firms affects the bribes they offer in equilibrium. Furthermore, the interaction between the information structure of the firms and their punishment may have policy implications, in terms of determining the optimal monitoring technology and punishment.

This chapter considers a very simple set up in which $n \geq 2$ firms compete to win a fixed price government procurement contract. Firms differ in the cost and quality at which they can carry out the project. Unlike the usual assumptions in the bribery literature, we do not assume that the lowest cost firm is also the one that can complete a project with the highest quality. Instead, we assume there is a menu of cost and quality (or value) combinations, which is given by a function that is concave in cost. The main implication of this assumption is that the lowest cost firm will not be the highest quality one, and, therefore, when there is competitive bribing, allocation efficiency will not be maintained. The government official who awards the contract may be either benevolent or corrupt. If he is honest, the firm closest to the optimal will be awarded the contract, whereas if he is corrupt, the firm that offers the highest bribe will win.

The analysis proceeds in four main stages. First, we assume that there are no penalties for bribing (or attempting to bribe) a government official. Second, we drop the assumption of no penalties and assume instead that there is an auditing technology by which there is an external inspection of the firm that wins the contract. If the winning firm has offered a bribe, then a penalty, which is proportional to the bribe offered, is imposed. Third, we assume that, instead of a proportional fine, a fixed fine is levied on the winning firm if it is found to have offered a bribe. Finally, we consider a fine proportional to the firm's surplus.

In each case, firms' bribing strategies are analysed in the scenarios of complete information, imperfect information regarding firm types, imperfect information regarding the official's type, and finally, when both types of information asymmetries are present. We examine the extent to which the availability of information, and thus, transparency, can affect the incidence of corrupt dealings, as well as the implications for allocation efficiency.

This chapter is organized as follows. Section 3.2 reviews the literature on competitive bribery games that is more closely related to this research. International developments in the awareness of the importance of the supply side of bribery are presented in Section 3.3. Section 3.4 describes the main framework used to analyse corruption and looks at the case where there are no penalties. Section 3.5 examines the case where the winning firm might face paying a penalty proportional to its bribe, whereas Section 3.6 analyses the case of a fixed fine. In Section 3.7, we consider a third penalty scheme, namely, when the winning firm faces a fine that is proportional to its surplus. Section 3.8 looks at the models from the perspective of foreign firms. Finally, Section 3.9 presents some concluding remarks.

3.2 Review of the Literature on Competitive Bribery

This section reviews the literature on competitive bribery games that is more closely related to this chapter. This literature has focused solely on allocation efficiency - bribery has been analysed in so far as it may result in any loss of efficiency in comparison with competitive bidding procedures. There are three main aspects that have been largely ignored and thus not adequately studied.

Firstly, it is generally assumed that firms only differ in one dimension, namely, their cost. Firms competing for a government contract are assumed to be capable of carrying out the project with equal qualities, i.e., the value of the project to the government official is the same for all firms. This has obvious implications for allocation efficiency - because the most efficient firm is the one that has a greater capacity to bribe, unless there is discrimination there will always be allocation efficiency. In these situations corruption only determines a different distribution of surplus between the firms and the official and the only conclusions pertain to the magnitude of the bribes.

Secondly, there has been very little emphasis on the illegal nature of bribery and as such the punishment of firms that engage in bribery has been mostly overlooked. The existing literature either considers that unsuccessful bribes are refunded or that all bribes are irretrievable. It is also assumed that there is no form of exogenous monitoring to the process of awarding the contract and, therefore, firms are never punished when they engage in bribery with corrupt officials. Firms that offer bribes suffer a punishment only if they attempt to bribe an honest government official, in which case they pay a fine.

Thirdly, although competitive bribery games have been studied under different types of information asymmetries, no importance has been given to the interaction of the information asymmetries and their role in determining the sizes and frequencies of the bribes. Consequently, no attempt has been made to model the relationship between the competition between bribers and their information structure.

Beck and Maher (1986) compare bribery to competitive bidding in the context of government contracts for goods and services. In their bribery model, firms are assumed to know the government's policy of awarding the contract to the firm offering to pay the largest bribe. There is an absence of penalties for bribery and all unsuccessful bribers get refunds. Firms are assumed to know their own costs, but to have incomplete information about competitors' costs and profits. They show that, in equilibrium, each firm offers a bribe that represents a markdown from its potential gross profit. The government official is able to extract producers' surplus in the form of a bribe. Their analysis is restricted to symmetric games. They show that for a predetermined contract price, the bribery model is isomorphic to the bidding model, as the same firm wins the contract and the government pays the same net-of-bribes purchase price. Therefore, under this model, firms would be indifferent between bribery and bidding institutions.

Lien (1986) uses the same framework of Beck and Maher (1986) to show that there exists a unique Nash equilibrium that is symmetric. It is also shown that under an alternative model specification where all firms, whether successful or not, forfeit their bribes there still exists a unique Nash equilibrium that is symmetric. The equilibrium bribe under this specification is always lower than that under the assumption that all unsuccessful bribes are refunded.

Lien (1987) analyses competitive bribery games with incomplete information about the nature of the potential bribee. The same basic framework of Beck and Maher (1986) and Lien (1986) is used, except that the government official in charge of the awarding process may or may not be corrupt. If he is corrupt, the firm that offers the highest bribe wins, whereas if he is honest, the lowest cost firm wins and the bribing firm must pay a penalty proportional to the bribe. The estimate of the probability that the official is corrupt may vary across firms. In the case that these estimates are equal for all firms and equal to one, the equilibrium will be unique and symmetric, with equal bribe functions for all firms [as shown in Lien (1986)]. For the general case, unless the estimates are equal for all firms, in which case the Nash equilibrium is symmetric, the equilibrium will be asymmetric if it exists. The Nash equilibrium only exists in the case in which all the bribers have similar beliefs about the nature of the bribee. At the same realized cost level, Firm i will pay more bribes than Firm j whenever its estimate of the probability that the official is corrupt is greater than that of Firm j. If Firm i changes its estimate whereas the other firms retain their estimates, then all the bribery functions of Firms $j \neq i$ will change: if one firm believes there is a greater probability the official may be corrupt, all firms will bribe more and vice versa. In equilibrium every firm bribes.

Lien (1990) investigates the possibility of allocation inefficiencies associated with competitive bribery games with discrimination. It is shown that in the presence of discrimination, inefficient allocations may be chosen by the corrupt official. Furthermore, the possibility of inefficient allocations increases when the degree of discrimination increases. Another result obtained is that if the firm discriminated against is low cost, the economy less frequently suffers allocation inefficiency through competitive bribery procedures. Clark and Riis (2000) consider an unfair bribery procedure between asymmetric players and find that in this case there is no parameter setting that guarantees allocation efficiency, thereby being unable to unambiguously determine the effect of making the procedure more (or less) unfair.

3.3 International Awareness of the Supply Side of Bribery

In this section, we briefly present some developments and examples outside academia in terms of focus on the propensity of firms to offer bribes to government officials, i.e., the supply of bribes. We interpret this increasing awareness of bribery as a further motivation for the analysis we have conducted on this subject.

It is interesting to note that a bias towards exploring government officials' propensity to accept bribes, i.e., the demand for bribes, had traditionally also been true of the news media and most international institutions (whether official or non-governmental). There appeared to be a lack of balance in anticorruption efforts, whereby governments and international organisations devoted more effort and resources to exposing bribe takers rather than bribe givers.

However, some action has recently been taken to attempt to reform the supply side of bribery. On 17 December 1997, a step was taken to curb bribe givers involved in international business.[88] The Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (also known as the Anti-Bribery Convention) was signed by representatives of the 29 member governments of the OECD. The Convention entered into force on 15

[88]Until then, only the US had a law (Foreign Corrupt Practices Act, 1977) that specifically made it a criminal offence for a company to pay bribes abroad. See Pieth (1997) for some issues concerning the Foreign Corrupt Practices Act and Lambsdorff (1998) for an empirical analysis of its impact.

February 1999 and makes it a crime to offer, promise or give a bribe to a foreign public official in order to obtain or retain international business deals. The Convention commits its now 35 signatory countries to adopt common rules to punish individuals and companies that engage in bribery transactions. The countries are also subjected to close monitoring in order to determine the adequacy of their implementing legislation.

Another initiative is the "Integrity Pact" scheme launched by TI. This relates to individual major public procurement contracts for goods and services and is designed to safeguard public procurement from corruption. Each pact represents a single contract, or a set of contracts in a single sector. Under a TI Integrity Pact, all bidders for a project must publicly pledge not to use bribes in the contracts in question, while the host government also pledges to ensure total transparency on behalf of its officials involved in the tendering and contract award processes. Whenever procurement is funded by bilateral and/or multilateral development agencies, these also pledge to make their best efforts to ensure the "cleanliness" of the procurement process. The Integrity Pact has already been implemented in several countries and in large-scale infrastructure projects, ranging from telecommunications to public transport.

These recent actions focusing on bribe givers raise the question of whether they are sufficient, or indeed necessary, for combating corruption. A suitable framework for the decision-making process of firms that engage in bribery is necessary in order to evaluate the adequacy of these actions and to be able to design better policies. We turn now to our simple model of government procurement that attempts to shed some light on the importance (or not) of certain types of transparencies and punishment structures.

3.4 The Basic Model (Model A)

A government official has to choose one firm to undertake an indivisible project.[89] A Fixed Price Contract T (gross-of-cost reimbursement transfer) is awarded to the winning firm, and is paid for with public funds ($\lambda \geq 0$ denotes the shadow premium on public funds). We assume that the government official may either value aggregate social welfare (SW), therefore, valuing the quality of the project carried out, or he may be solely interested in the amount of bribes (B) that he can collect. Therefore, the government official's payoff function will be of the form:[90]

$$G_i = \alpha SW_i + (1-\alpha)B_i, \tag{3.1}$$

where $\alpha \in \{0,1\}$, thereby denoting whether the government official is corrupt ($\alpha = 0$) or honest ($\alpha = 1$). If the government official's type is private information, then firms do not know his true type. In that case, the firms assume that the government official is honest with probability γ, (i.e. $G_i = SW_i$), and that he is corrupt with probability $(1-\gamma)$, (i.e., $G_i = B_i$). For simplicity, it is assumed that this belief/probability γ is common to all firms.

[89]We assume that the government official always awards the project to one of the firms.

[90]The government official's payoff function may be expressed more generally by $G_i' = \alpha SW_i + (1-\alpha)\sum_{k=1}^{n} B_k$. This formulation includes the case in which losing firms also have to pay the bribe they offered.

There is a finite number of firms, denoted by $i = 1,2,\ldots,n$, that compete to win the government procurement contract. The firms differ in the cost and quality at which they can carry out the project. There is a menu of cost and quality (or value) combinations, which is given by the function $V_i = V(C_i) = a \ln C_i^2$, $a > 0$, with $V' > 0$ and $V'' < 0$. Quality is increasing with cost, but at a decreasing rate. Note that, given the value function, what determines a firm's type is its cost. A firm's cost belongs to the interval $[\underline{C},\overline{C}]$, where $\underline{C} > 0$. If a firm cannot observe its rivals' costs, it assumes that they are independently drawn from a probability distribution $F(C_i)$. A firm may choose to bribe the government official in an attempt to win the contract, i.e., each firm may offer the government official a monetary reward of $B_i \geq 0$ to be awarded the contract. The firm (briber) is thus the "active" party, whereas the government official is "passive".[91]

Denote a firm's gross gain by g_i, that is, $g_i = T - C_i$.[92] The profit function for Firm i is given by[93]

$$\Pi_i = \begin{cases} g_i - B_i & \text{if } G_i > G_j \\ \frac{1}{n}(g_i - B_i) & \text{if } G_i = G_j \text{ , } \forall \;\; i = 1,\ldots,n \text{ , } j \neq i \text{ .} \\ 0 & \text{if } G_i < G_j \end{cases}$$

Note that the government official's payoff function will depend on whether the firms competing for the contract are national or foreign. More

[91]In practice, the distinction between active and passive corruption (and between extortion - where the public official is the active party who extorts a payoff - and bribery) means little because both parties must agree before corruption can occur.
[92]Occasionally, g_i and $T - C_i$ may be used interchangeably.
[93]Note that a firm's ability/capacity to bribe is given by its gross gain, that is, if $g_i > g_j$, then Firm i can *afford* a higher bribe than Firm j.

specifically, it is the aggregate social welfare that differs. If there are only national firms competing to win the government contract, then a benevolent official must take into account the profits of the firms, whereas if there are only foreign firms, he will only consider the value of the project and the price it must pay. Therefore, if there are only national firms, (3.1) becomes

$$G_i = \alpha[V_i - C_i - \lambda T] + (1-\alpha)B_i, \tag{3.2}$$

and if there are only foreign firms, (3.1) becomes

$$G_i = \alpha[V_i - (1+\lambda)T] + (1-\alpha)B_i. \tag{3.3}$$

As situations where *both* national *and* foreign firms compete would entail assumptions about discrimination on the part of the government official and further complicate the analysis, we abstract from dealing with those cases in this chapter. For an analysis of discrimination in bribery games, see Lien (1990) and Clark and Riis (2000).

We assume that first, the firms announce their bribes; then, the government official awards the contract to one of the firms; and finally, the winning firm pays its bribe. This approach follows the lobbying literature, where each organized interest group confronts the government with a contribution schedule that maps every policy vector into a campaign contribution level; the government then sets a policy vector and then collects from each lobby the contribution associated with its policy choice [Grossman and Helpman (1994), Bernheim and Whinston (1986)].

This sequence of movements is also more intuitive than considering that bribers get refunds whenever their bribery attempts fail. Although refunds for unsuccessful bribes can be justified by assuming that, if an official receives bribes from some firms without granting them the procurement contract, he faces great risk of being brought to the court and eventually being penalised, this assumption may not be suitable in some circumstances. For example, the unsuccessful briber's threat would not be credible as he might also be punished for attempted bribery. Also, due to possible future contract awarding opportunities and fears of revenge, the firm's threat would not be credible.

Furthermore, as it is assumed that a firm pays the bribe *after* it has won, this chapter abstracts from the problems emphasized in Boycko, Shleifer and Vishny (1995) concerning slips between the bribing transaction and the actual delivery of the good or service involved.

When solving the model we assume that first, the firms simultaneously offer a bribe *and* announce their cost; then, the government official chooses the winning firm; and finally, the official receives the payoff from the winning firm. We assume that the firms always truthfully announce their cost and, therefore, abstract from revelation problems.

3.4.1 Complete Information

This is a game of complete information where each player's payoff function is common knowledge among all the players, i.e., all the parameters are common knowledge.

The cases where the government official is corrupt and those in which he is not corrupt are considered.

The government official is not corrupt (α = 1)

When $\alpha = 1$, the government official only values social welfare and, therefore, derives no benefit from bribes. His objective function becomes $G_i = SW_i$.

Result 1 *When there is complete information and the government official is honest:*

(i) Firms offer zero bribes;

(ii) The official awards the contract to the optimal firm (or the firm closest to it), which is given by $C_N^* = 2a$, if only national firms compete, or $C_F^* = \overline{C}$, if only foreign firms compete.

The equilibrium is welfare-optimal.

Proof. (i) If firms know with certainty that the official is not corrupt, it is useless offering bribes.

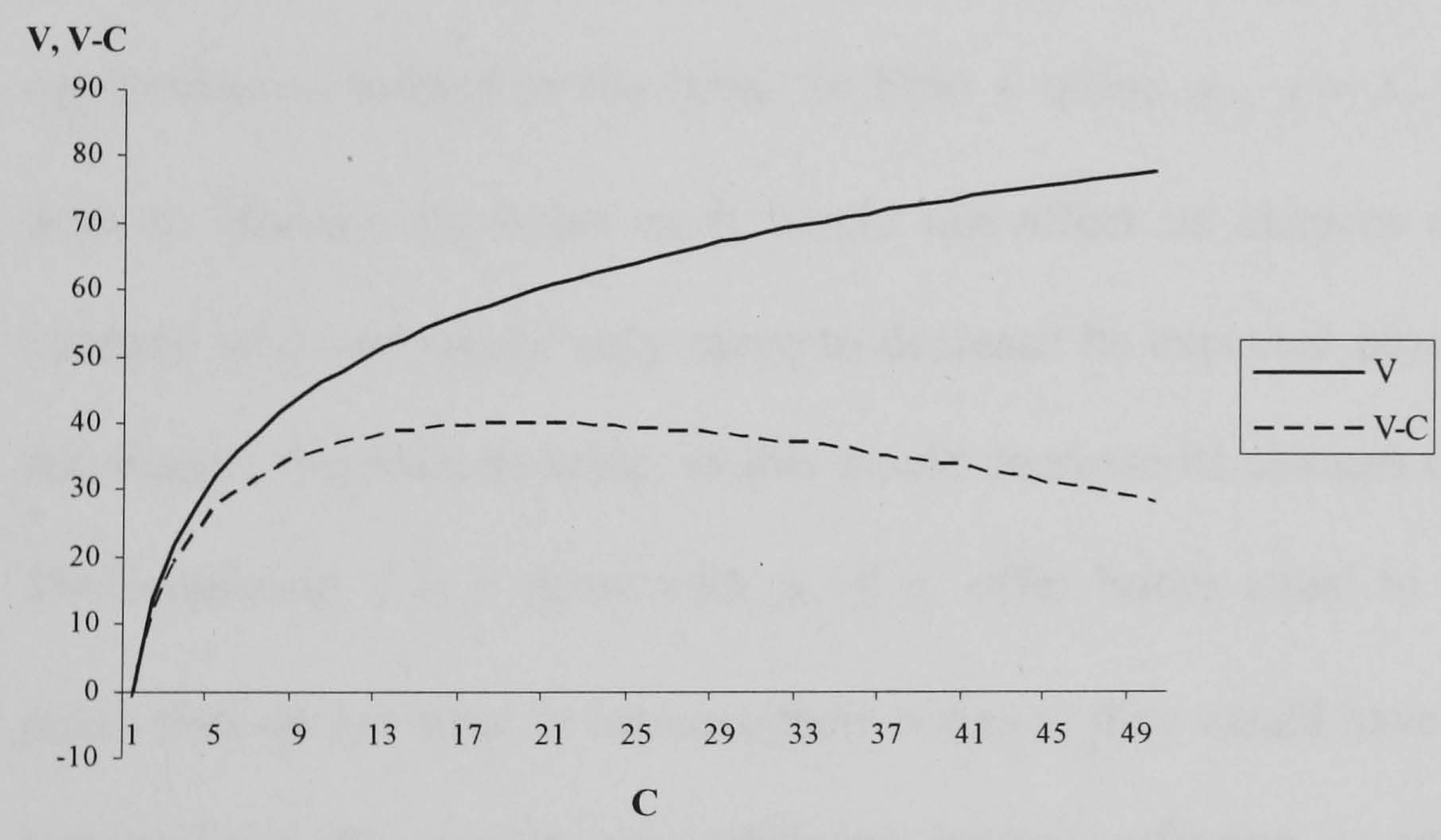
(ii) The equilibrium quality level is determined straightforwardly by maximizing the government official's objective function. The resulting equilibrium cost level is the one that equalizes the marginal value and the marginal cost.

If there are only national firms, $G_N = V_i - C_i - \lambda T$, so $\underset{C_i}{Max}\, G_i = V_i - C_i - \lambda T = a \ln C_i^2 - C_i - \lambda T$ yields $\frac{\delta G_i}{\delta C_i} = 0 \Leftrightarrow$ $V_i^{'} - C_i^{'} = 0 \Leftrightarrow C_N^* = 2a$.

If the official has to choose between foreign firms, his objective function becomes $G_F = V_i - (1+\lambda)T$. The maximum of G_F occurs at $C_F^* = \overline{C}$. Notice that $C_N^* < C_F^*$.■

Example Consider a simple example where $a = 10$; $\underline{C} = 1$ and $\overline{C} = 50$. $T = \overline{C}$, so $\underline{g} = 0$ and $\overline{g} = 49$. In this case, $C_N^* = 20$ and $C_F^* = 50$. The figure below illustrates the value function.

Figure 3.1: *V*(*C*) and *V*(*C*) - *C*



The government official is corrupt ($\alpha = 0$)

Result A.1 *When the government official is known to be corrupt, the firm that offers the highest bribe wins the contract. The bribe function for Firm i is given by*[94]

$$B_i = \begin{cases} g_j & \text{if } g_i > g_j \\ g_i & \text{if } g_i \leq g_j \end{cases}, \forall i = 1, \ldots, n, j \neq i. \tag{3.4}$$

Proof. If Firm i is the one with the highest gross gain, then it only needs to offer a bribe equal to the second-highest gross gain plus a little more (ε) to guarantee that it wins the contract. Firm i wants to choose ε as close as possible to (but different from) zero. As such an ε does not exist, the equilibrium is defined as the limit. So Firm i offers g_j, $j \neq i$. It does not want to increase its bribe, as it would not affect its chances of winning (already one) and would only serve to decrease its expected payoff. It does not want to decrease its bribe, as this would decrease its chances of winning. The remaining $j \neq i$ firms with $g_j \leq g_i$ offer bribes equal to their gross gain - they do not want to increase their bribes as they would have a negative expected payoff, and they are indifferent between offering g_j and anything less.■

[94]Actually, if $g_i > g_j$, Firm i offers a bribe of $g_j + \varepsilon$ to make sure it wins the contract. Firm i wants to choose ε as close as possible to (but different from) zero. As such an ε does not exist, the equilibrium is defined as the limit.

In this case, the firm with the highest gross gain, g_i, or, equivalently, lowest cost, C_i, wins. The only situation in which there is no welfare loss is the one where the lowest-cost firm is the one with C^*. As long as there exists at least one firm with a cost level lower than C^*, the equilibrium is not welfare-optimal. This result contrasts to the one obtained in the models commonly used when either (i) firms only compete in cost and the value of the project is independent of the firm chosen to carry it out, or (ii) firms compete in cost and quality, but the lowest-cost firm is also the highest quality. In those cases, if in a bribery game there is competitive bidding by private firms for a government procurement contract, and the corrupt official awards the contract to the highest bidder in bribes, then allocation efficiency is maintained, as only the lower-cost firm can afford the largest bribe. Our result thus marks a major departure from such papers [Beck and Maher (1986), Lien (1986, 1987, 1990)]. Bribery no longer signifies a mere transfer from firms to government official, but instead entails an allocation inefficiency.

3.4.2 Firms' Types are Private Information

The government official is not corrupt ($\alpha = 1$)

In this case, firms know that the government official is not corrupt, but don't know their rivals' types. Firms will not offer a bribe. We assume that firms always truthfully announce their true cost level. Without this assumption, it is not always true that firms truthfully announce their cost levels. If a firm truthfully announces its cost, its probability of winning is given by

$\Pr(|C_i - C^*| < |C_j - C^*|)$, $\forall j \neq i$. If all firms are known to be truthful, there is a very high incentive for one firm to deviate and pretend to be the optimal one. The deviating firm will win the contract with probability one (or, at worst, it will be as equally likely to win as the true optimal firm, if it exists), giving it a higher expected profit than if it were to be honest.[95]

However, if the other firms believe that one firm will deviate they too will deviate and claim to be the optimal firm. In this case, there are n firms claiming to be the optimal one, and they will have an equal probability $(1/n)$ of winning. It can be shown that firms only prefer to tell the truth if they are sufficiently close to the optimal cost level. In our example, if there are two firms and cost levels are uniformly distributed on $[\underline{C}, \overline{C}]$, then firms will only prefer to be truthful if their cost level belongs to the interval $\left(C^* - \frac{\overline{C}-\underline{C}}{4}, C^* + \frac{\overline{C}-\underline{C}}{4}\right)$. In this case, firms have a higher expected profit from telling the truth than from pretending to have the optimal cost level.[96] Of course, any one firm that deviated and lied would win and be awarded the government contract.

The assumption that firms truthfully announce their cost level seems reasonable. The honest government official may be suspicious that all firms claim to have the optimal cost level. He will verify the actual quality, and, therefore, cost, when the project is completed. If we assume that a firm's cost level must incorporate a contingency for any unexpected increases (or

[95]Naturally, in the case of the optimal firm, it would be indifferent between being truthful or not.
[96]However, this is only true if *all* firms have cost levels belonging to this interval. If one firm does not belong, then it prefers to lie. Furthermore, firms do not know their rivals' type, and having a cost level inside the interval does not guarantee that this is also true of the other firms.

decreases) in cost, it becomes difficult for the winning firm to argue that it suffered an unexpected shock and that consequently its cost is different to the one it announced.

The government official is corrupt (α = 0)

When $\alpha = 0$, $G_i = B_i$. Now the firms decide how much they will offer as a bribe. The bribe a firm offers is going to depend on its cost, or, equivalently, on its gross gain, i.e., the difference between the fixed transfer T it receives from the government official if it wins the project, and the cost it incurs.

Result A.2 *When firm types are private information and the government official is known to be corrupt, Firm i's equilibrium bribing strategy is*

$$B(g_i) = g_i - \frac{\int_{\underline{g}}^{g_i} [F(s)]^{n-1}\, ds}{[F(g_i)]^{n-1}}, i = 1,\ldots,n. \tag{3.5}$$

Proof. Consider the decision of Firm i, whose gross gain if it wins the project is g_i. Firm i conjectures that the other firms are following a decision rule given by a bribing function B: that is, it predicts that any other Firm j will bid an amount $B(g_j)$ if its gross gain is g_j (although Firm i does not know g_j).We assume that B is an increasing function in gross gain. What is Firm i's best bribe? If it offers a bribe of b_i and wins, its net gain is $g_i - b_i$. The probability of winning with a bribe b_i is the probability that all $n-1$ of the other firms have a gross gain g_j such that $B(g_j) < b_i$. This probability is $\left[F(B^{-1}(b_i))\right]^{n-1}$.[97, 98]

Firm i chooses its bribe b_i to maximize its expected net gain:

$$\pi_i = (g_i - b_i)\left[F(B^{-1}(b_i))\right]^{n-1}. \tag{3.6}$$

Therefore, Firm i chooses b_i such that $\delta\pi_i / \delta b_i = 0$. By differentiating π_i with respect to b_i, we obtain[99]

$$\frac{d\pi_i}{dg_i} = \frac{\delta\pi_i}{\delta g_i} + \frac{\delta\pi_i}{\delta b_i}\frac{db_i}{dg_i} = \frac{\delta\pi_i}{\delta g_i}. \tag{3.7}$$

By differentiating (3.6), an optimally chosen bribe must satisfy

$$\frac{d\pi_i}{dg_i} = \frac{\delta\pi_i}{\delta g_i} = \left[F(B^{-1}(b_i))\right]^{n-1}. \tag{3.8}$$

We now impose the Nash requirement that the conjectured decision rules are consistent with optimizing behaviour by the other firms. Together with an assumption of symmetry (i.e., any two bidders with the same gross gain will submit the same bid), this implies that Firm i's optimal bribe b_i, satisfying (3.8), must be the bribe implied by the decision rule B, that is, at a Nash Equilibrium, $b_i = B(g_i)$. Substituting this condition into (3.8), we obtain an equation defining Firm i's expected net gain at a Nash Equilibrium:

$$\frac{d\pi_i}{dg_i} = [F(g_i)]^{n-1}. \tag{3.9}$$

97 From the point of view of the winning firm, the other firm's gross gain is an independent draw from a probability distribution F.

98 $\Pr\{b_i > B(g_j)\} = \Pr\{B^{-1}(b_i) > B^{-1}B(g_j)\} = \Pr\{B^{-1}(b_i) > g_j\} = \left[F(B^{-1}(b_i))\right]^{n-1}$.

99 Equation (3.7) is the Envelope Theorem.

At a Nash Equilibrium, all n firms must be maximizing simultaneously, so that (3.9) must hold for all firms $i = 1,\ldots,n$. We solve the differential equation (3.9) for π_i by integrating (using the boundary condition that if a firm has the lowest possible gross gain then it has a net gain of zero, implying $B(\underline{g}) = \underline{g} = T - \overline{C}$). Using the definition of π_i (3.6) and the Nash condition $b_i = B(g_i)$ we obtain each firm's decision rule:

$$B(g_i) = g_i - \frac{{}_{\underline{g}}\int^{g_i} [F(s)]^{n-1}\, ds}{[F(g_i)]^{n-1}}, i = 1,\ldots,n. \qquad (3.5)$$

■

The bribe function is increasing in gross gain, g_i, as was assumed. The second term on the right-hand side of (3.5) indicates how much the firm decreases the bribe it offers in relation to its full capacity to pay (that is, its gross gain). In particular, we can see that the i^{th} firm's expected bribe is effectively bounded by the expected gross profit of the second lowest cost firm.[100] Another property exhibited by (3.5) is that the expected bribe paid to the government official is a non-decreasing function of the number of firms, n. Increased competition among firms affects the equilibrium bribe by increasing the probability of including the highest gain (lowest cost) firms and by inducing firms to become more aggressive.

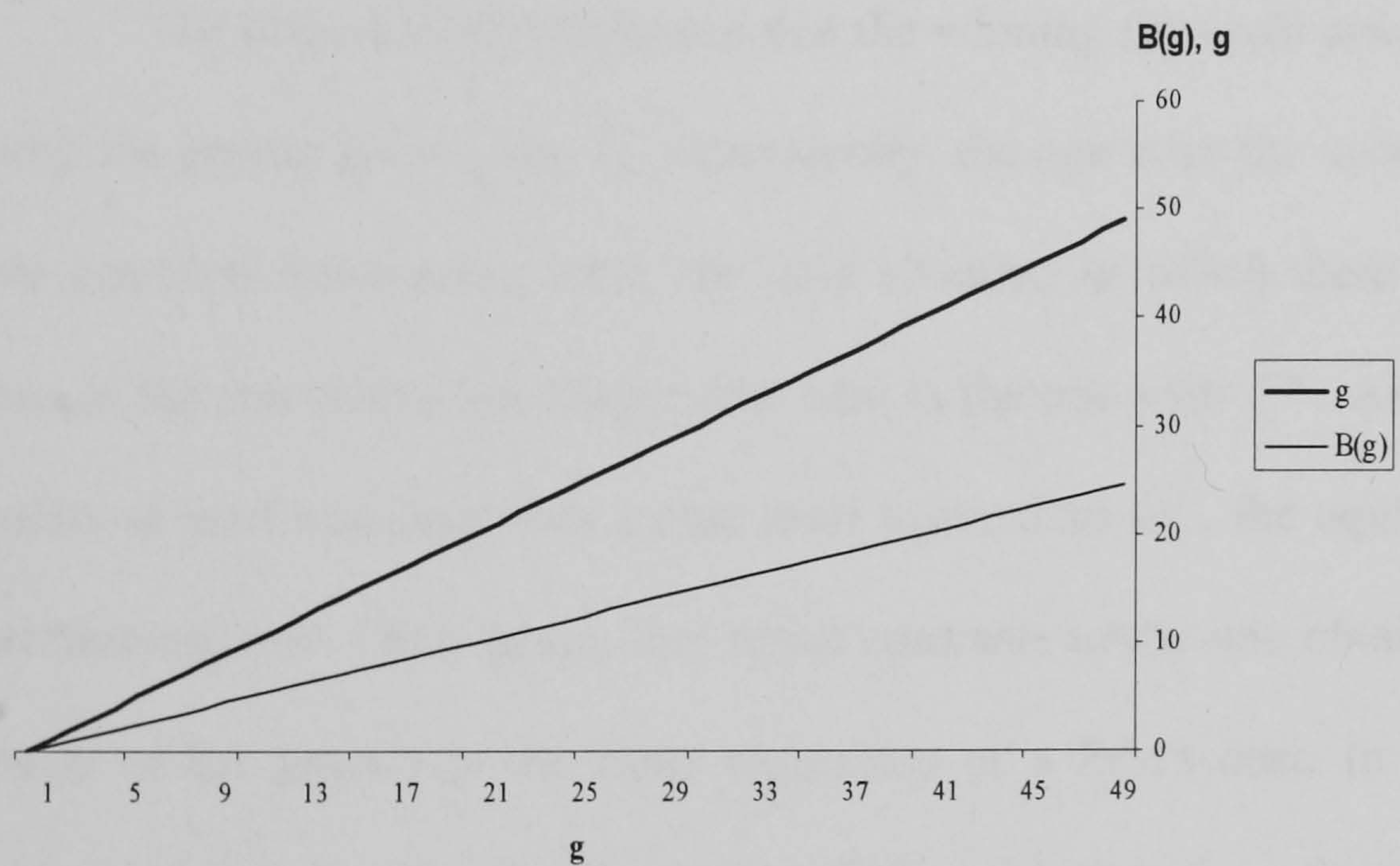
[100] To see why, notice that the expression for Firm i's bribe can be re-written as $B(g_i)F(g_i)^{n-1} = (n-1)_{\underline{g}}\int^{g_i} s \cdot F(s)^{n-2} f(s)\, ds$. The left-hand side is the expected value of the bribe paid by the i^{th} firm, while the right-hand side is the expected gross profit of the firm offering the second largest bribe (given that the i^{th} firm offers the largest bribe).

If cost levels are uniformly distributed on $[\underline{C},\overline{C}]$, then the gross gains, g_j, are also uniformly distributed on $[\underline{g},\overline{g}]$.[101,102] The bribe function becomes

$$B(g_i) = \frac{n-1}{n} g_i + \frac{1}{n}\underline{g}.$$

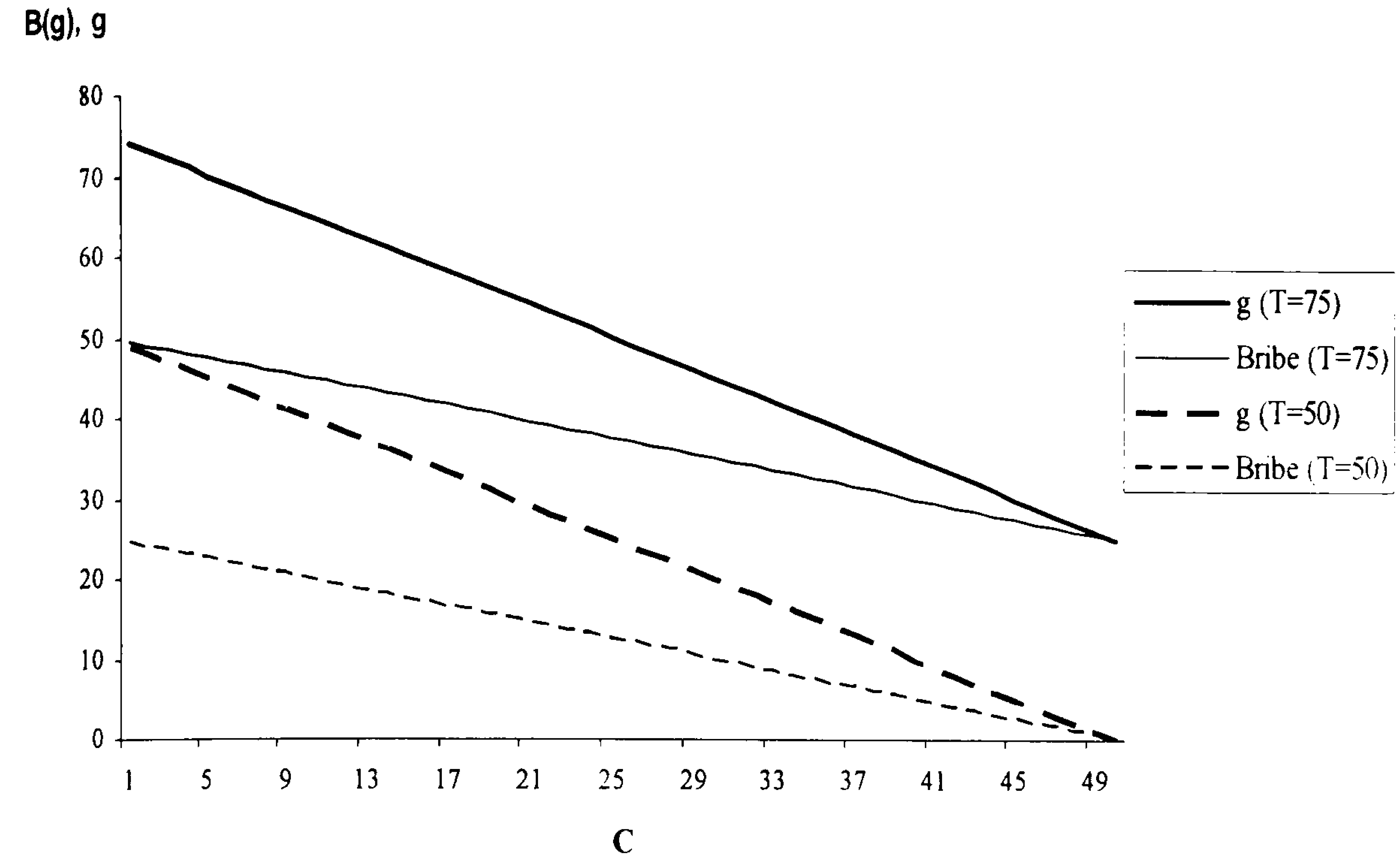
The following two figures show both the gross gain, g_i, and the bribe function $\frac{1}{2}(g_i + \underline{g})$ for the case where $n = 2$. Two cases are illustrated in Figure 3.3 - one where $T = \overline{C}$, i.e., $\underline{g} = 0$ ($T = \overline{C} = 50$), and another where $T > \overline{C}$, i.e., $\underline{g} > 0$ ($T = 75; \overline{C} = 50$).

Figure 3.2: Bribe function



[101]This follows from a simple change of variable from C_i to $g_i = T_i - C_i$ [Robinson (1985)].
[102]Note that $\underline{g} = T - \overline{C}$ and $\overline{g} = T - \underline{C}$.

Figure 3.3: Bribe functions for different values of T



The bribe function indicates that the winning firm will always be the one with the greater gross gain, or, equivalently, the one with the lowest cost. As in the complete information case, the only situation in which there is no welfare loss is the one where the lowest-cost firm is the one with C^*. As long as there exists at least one firm with a cost level lower than C^*, the equilibrium is not welfare-optimal. Once again, this result contrasts to the one obtained when the value of the project is the same regardless of a firm's cost. In that case, the lowest cost firm will offer the highest bribe and, therefore, there is no loss of allocative efficiency.

3.4.3 Government Official's Type is Private Information

When the firms don't know whether or not the government official is corrupt, but do know the types, or cost levels, of their rivals, they also know their gross gain, and thus their capacity to bribe.

Result A.3 *When the government official's type is private information, Firm i's equilibrium bribing strategy is the same as in the case of complete information with a corrupt official.*

Proof. As in this simplest model there is no punishment for bribery and firms' types are common knowledge, if a firm offers a bribe to an honest government official it will not be penalised. Therefore, a firm has the incentives to act as if the official is corrupt.■

In sum, when firms incur no punishment for bribery (attempted or actual), having information about the government official's corruptibility does not change their equilibrium bribes.

3.4.4 Two Information Asymmetries

Result A.4 *When the two information asymmetries are present, firms offer the same bribes as when only firm types are private information and the government official is known to be corrupt.*

Proof. In this case, both the government official type and the firms' types are private information. When deciding what bribe to offer, Firm i maximizes its expected profit, given by

$$\gamma \Pi_i^{\alpha=1} \Pr(\text{winning}|\alpha = 1) + (1-\gamma)\Pi_i^{\alpha=0} \Pr(\text{winning}|\alpha = 0). \quad (3.10)$$

This problem is solved in the same way as in the case of only one information asymmetry (firms' types as private information), except that now we must calculate the probability of Firm i winning the contract when the government official is not corrupt. When the government official is honest he will want to award the contract to the firm with the optimal cost level, C^*, or, if there is no such firm, to the one that has the cost level closest to C^*. That is, the probability of winning with cost C_i is the probability that all $n-1$ of the other firms have cost C_j such that $|C_i - C^*| < |C_j - C^*|$, $\forall j \neq i$ (or alternatively, that $|g_i - g^*| < |g_j - g^*|$, $\forall j \neq i$). This probability is given by $[1 - F(g^* + |g_i - g^*|) + F(g^* - |g_i - g^*|)]^{n-1}$. By maximizing (3.10) we obtain each firm's decision rule:

$$B(g_i) = g_i - \frac{\int_{\underline{g}}^{g_i} [F(s)]^{n-1} ds}{[F(g_i)]^{n-1}}, i = 1, \ldots, n,$$

which is exactly the same as the one obtained when only firm types were private information.■

From the analysis of the basic model, we are able to draw the following conclusions:

(a) When the government official is corrupt, the economy will always suffer from welfare inefficiency;[103]

(b) When the government official is known to be corrupt, uncertainty regarding firms' costs leads to lower bribes. However, there is still welfare inefficiency;

(c) The results for when the government official's type is private information are exactly the same as when the official is known to be corrupt;

(d) When firms are not punished for bribery (attempted or actual), the availability of information regarding the government official or rival firms does *not* affect welfare optimality. *Transparency* does not ensure welfare efficiency. It is pointless to design policies targeting one or the other type of information flow. The only measure that can affect welfare efficiency *and* also lower the levels of bribes is not to allow the lower cost firms to compete for the government contract. This would involve a pre-qualification of the bidders, which in turn could give rise to another type of bribery, that is, firms making payments so that they are included in the pre-qualifying list;

(e) In terms of the magnitude of the bribes, if the firm types are private information, then it is irrelevant whether or not the government official is known to be corrupt - the bribe levels are the same in either case. This is also the case

[103]Except in the special case where the lowest-cost firm is the one with C^* (this is true regardless of firms knowing their rivals' types).

when firm types are known. Bribes are lower when there is uncertainty regarding rival firms. It seems that transparency regarding firm types increases the incidence of bribes. This would imply that when there is no punishment for bribery, firms operating in less concentrated markets or firms in markets with differentiated products tend to bribe less.

These conclusions suggest that there should exist some form of punishment for firms that offer bribes. In the following sections, we extend the basic model in order to incorporate the possibility of penalties for corrupt firms. Three different types of penalties are examined, namely, a fine proportional to the bribe, a fixed fine and a fine proportional to gross gain.

3.5 Fine Proportional to a Firm's Bribe (Model B)

In order to incorporate into the model the notion of illegality that is associated with bribery and corruption, we assume there is an auditing technology. With probability π there is an external inspection to the winning firm. If the winning firm is found to have offered a bribe, a fine is administered with probability one. The fine (f) will be a proportion of the bribe the firm is offering the government official, $f = \varphi B_i$. Therefore, the expected value of the fine will be $E[f(B_i)] = \pi\varphi B_i$.[104] It is assumed that the probability of inspection, π, and the proportion of the bribe that constitutes the fine, φ, are both common knowledge. Therefore, the possibility of inspection and the fine

[104] If we assume that punishment is only enforced with some probability μ, then the expected value of the fine becomes $E[f(B_i)] = \pi\mu\varphi B_i$. Although this further assumption would make the analysis more realistic, it would not significantly affect the results.

levied on firms that bribe government officials reflect the punishment incurred by the firms that engage in illicit activities. It is not costless for the firm to bribe, or even to attempt to bribe, government officials, and the punishment that they incur will be proportional to the bribe that they offer. The auditing technology assumes there is an external inspection of the firm that *wins* the contract.

The probability π can be thought of as a measure of the effectiveness of the legal system, whereas φ measures the stance against actual (and attempted) bribery, so that a higher value of φ makes the purchase of influence more costly to the firms. Note that $\varphi > 0$. For example, in the US, the federal law allows a briber to be penalized an amount equal to four times the bribe.[105]

Note that the expected penalty the government official incurs by engaging in corrupt activities is not explicitly modelled. As this chapter is primarily interested in the private sector's willingness to offer bribes, there is a focus on the punishment to the firms (the bribers).[106] The punishment of the government official (the bribee) can be thus interpreted as implicit - the official's decision to be corrupt has already taken into account this expected penalty. When there is uncertainty as to the government official's corruptibility, the firms

[105] US Code, vol.18, sec. 201, par. (e), 1962 provides that the penalty for 'corrupt giving' shall be a fine of 'not more than $20,000 or three times the monetary equivalent of the thing of value, whichever is greater, or imprisonment for not more than fifteen years, or both...' Moreover, US Code, vol. 18, sec. 3612, 1949, provides that if the bribe itself can be recovered, it shall be deposited in the registry of the court. This makes a fine of up to *four* times the bribe.
[106] See Rose-Ackerman (1975) for an example where the expected penalties for both the government official and the firms are explicitly considered.

incorporate the punishment of the bribee in their beliefs (a greater penalty for the official would imply a higher γ).[107]

It is very important to stress that we are not arguing that punishing bribers is more important, or indeed more effective, than punishing bribees. If corrupt government officials incur punishments such that they are completely deterred from corruption, then there is clearly no need for any further penalty schemes for firms, as the crime will not occur if the law can deter at least one of the parties. Anti-corruption laws and initiatives have typically focused on officials, yet, as Peter Eigen, the chairman of Transparency International, stated, "*there is no end in sight to the misuse of power by those in public office and corruption levels are perceived to be as high as ever in both developed and developing worlds*."

Corruption is still a rampant problem, and concentrating anti-corruption efforts on the punishment of officials has clearly not been enough. Therefore, given that targeting the demand for bribes has not been successful in eliminating bribery, tackling the supply side of bribery becomes relevant. A further justification for concentrating on the punishment of firms is the case where third parties, such as the World Bank, are interested in reducing corruption as part of their mandate, but have limited instruments for punishing officials within the affected countries. In this case, tackling the supply side of bribery becomes their only option, even if it may only be second-best.

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[107]Typically, in the literature bribe-givers are punished less severely than bribe-takers. For an example where *bribers* suffer a greater punishment, albeit in a different context than that of this study, see Mookherjee and Png (1995).

The payoff functions for Firm i, when the government official is corrupt and when he is not corrupt, are (respectively) defined as follows:

$$\Pi_i|_{\alpha=0} = \begin{cases} g_i - (1+\pi\varphi)B_i & \text{if } G_i > G_j \\ \frac{1}{n}(g_i - (1+\pi\varphi)B_i) & \text{if } G_i = G_j \\ 0 & \text{if } G_i < G_j \end{cases} , \forall \quad i = 1,\ldots,n \ , \ j \neq i$$

and

$$\Pi_i|_{\alpha=1} = \begin{cases} g_i - \pi\varphi B_i & \text{if } G_i > G_j \\ \frac{1}{n}(g_i - \pi\varphi B_i) & \text{if } G_i = G_j \\ 0 & \text{if } G_i < G_j \end{cases} , \forall \quad i = 1,\ldots,n \ , \ j \neq i \ .$$

3.5.1 Complete Information

Result B.1 *When the government official is known to be corrupt, and the winning firm may face a fine proportional to its bribe, the firm that offers the highest bribe wins the contract. The bribe function for Firm i is given by*[108]

$$B_i = \begin{cases} \frac{1}{1+\pi\varphi} g_j & \text{if } g_i > g_j \\ \frac{1}{1+\pi\varphi} g_i & \text{if } g_i \leq g_j \end{cases} , \forall i = 1,\ldots,n, j \neq i. \quad (3.11)$$

The difference between this model and the basic model is that firms have to take into account the fine that they have to pay if there is an inspection and they are fined for bribery.

[108]Actually, if $g_i > g_j$, Firm i offers a bribe of $\frac{1}{1+\pi\varphi} g_j + \varepsilon$ to make sure it wins the contract. Firm i wants to choose ε as close as possible to (but different from) zero. As such an ε does not exist, the equilibrium is defined as the limit.

Proof. The equilibrium strategy is derived using the same approach as that in Result A.1.■

The bribe function in this model is a fraction $\frac{1}{1+\pi\varphi}$ of the one in the basic model $\left(\frac{1}{1+\pi\varphi} < 1\right)$. Once again, the firm with the highest gross gain, g_i, or, equivalently, lowest cost, C_i, wins. As long as there exists at least one firm with cost lower than C^*, the equilibrium is not welfare-optimal.

Note that $\frac{1}{1+\pi\varphi}$ is smaller than one, but greater than zero. For example, if *both* the probability of an external inspection *and* the fine as a proportion of the bribe offered to the government official are equal to one, a firm will still continue to offer a positive bribe (in particular, it would offer a bribe equal to half of what it would offer in the absence of a fine). Taking the US federal law as a further example, then the greatest reduction in the bribes offered to the government official that this penalty scheme can achieve, *if there is an inspection with certainty,* is 80%.[109] This does not appear to be the best way of eliminating or drastically reducing firms' incentives to offer bribes. We shall see in the next sections that having either a fixed fine or a fine proportional to gross gain will prove to be more effective in deterring firms from offering bribes.

[109] Note that if $\pi = 1$ and $\varphi = 4$, then $\frac{1}{1+\pi\varphi} = \frac{1}{5} = 20\%$.

3.5.2 Firms' Types are Private Information

Result B.2 *When firm types are private information, the government official is known to be corrupt, and the winning firm may face a fine proportional to its bribe, the bribe function for Firm* i *is a fraction* $\frac{1}{1+\pi\varphi}$ *of the one in the basic model, that is,*

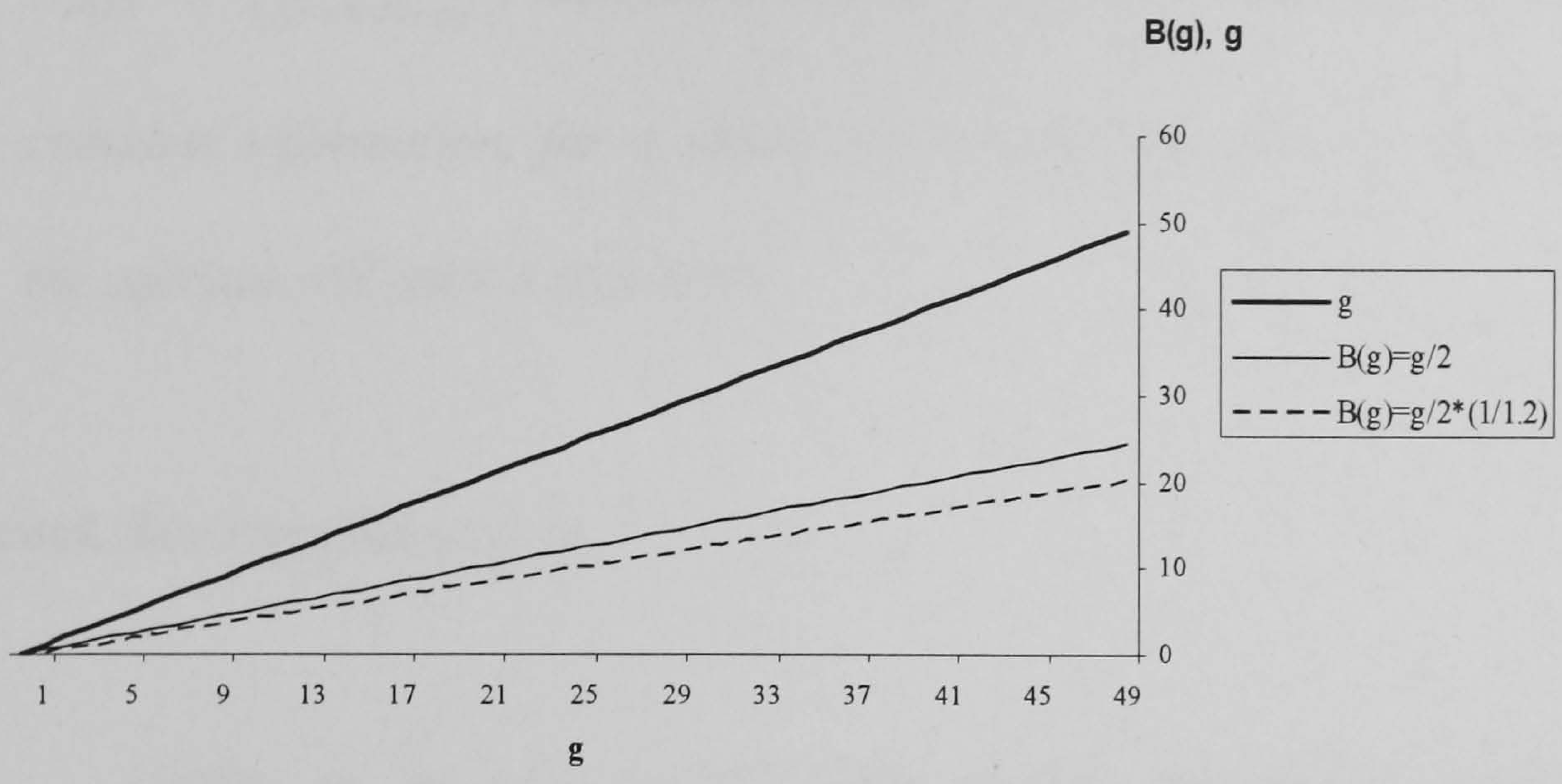
$$B(g_i) = \frac{1}{1+\pi\varphi}\left[g_i - \frac{\int_{\underline{g}}^{g_i} [F(s)]^{n-1}\, ds}{[F(g_i)]^{n-1}} \right], i = 1,\ldots,n. \quad (3.12)$$

Proof. The equilibrium strategy is derived using the same approach as that in Result A.2.■

In the cases reviewed so far, the only implication of the possibility of a firm being punished for bribery is to reduce its bribes by an amount proportional to the probability of inspection (π) and the size of the fine (φ); the welfare implications are not altered.

Figure 3.4 illustrates the bribes for the case where the costs are uniformly distributed, $g_i \sim U[0,49]$, $n = 2$, $\pi = 0.1$ and $\varphi = 2$.

Figure 3.4: Bribe function with a fine proportional to the bribe



3.5.3 Government Official's Type is Private Information

When the government official's type is private information, the winning firm must take into account the fact that if it offers a bribe it will have to pay a fine proportional to that bribe in the event of an external inspection, regardless of the official being corrupt. Therefore, the result of the basic model, where firms offered the same bribes when the government official's type was unknown as when there was complete information, does not (always) hold in this model with punishment.

Result B.3 *When the government official's type is private information, and the winning firm may face a fine proportional to its bribe:*

(i) If the firm closest to the optimal has no chances of outbribing all its rivals (i.e., because it has a lower gross gain), then it will offer a zero bribe;

(ii) If it can outbribe all its rivals and γ is below a critical level, $\gamma^{c}_{B(3)} = \frac{(g_1-g_2)(1+\pi\varphi)}{g_1(1+\pi\varphi)-g_2}$, then firms will offer the same bribes as in the case of complete information; for γ above the critical level, then the firm closest to the optimal will offer a zero bribe.

Proof. See Appendix 3.A.■

Unlike in the case of the basic model, uncertainty regarding the corruptibility of the government official may potentially reduce bribe payments.

3.5.4 Two Information Asymmetries

Result B.4 *When the two information asymmetries are present, and the winning firm may face a fine proportional to its bribe, a firm's bribe:*

(i) Is decreasing in the probability γ that the government official is honest;

(ii) Depends on its position in relation to the optimal-cost firm.

If cost levels are uniformly distributed on $[\underline{C},\overline{C}]$, and, therefore, the gross gains, g_i, are also uniformly distributed on $[\underline{g},\overline{g}]$, the bribe functions are:

1. *If $g_i = g^*$,*

$$b(g_i) = \frac{(1-\gamma)(g_i-\underline{g})^{n-1}\left[(n-1)g_i+\underline{g}\right]}{n\gamma\pi\varphi\left(\overline{g}-\underline{g}\right)^{n-1}+n(1-\gamma)(1+\pi\varphi)(g_i-\underline{g})^{n-1}}; \tag{3.13}$$

2. *If $g_i > g^*$,*

$$b(g_i) = \frac{(1-\gamma)(g_i - \underline{g})^{n-1}\left[(n-1)g_i + \underline{g}\right]}{n\gamma\pi\varphi\left(\overline{g} - \underline{g} + 2g^* - g_i\right)^{n-1} + n(1-\gamma)(1+\pi\varphi)(g_i - \underline{g})^{n-1}}; \tag{3.14}$$

3. *If* $g_i < g^*$ *and* $g_i > 2g^* - \overline{g}$,

$$b(g_i) = \frac{(1-\gamma)(g_i - \underline{g})^{n-1}\left[(n-1)g_i + \underline{g}\right]}{n\gamma\pi\varphi\left(\overline{g} - \underline{g} - 2g^* + g_i\right)^{n-1} + n(1-\gamma)(1+\pi\varphi)(g_i - \underline{g})^{n-1}}; \tag{3.15}$$

4. *If* $g_i < g^*$ *and* $g_i \leq 2g^* - \overline{g}$,

$$b(g_i) = \frac{(1-\gamma)\left(g_i\left(n(1-\gamma\pi\varphi) + \gamma\pi\varphi - 1\right) + \underline{g}\right)(g_i - \underline{g})^{\frac{\gamma\pi\varphi(n-1)(\gamma-\pi\varphi)}{1+\pi\varphi-\gamma}}}{(1+\pi\varphi-\gamma)\left(n(1-\gamma\pi\varphi) + \gamma\pi\varphi - 1\right)\left(n(1-\gamma\pi\varphi) + \gamma\pi\varphi\right)\left(\overline{g} - \underline{g}\right)^{n-2+\frac{\gamma\pi\varphi(n-1)(\gamma-\pi\varphi)}{1+\pi\varphi-\gamma}}}. \tag{3.16}$$

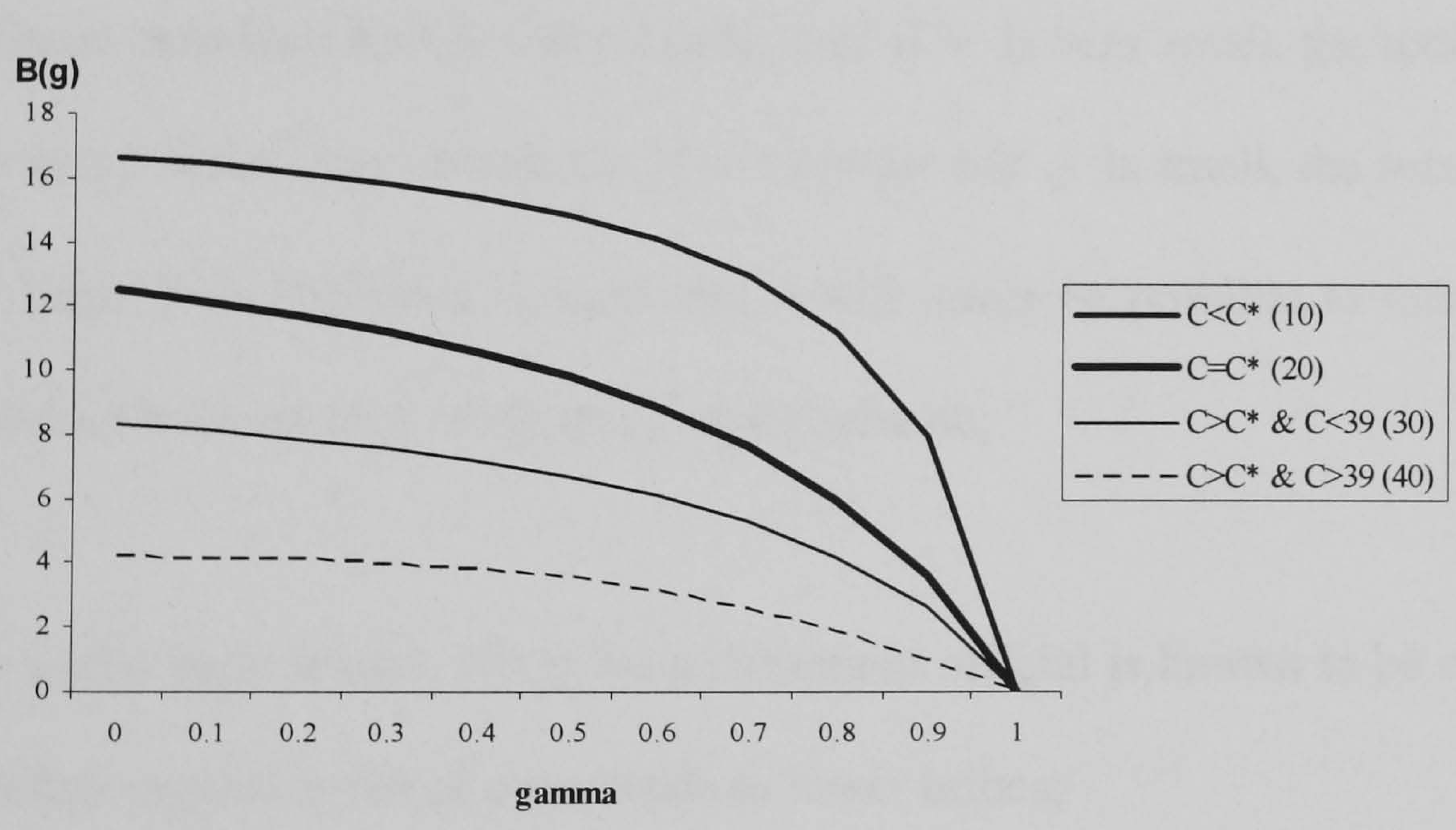
Due to the specifications of the model, if the firm offers a bribe and gets caught, the punishment imposed is independent of the awarding procedure. Therefore, whenever there is a positive probability that the official may be corrupt and the punishment is proportional to the bribe, it is always optimal for each firm to bribe.

Proof. See Appendix 3.B.■

From (3.13), (3.14), (3.15) and (3.16), we can see that when both the government official's and firms' types are private information, the bribe function is increasing in gross gain, decreasing in both the probability of an external inspection to the winning firm, π, and the proportion of the bribe levied as a fine, φ. Furthermore, as would be expected, the bribe function is decreasing in the probability γ that the government official is honest.

Let us consider that $g_i \sim U[0,49]$, $n = 2$, $\pi = 0.1$ and $\varphi = 2$. The figure below shows how the bribe functions for four specific values of C_i (namely, 10, 20, 30 and 40) vary with the probability of a government official being honest (γ).

Figure 3.5: Bribe functions with a proportional fine and two information asymmetries



From the analysis of the model with a penalty proportional to the bribe offered, we are able to draw the following conclusions:

(a) As in the basic model, when the government official is corrupt, the economy will always suffer from allocation inefficiency (unless the lowest-cost firm is the optimal one);

(b) Bribes are smaller in size compared to the basic model;

(c) Even in the case of complete information, by choosing appropriate values for the parameters π and φ, bribes can, in principle, become a small percentage of the bribes in the basic model. However, for the penalty to be effective in reducing the bribes, both the probability of an inspection and the proportion of the bribe paid as a fine have to assume high values. If we assume $\varphi = 4$ (maximum permitted by US federal law), then if π is very small, the total effect on the bribe is not large. Similarly, if π is large, but φ is small, the total effect is not large. It is important to note that it will never be possible to reduce the equilibrium bribe to zero using this penalty scheme;

(d) As in the basic model, when the government official is known to be corrupt, uncertainty regarding firms' costs leads to lower bribes;

(e) Unlike the basic model, the results for when the government official's type is private information are not always the same as when the official is known to be corrupt. In particular, if the firm closest to the optimal has no chances of outbribing *all* its rivals, then it will offer a zero bribe. If it can outbribe all its rivals and γ is below a critical level γ^c $\left(\text{with } \frac{\delta\gamma^c_{B(3)}}{\delta(g_1-g_2)} > 0 \text{ and } \frac{\delta\gamma^c_{B(3)}}{\delta\pi_{\varphi}} < 0\right)$, then firms will offer the same bribes as in the case of complete information; for $\gamma \geq \gamma^c$, then the firm closest to the optimal will offer a zero bribe;

(f) Bribes are smallest in size when information about both the types of the firms and the government official is private. This would imply that in the presence of proportional fines, when operating in less concentrated markets or in markets with differentiated products and in situations of unknown corruptibility of officials, firms tend to bribe less than in any other circumstance.

3.6 Fixed Fine (Model C)

In this section, we introduce another type of punishment for a firm that bribes (or attempts to bribe) a government official. The motivation for including a fixed fine is twofold. Firstly, as seen in the previous section, a fine proportional to the bribe offered by a firm is not sufficient to deter bribery. This is particularly relevant, as in this chapter we are concerned not only with the role of information and uncertainty in fostering or deterring bribery, but also with ways to change the penalty structures in order to reduce incentives for bribery. Therefore, we are interested in examining alternative forms of punishment that may prove more effective in deterring bribery.

Secondly, we are interested in examining the World Bank's blacklisting policy for firms that offer bribes to government officials in government procurement contracts. We shall see that, even in a static one-period context, this policy is effective in deterring bribery. By adequately selecting the size of the fixed fine, this form of punishment can be equivalent to a firm being blacklisted from government contracts.

With probability π there is an external inspection of the firm that wins the government contract. If the winning firm is found to have offered a strictly positive bribe,[110] a fine (f) is administered with probability one. In contrast to the previous section, this fine will be fixed, and shall be denoted by M, so that $f = M$. Therefore, the expected value of the fine will be $E(f) = \pi M$.

The payoff functions for Firm i when the government official is corrupt and when he is not corrupt are (respectively) defined as follows:

$$\Pi_i|_{\alpha=0} = \begin{cases} g_i - B_i - \pi M & \text{if } G_i > G_j \\ \frac{1}{n}(g_i - B_i - \pi M) & \text{if } G_i = G_j \text{ , } \forall \ \ i = 1,\ldots,n \text{ , } j \neq i \\ 0 & \text{if } G_i < G_j \end{cases}$$

and

$$\Pi_i|_{\alpha=1;B_i>0} = \begin{cases} g_i - \pi M & \text{if } G_i > G_j \\ \frac{1}{n}(g_i - \pi M) & \text{if } G_i = G_j \text{ , } \forall \ \ i = 1,\ldots,n \text{ , } j \neq i \\ 0 & \text{if } G_i < G_j \end{cases}$$

$$\Pi_i|_{\alpha=1;B_i=0} = \begin{cases} g_i & \text{if } G_i > G_j \\ \frac{1}{n} g_i & \text{if } G_i = G_j, \forall i = 1,\ldots,n, j \neq i. \\ 0 & \text{if } G_i < G_j \end{cases}$$

[110] If a firm does not know whether the government official is corrupt or not and offers a strictly positive bribe, then even if the official turns out to be honest and the firm does not pay the bribe, it will still have to pay the fine if there is an inspection.

3.6.1 Complete Information

Result C.1 *When the government official is known to be corrupt, and the winning firm may face a fixed fine, the firm that offers the highest bribe wins the contract. The bribe function for Firm i is given by*[111]

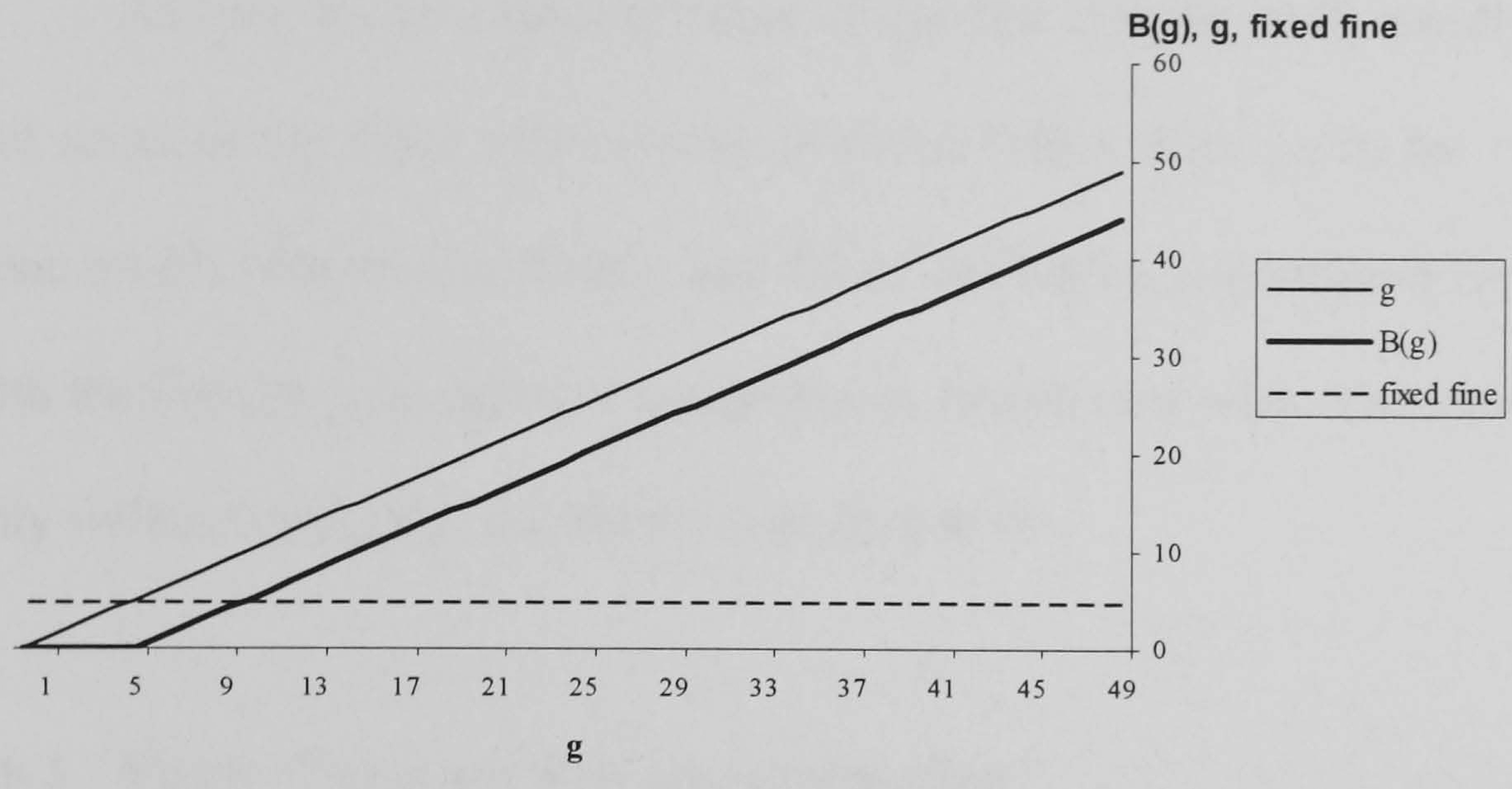
$$B_i = \begin{cases} g_j - \pi M & \text{if } g_i > g_j \text{ and } g_i > \pi M \\ g_i - \pi M & \text{if } g_i \leq g_j \text{ and } g_i > \pi M \\ 0 & \text{if } g_i \leq \pi M \end{cases} \quad ,\forall i = 1,...,n, j \neq i. \tag{3.17}$$

Proof. The equilibrium strategy is derived using the same approach as that in Results A.1 and B.1, but in this case a firm's decision of the bribe to offer is the solution to the problem $\underset{B_i}{Max}\, \Pi_i|_{\alpha=0} = T - C_i - B_i - \pi M$.■

Figure 3.6 illustrates the case where $g_i \sim U[0,49]$, $n = 2$, and the expected value of the fine is 5.

[111]Actually, if $g_i > g_j$, Firm i offers a bribe of $g_j - \pi M + \varepsilon$ to make sure it wins the contract. Firm i wants to choose ε as close as possible (but different from) zero. As such an ε does not exist, the equilibrium is defined as the limit.

Figure 3.6: Bribe function with a fixed fine (complete information)



We observe that, unlike the case of the proportional fine, it is now possible to select a fixed fine such that no firm will want to offer a strictly positive bribe. If the fixed fine is such that its expected value is greater than the gross gain g_i of the firm with the smallest cost, i.e., $\pi M \geq T - \underline{C}$, then all firms will want to offer a zero bribe, even though the government official is known to be corrupt. This is quite a powerful result, as it shows how such a simple punishment can be effective in deterring any incentive for a firm to offer a bribe in order to win a government contract. Moreover, it also shows how a penalty may appear to be fighting corruption without actually doing so. That is, if a government wants to appear to be taking measures against bribery by firms, it may impose a fixed fine whose expected value is low. This effectively amounts to "truncating" the distribution of the bribes, by removing the lowest bribes, while maintaining the higher bribes. By setting a low fixed fine only the firms with a low gross gain will offer zero bribes; but these firms are the losing ones anyway, so the government appears to be taking action against bribery, without actually doing so.

As long as the expected value of the fine is sufficiently small, i.e., such that some of the firms offer strictly positive bribes, then, as in the case of the basic model with no punishment and the model with a proportional fine, the firm with the highest gross gain, or equivalently, lowest cost wins. The equilibrium is only welfare-optimal if the lowest-cost firm is C^*.

3.6.2 Firms' Types are Private Information

Result C.2 *When firm types are private information, the government official is known to be corrupt, and the winning firm may face a fixed fine, the bribe function for Firm i is given by*

$$B(g_i) = \begin{cases} \underbrace{g_i - \frac{\int_{\underline{g}}^{g_i} [F(s)]^{n-1} ds}{[F(g_i)]^{n-1}}}_{A} - \pi M & \text{if } A > \pi M \\ 0 & \text{if } A \leq \pi M \end{cases}, i = 1, \ldots, n. \tag{3.18}$$

Proof. The equilibrium strategy is derived using the same approach as that in Results A.2 and B.2.■

Note that, as was the case in the two previous models, bribes are lower when this type of information asymmetry is present. Furthermore, in this case a given fixed fine will deter more firms from bribing than in the case of complete information.

3.6.3 Government Official's Type is Private Information

When the government official's type is private information, if the winning firm offers a bribe it will have to pay the fixed fine in the event of an inspection, independently of the government official being corrupt or not. This case is analogous to that of the proportional fine.

Result C.3 *When the government official's type is private information, and the winning firm may face a fixed fine:*

(i) If the firm closest to the optimal has no chances of outbribing all its rivals (i.e., because it has a lower gross gain), then it will offer a zero bribe;

(ii) If it can outbribe all its rivals and γ *is below a critical level,*[112] $\gamma^c_{C(3)} = \frac{g_1 - g_2}{\pi M + g_1 - g_2}$, *then firms will offer the same bribes as in the case of complete information; for* γ *above the critical level, then the firm closest to the optimal will offer a zero bribe.*

Proof. See Appendix 3.C.■

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[112]The critical level of γ in this model with a fixed fine is different to the one in the model with a proportional fine.

3.6.4 Two Information Asymmetries

Result C.4 *When the two information asymmetries are present, and the winning firm may face a fixed fine:*

(i) If a firm offers a bribe, it will offer the same as when only firm types are private information and the government official is known to be corrupt;

(ii) A firm will bribe if its belief that the official is honest, γ*, is below a critical value, which depends on its position in relation to the optimal-cost firm;*

(iii) Firm i *'s bribe function is given by*

$$B(g_i) = \begin{cases} \underbrace{g_i - \frac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{[F(g_i)]^{n-1}}}_{A} - \pi M & \text{if } A > \pi M \text{ and } \gamma < \gamma^c_{C(4)} \\ 0 & \text{if } A \leq \pi M \text{ or } A > \pi M \text{ and } \gamma \geq \gamma^c_{C(4)} \end{cases}, i = 1,\dots,n \tag{3.19}$$

where

$$\gamma^c_{C(4)} = \begin{cases} \frac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{\pi M + \int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds} & \text{if } g_i = g^* \\ \frac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{\pi M[1-F(g^+)+F(g^-)]^{n-1} + \int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds} & \text{if } g_i > g^* \text{ or } (g_i < g^* \text{ and } g_i > 2g^* - \overline{g}). \\ \frac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{\pi M F(g)^{n-1} + \int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds} & \text{if } g_i < g^* \text{ and } g_i \leq 2g^* - \overline{g} \end{cases}$$

Proof. When both the government official's and firms' types are private information, Firm i must decide whether to offer a bribe, and if so, how much the bribe will be. To ascertain a firm's equilibrium bribe, first we maximize its expected profit, given that it offers a strictly positive bribe, which is given by (3.10). Thus, the expected payoff to Firm i from offering a bribe $b(w_i)$ is given by

$$\gamma(g_i - \pi M)[1 - F(g^+) + F(g^-)]^{n-1} + (1-\gamma)(g_i - \pi M - b(w_i))F(w_i)^{n-1}. \tag{3.20}$$

We maximize (3.20) with respect to w_i. In equilibrium, the derivative of this expected payoff with respect to w_i should equal 0 when w_i equals g_i. We obtain the first order differential equation,

$$b'(g_i) + b(g_i)(n-1)\frac{F'(g_i)}{F(g_i)} = (g_i - \pi M)(n-1)\frac{F'(g_i)}{F(g_i)}, \tag{3.21}$$

which we solve to obtain the following bribe function for Firm i

$$B(g_i) = \begin{cases} \underbrace{g_i - \frac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{[F(g_i)]^{n-1}}}_{A} - \pi M & \text{if } A > \pi M \\ 0 & \text{if } A \le \pi M \end{cases}, i = 1,\dots,n.$$

We must then proceed to check under what circumstances Firm i might prefer to offer a zero bribe, that is, for what values of γ a firm will not want to bribe. To do this, we compare a firm's expected profit if it offers a bribe $[E(\Pi_i \mid_{B>0})]$ with its expected profit when it does not bribe $[E(\Pi_i \mid_{B=0})]$. This procedure is conducted for the four possible positions in which a firm may be in relation to the optimal-cost firm. For example, when $g_i = g^*$,

$E(\Pi_i|_{B=0}) > E(\Pi_i|_{B>0})$ implies $\gamma g_i > \gamma g_i - \gamma\pi M + (1-\gamma)\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds$.

which in turn implies γ must be greater than or equal to $\frac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{\pi M + \int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}$

for Firm i prefer not to bribe. We thus obtain the bribe function (3.19).■

Let us consider once again the example in Section 3.4.1 with $g_i \sim U[0,49]$ and $n = 2$. The expressions for $\gamma^c_{C(4)}$ become

$$\begin{cases} \frac{g_i^2}{2\overline{g}\pi M + g_i^2} & \text{if } g_i = g^* \\ \frac{g_i^2}{\pi M(2\overline{g}+4g^*-4g_i)+g_i^2} & \text{if } g_i > g^* \\ \frac{g_i}{2\pi M + g_i} & \text{if } g_i < g^* \text{ and } g_i \leq 2g^* - \overline{g} \\ \frac{g_i^2}{\pi M(2\overline{g}-4g^*+4g_i)+g_i^2} & \text{if } g_i < g^* \text{ and } g_i > 2g^* - \overline{g}. \end{cases}$$

Assume now that $\pi M = 5$. Consider the case where $\gamma = 0.5$. First, we know that firms with $g_i \leq 10$ will *not* offer a bribe. After performing calculations with the critical value, we see that those are the only firms that will not offer a strictly positive bribe. Firms with $g_i \in (10,49]$ will offer a bribe equal to $\frac{g_i}{2} - \pi M$. If we increase γ to 0.6 (i.e., firms believe that the government official is honest with probability of 60%), then firms with $g_i \in (22.75,49]$ will offer a bribe and firms with $g_i \in [0,22.75]$ will offer a zero bribe. As γ increases, the interval of firms offering a bribe will become smaller - only the firms closer to the upper bound will remain. For the optimal firm to prefer to offer a zero bribe, $\gamma^c_{C(4)}$ is 0.6474, which means that if γ is greater than this value it will never offer a bribe.

From the analysis of the model with a fixed fine, we may conclude the following:

(a) Unlike in the two previous models, it is possible to have allocation efficiency even when the government official is corrupt (without having to exclude firms with cost lower than the optimal). In order to ensure this, the expected value of the fixed fine has to be greater than the gross profit of the firm with the lowest cost, or equivalently, the firm with the highest gross profit;

(b) An appropriate fixed fine can completely deter bribery. This is a significant improvement to the previous model, where it was not possible to reduce the equilibrium bribe to zero with that penalty scheme;

(c) As in the previous two models, when the government official is known to be corrupt, uncertainty regarding firms' types leads to lower bribes. In particular, the expected value of the fixed fine that deters all bribery is lower than in the case where there is information about firm types. If there are two firms with uniform costs, then for the same probability of inspection, the fixed fine only needs to be one half of what it is in complete information;

(d) When the government official's type is private information, the optimal firm will, under some circumstances, offer a zero bribe. This might happen both when the optimal firm does not have the highest gross gain, and when it is the lowest cost firm, depending on whether the second lowest-cost firm is very close to it, the fine is very large and the firms' belief of the honesty of the official is above a critical value;

(e) When both types of information asymmetries are present, if a firm decides to offer a bribe, it will be of the same magnitude as when only firm types are private information. Firms may, however, decide not to offer a bribe. Because firms do not know whether the government official is corrupt they must weigh the benefits of offering a bribe against the costs. Thus, each firm has a critical level for the belief that the official is honest. If γ is above that critical level, then a firm will not offer a bribe. Naturally, as firm types are unknown, a firm's critical level depends on its cost level relatively to the optimal cost.

3.7 Fine Proportional to a Firm's Gain (Model D)

In the previous section, we saw that a fixed fine was capable of deterring firms from bribing. In this section, we investigate the effectiveness of a different type of punishment scheme, namely, when a firm's penalty upon conviction depends on its surplus, or gross gain. The main motivation to examine a further penalty scheme is to ascertain whether there exists an alternative to a fixed fine, which is equally as effective and perhaps of easier implementation.

As before, with probability π there is an external inspection of the firm that wins the government contract. If the winning firm is found to have offered a strictly positive bribe,[113] a fine (f) is administered with probability one. The

[113]As in the previous model, if a firm does not know whether the government official is corrupt or not and offers a strictly positive bribe, then even if the official turns out to be honest and the firm does not pay the bribe, it will still have to pay the fine if there is an inspection.

fine will be a proportion θ of the winning firm's gross gain, that is, $f = \theta g_i$.

The expected value of the fine will thus be $E[f(g_i)] = \pi\theta g_i$.

The payoff functions for Firm i when the government official is corrupt and when he is not corrupt are (respectively) defined as follows:

$$\Pi_i|_{\alpha=0} = \begin{cases} g_i(1-\pi\theta) - B_i & \text{if } G_i > G_j \\ \frac{1}{n}(g_i(1-\pi\theta) - B_i) & \text{if } G_i = G_j \text{ , } \forall \ \ i = 1,\ldots,n \text{ , } j \neq i \\ 0 & \text{if } G_i < G_j \end{cases}$$

and

$$\Pi_i|_{\alpha=1;B_i>0} = \begin{cases} g_i(1-\pi\theta) & \text{if } G_i > G_j \\ \frac{1}{n} g_i(1-\pi\theta) & \text{if } G_i = G_j \text{ , } \forall \ \ i = 1,\ldots,n \text{ , } j \neq i \\ 0 & \text{if } G_i < G_j \end{cases}$$

$$\Pi_i|_{\alpha=1;B_i=0} = \begin{cases} g_i & \text{if } G_i > G_j \\ \frac{1}{n} g_i & \text{if } G_i = G_j \text{ ,} \forall i = 1,\ldots,n, j \neq i. \\ 0 & \text{if } G_i < G_j \end{cases}$$

3.7.1 Complete Information

Result D.1 *When the government official is known to be corrupt, and the winning firm may face a fine proportional to its gain, the firm that offers the highest bribe wins the contract. The bribe function for Firm i is given by*[114]

[114]Actually, if $g_i > g_j$, Firm i offers a bribe of $g_j(1-\pi\theta)+\varepsilon$ to make sure it wins the contract. Firm i wants to choose ε as close as possible to (but different from) zero. As such an ε does not exist, the equilibrium is defined as the limit.

$$B_i = \begin{cases} g_j(1-\pi\theta) & \text{if } g_i > g_j \text{ and } \pi\theta < 1 \\ g_i(1-\pi\theta) & \text{if } g_i \leq g_j \text{ and } \pi\theta < 1 \\ 0 & \text{if } \pi\theta \geq 1 \end{cases} , \forall i = 1,\ldots,n, j \neq i.$$

(3.22)

Proof. The equilibrium strategy is derived using the same approach as that in Results A.1, B.1 and C.1, but in this case a firm's decision of the bribe to offer is the solution to the problem $\underset{B_i}{Max}\, \Pi_i |_{\alpha=0} = g_i(1-\pi\theta) - B_i$.■

We observe that, as was the case for the fixed fine, it is now possible to select a fine such that no firm will want to offer a strictly positive bribe. In particular, if the product of the probability of inspection and the proportion of the gain that is fined is at least one, then all firms will want to offer a zero bribe, even though the government official is known to be corrupt.

This penalty scheme is, essentially, one of punitive damages. The punitive damages approach focuses principally on the observation that punishment levels should be related to the reciprocal of the probability of detection. For example, if the chance of detection is 50%, then the total penalty must be twice the value of the harm in order to create the proper incentives for deterrence on an expected value basis.[115]

This is quite a powerful result, as it shows how such a simple punishment can be effective in deterring any incentive for a firm to offer a bribe in order to win a government contract. Even if a firm's true surplus is

[115]See Bentham (1962).

imperfectly observable, as long as $\pi\theta$ is sufficiently greater than one, the firm will be deterred from bribing.

As long as the expected value of the fine is sufficiently small, i.e., such that some of the firms offer strictly positive bribes, then, as in the case of the three previous models, the firm with the highest gross gain, or equivalently, lowest cost wins. The equilibrium is only welfare-optimal if the lowest-cost firm is C^*.

3.7.2 Firms' Types are Private Information

Result D.2 *When firm types are private information, the government official is known to be corrupt, and the winning firm may face a fine proportional to its gain, the bribe function for Firm i is given by*

$$B(g_i) = \begin{cases} (1-\pi\theta)\left[g_i - \dfrac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{[F(g_i)]^{n-1}}\right] & \text{if } \pi\theta < 1 \\ 0 & \text{if } \pi\theta \geq 1 \end{cases} ,i = 1,...,n. \tag{3.23}$$

Proof. The equilibrium strategy is derived using the same approach as that in Results A.2, B.2 and C.2.■

Note that, unlike the case of the fixed fine, where a given fixed fine would deter more firms from bribing in the case of this type of information asymmetry than in the case of complete information, in this case the 'cut-off' point for deterrence (i.e., $\pi\theta = 1$) is the same as in complete information.

3.7.3 Government Official's Type is Private Information

When the government official's type is private information, if the winning firm offers a bribe, it will incur the punishment in the event of an inspection, independently of the government official being corrupt or not.

Result D.3 *When the government official's type is private information, and the winning firm may face a fine proportional to its gain:*

(i) If the firm closest to the optimal has no chances of outbribing all its rivals (i.e., because it has a lower gross gain), then it will offer a zero bribe;

(ii) If it can outbribe all its rivals and γ *is below a critical level,* $\gamma^c_{D(3)} = \frac{(g_1-g_2)(1-\pi\theta)}{g_1-g_2(1-\pi\theta)}$,[116] *then firms will offer the same bribes as in the case of complete information; for* γ *above the critical level, then the firm closest to the optimal will offer a zero bribe.*

Proof. The proof is analogous to that of Results B.3 (Appendix 3.A) and C.3 (Appendix 3.C).■

[116]The critical value for this model is lower than the one for the model with a fine proportional to the bribe if $\theta > \frac{g_2\varphi}{g_1(1+\pi\varphi)+g_2\pi\varphi}$. It is smaller than the critical value for the model with a fixed fine if $\theta > \frac{M}{\pi M + g_1}$.

3.7.4 Two Information Asymmetries

Result D.4 *When the two information asymmetries are present, and the winning firm may face a fine proportional to its gain:*

(i) If a firm offers a bribe, it will offer the same as when only firm types are private information and the government official is known to be corrupt;

(ii) A firm will bribe if its belief that the official is honest, γ*, is below a critical value, which depends on its position in relation to the optimal-cost firm;*

(iii) Firm i*'s bribe function is given by*

$$B(g_i) = \begin{cases} (1-\pi\theta)\left[g_i - \dfrac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{[F(g_i)]^{n-1}} \right] & \text{if } \pi\theta < 1 \text{ and } \gamma < \gamma^c_{D(4)} \\ 0 & \text{if } \pi\theta \geq 1 \text{ or } \pi\theta < 1 \text{ and } \gamma \geq \gamma^c_{D(4)} \end{cases} ,i = 1,\dots,n \tag{3.24}$$

where

$$\gamma^c_{D(4)} = \begin{cases} \dfrac{(1-\pi\theta)\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{g_i\pi\theta + (1-\pi\theta)\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds} & \text{if } g_i = g^* \\ \dfrac{(1-\pi\theta)\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{g_i[1-F(g^+)+F(g^-)]^{n-1} + (1-\pi\theta)\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds} & \text{if } g_i > g^* \text{ or } g_i < g^* \text{ and } g_i > 2g^* - \overline{g}. \\ \dfrac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{g_i\pi\theta F(g)^{n-1} + (1-\pi\theta)\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds} & \text{if } g_i < g^* \text{ and } g_i \leq 2g^* - \overline{g} \end{cases}$$

Proof. Analogous to the proof of Result C.4.■

From the analysis of the model with a fine proportional to gain, we may conclude the following:

(a) As in the model with a fixed fine, it is possible to have allocation efficiency even when the government official is corrupt (without having to exclude firms with cost lower than the optimal). For this to be true, all firms must be deterred from bribing. This can be achieved by setting the punishment level, θ, equal to the reciprocal of the probability of an external inspection, π. This appears to be simpler than setting the expected value of the fixed fine at a value greater than the gross profit of the firm with the lowest cost;

(b) As in the previous models, when the government official is known to be corrupt, uncertainty regarding firms' types leads to lower bribes. Unlike the case of the fixed fine, deterring firms from bribing does not involve changing the 'cut-off' point for deterrence (i.e., the product of π and θ must be at least equal to one);

(c) When the government official's type is private information, the optimal firm will, under some circumstances, offer a zero bribe. This might happen both when the optimal firm does not have the highest gross gain and when it is the lowest cost firm, depending on whether the second lowest-cost firm is very close to it, the expected fine is large and firms' belief of the honesty of the official is above a critical level;

(d) As in the case of a fixed fine, when both types of information asymmetries are present, firms do not always bribe, even if $\pi\theta < 1$. This occurs because, as firms do not know whether the government official is corrupt, they must weigh the benefits of offering a bribe against the costs (namely, attempting to bribe an honest official and paying a fine that could have been avoided by not offering a bribe). If a firm decides to offer a bribe, it will be of the same magnitude as when only firm types are private information. Firms may, however, decide not to offer a bribe - each firm has a critical level for the belief that the official is honest. If γ is above that critical level, then a firm will not offer a bribe. As firm types are unknown, a firm's critical level depends on its cost level relatively to the optimal cost.

3.8 The Case of Foreign Firms

The previous sections looked at the behaviour and bribe functions of *national* firms competing to win a government contract. The case of competition between foreign firms has not yet been examined. As this research aims to look particularly at developing countries, where the need for large government projects usually attracts foreign investors, it is highly appropriate that foreign firms be considered.

The assumptions regarding firm characteristics, namely, differences in cost translated into differences in quality by the function $V_i = a \ln C_i^2$, $a > 0$, with $V' > 0$ and $V'' < 0$, mean that the optimal firm (in terms of social welfare) will depend on whether national *or* foreign firms are competing. A benevolent or honest government official would award the contract to the national firm with $C_N^* = 2a$, whereas it would choose the foreign firm with $C_F^* = \overline{C}$ (See Result 1). This has implications regarding some of the results obtained, as clearly the optimal foreign firm is the one with the lowest gross gain. Some of the results are the same as in the case for national firms.

3.8.1 Results that are Maintained

- All the results for model A remain the same in the case of foreign firms. As there is no punishment for bribing or attempting to bribe, when there is some probability that the government official is corrupt firms will always offer a bribe, which will be proportional to their gross gain. Note that, unlike in the case of national firms where a pre-qualification of bidders (firms with cost lower than C^* not allowed to compete) could both ensure welfare efficiency and lower bribe levels (abstracting from any potential further problems of bribery associated with this measure), there is no equivalent measure for the case of foreign firms.
- Models B, C and D entail a penalty scheme for firms that bribe or attempt to bribe an official. As such, the results that do not depend on uncertainty regarding a government official's corruptibility will remain unaltered. Such results are B.1, B.2, C.1, C.2, D.1 and D.2.

3.8.2 Results that are Different

- **Government official's type is private information**

In the case of foreign firms, the socially optimal firm is the one with the highest quality and thus the one with the highest cost. As it has no chances of outbribing any of its rivals, it will offer a zero bribe. This is true for models B, C and D. What differ between the three models are the bribes offered by the remaining firms.

$g_1 > g_2 > \ldots > g_n (*)$

Model B $\quad B_1 = B_2;\ B_i = \frac{1}{1+\pi\varphi} g_i,\ i = 2,\ldots,n-1;\ B_n = 0;$

Model C $\quad B_1 = B_2;\ B_i = g_i - \pi M,\ i = 2,\ldots,n-1;\ B_n = 0;$

Model D $\quad B_1 = B_2;\ B_i = g_i(1-\pi\theta),\ i = 2,\ldots,n-1;\ B_n = 0.$

- **Two information asymmetries**

Firm i must maximise (3.10) as before, but $\Pr(\text{winning}|\alpha = 1)$ becomes $\Pr(V_i > V_j) = \Pr(C_i > C_j) = \Pr(g_i < g_j) = [1 - F(g_i)]^{n-1}$, so that (3.10) can be expressed as

$$\gamma \Pi_i^{\alpha=1}[1 - F(g_i)]^{n-1} + (1-\gamma)\Pi_i^{\alpha=0} F(g_i)^{n-1}. \tag{3.10'}$$

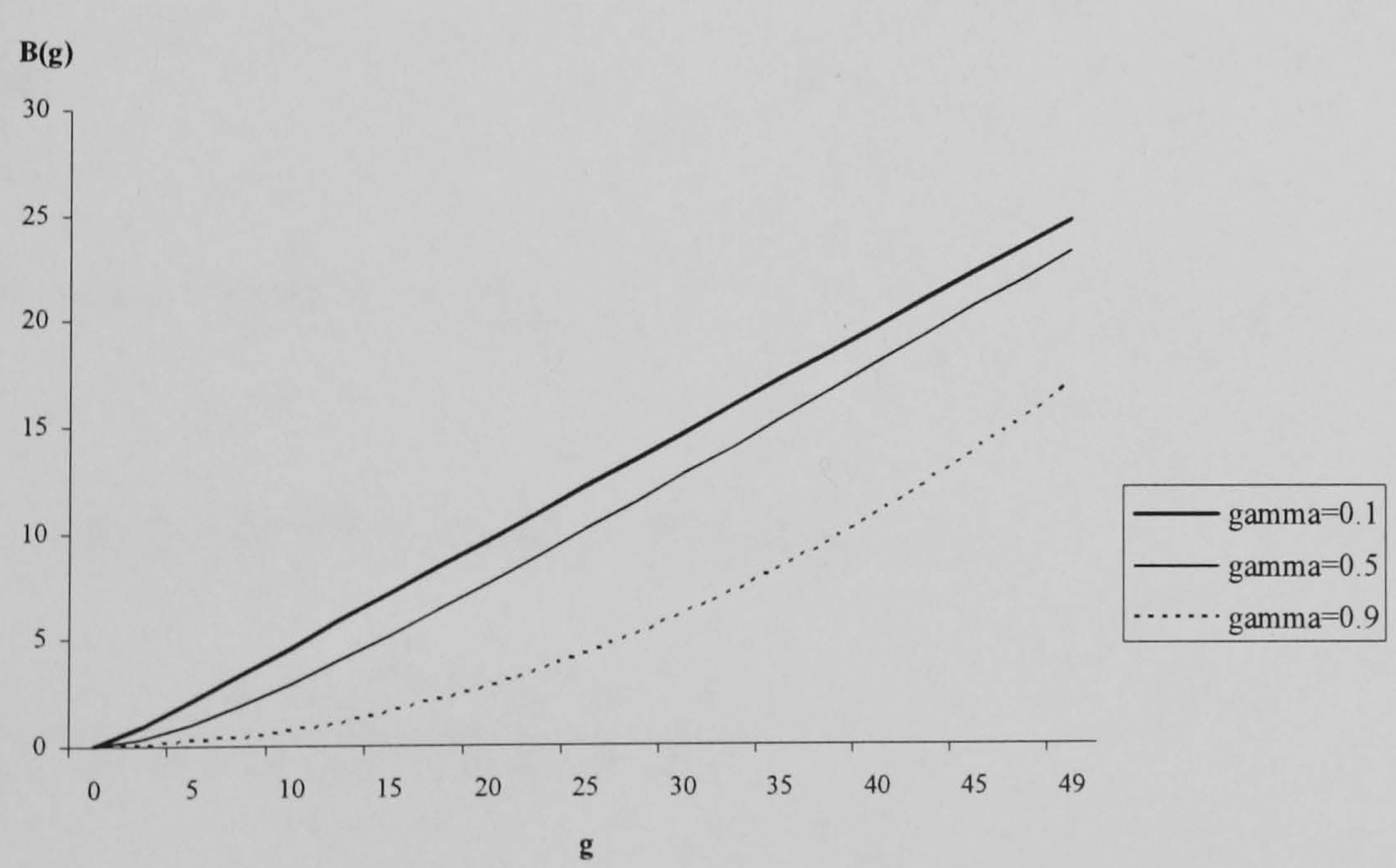
Model B Maximizing the expected profit function (3.10') yields the differential equation

$$b'(g_i) + b(g_i)\underbrace{\frac{(1-\gamma)(1+\pi\varphi)(n-1)F(g_i)'F(g_i)^{n-2}}{(1-\gamma)(1+\pi\varphi)F(g_i)^{n-1} + \gamma\pi\varphi[1 - F(g_i)]^{n-1}}}_{\Omega} = g_i\Omega. \tag{3.25}$$

Solving (3.25) yields the bribe function for Firm i. Unlike the case of national firms, this bribe function does not depend on the position of Firm i in relation to the socially optimal firm. The bribe function is increasing in gross gain, g_i, decreasing in both the probability of an external inspection to the winning firm, π, and the proportion of the bribe levied as a fine, φ. Furthermore, as would be expected, the bribe function is decreasing in the probability γ that the government official is honest.

Let us consider that $g_i \sim U[0,49]$, $n = 2$, $\pi = 0.1$ and $\varphi = 2$. The figure below shows how the bribe functions for three specific values of γ (namely, 0.1, 0.5 and 0.9) vary with a foreign firm's level of gross gain.

Figure 3.7: Bribe functions with a proportional fine – The case of foreign firms and two information asymmetries



Model C Result C.4 applies, but Firm i's bribe function is given by

$$B(g_i) = \begin{cases} \underbrace{g_i - \dfrac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{[F(g_i)]^{n-1}}}_{A} - \pi M & \text{if } (i) \\ 0 & \text{if } (ii) \end{cases}, i = 1,\ldots,n$$

where (i) $A > \pi M$ and $\gamma < \gamma^c_{C(4)'}$;

(ii) $A \leq \pi M$ or $A > \pi M$ and $\gamma \geq \gamma^c_{C(4)'}$;

and $\gamma^c_{C(4)'} = \dfrac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{\pi M[1-F(g_i)]^{n-1} + \int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}$.

Model D Result D.4 applies, but Firm i's bribe function is given by

$$B(g_i) = \begin{cases} (1-\pi\theta)\left[g_i - \dfrac{\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{[F(g_i)]^{n-1}}\right] & \text{if } (iii) \\ 0 & \text{if } (iv) \end{cases}, i = 1,\ldots,n$$

where (iii) $\pi\theta < 1$ and $\gamma < \gamma^c_{D(4)'}$;

(iv) $\pi\theta \geq 1$ or $\pi\theta < 1$ and $\gamma \geq \gamma^c_{D(4)'}$;

and $\gamma^c_{D(4)'} = \dfrac{(1-\pi\theta)\int_{\underline{g}}^{g_i}[F(s)]^{n-1}ds}{(1-\pi\theta)[1-F(g_i)]^{n-1} + g_i\pi\theta[1-F(g_i)]^{n-1}}$.

3.9 Concluding Remarks

The main goal of this chapter is to explore the supply side of bribery. In particular, we employ a framework that studies this aspect of corruption in government procurement contracts. The approach we adopt involves studying the role of information available to firms who bid in public tenders. Firms are typically faced with uncertainties such as not knowing the type of government official that is in charge of the contract awarding process (that is, whether or not he is corrupt), as well as sometimes having limited information regarding their rivals' characteristics. This analysis aims to determine how the interaction between these types of uncertainties affects the bribes offered by firms. The illegal nature of bribery is also explicitly taken into account, and three different types of punishment are considered. This analysis is useful in pinpointing the factors that are significant in the determination of the private sector's willingness to pay bribes. This, in turn, enables the design of policies that specifically address those factors that provide incentives for bribery, thereby enabling more effective anti-corruption reforms.

Unless the government official is known with certainty to be honest, bribery will always take place. The only exceptions are the case of a sufficiently large expected fixed fine (i.e., a fixed fine such that $\pi M \geq \overline{g}$), or if a firm's expected punishment is more than proportional to its gain. Moreover, as long as bribery occurs, there will generally be no welfare efficiency. For the first two models (A and B), the only case where there will be welfare efficiency is when the lowest-cost firm bidding for the government contract is the socially optimal one.

This result contrasts strongly to the results obtained in similar studies [see Beck and Maher (1986), Lien (1986, 1987, 1990), Clark and Riis (2000)]. The reason for this disparity lies in the assumption of those models, where either all firms can carry out the project at the same quality, or the lowest-cost firm is always the highest quality one. In these cases, bribing entails no loss of efficiency, and bribes merely represent a wealth redistribution, whereby they are transfers from the firms to the official. Because in our model quality is increasing in cost ($V' > 0$; $V'' < 0$), the optimal firm is, therefore, not the one with the lowest cost.

This result of lack of welfare efficiency seems particularly important in the case of developing countries. These countries typically have strong needs in terms of the construction of infrastructures, where quality will make a difference. Furthermore, such poorer countries do not customarily make big investments in the maintenance of infrastructures, and as such, it is even more imperative that they should be of good quality. To compound the problem, these are usually countries where there are high levels of corruption. This is especially true in the case of sub-Saharan Africa.

For model C, it is possible that the fixed fine will completely deter all firms from offering strictly positive bribes. For this to happen, the expected value of the fixed fine must be such that all firms will never find it profitable to bribe, even though they may know the government official to be corrupt. An initiative equivalent to such a fine is the World Bank's policy of blacklisting firms that bribe foreign government officials in order to be awarded a government contract. In that case, the fixed fine can be interpreted as the present value of all future World Bank contracts. (We can see that a firm for which future projects represent a substantial value will prefer not to offer bribes.) From our analysis, this seems to be one of the right directions for policies designed to combat corruption.

The other penalty scheme found to be effective is that of punitive damages - if a firm is fined a proportion of its gain, then it will be completely deterred from bribing if the fine is greater than or equal to the reciprocal of the probability of detection.

In general, it is the availability of information about their rivals that permits firms to offer higher bribes. Transparency in terms of firms' rankings of capacity to bribe does *not* appear to be helpful in decreasing the incidence of corrupt dealings. This is a direct consequence of the simplifying assumption in our model that a firm's capacity to bribe depends on its cost. It is unlikely that in the real world firms determine their bribes solely by the difference between their costs and the fixed price contract - there are usually other factors at play, such as revenues from other projects or departments within the company. This naturally makes it more difficult for competing firms to gauge their rivals' capacity to bribe. This would contribute to greater uncertainty with regards to rival firms, and, therefore, lower bribes. The market in which firms are competing is also likely to influence whether firms' ability to bribe is private information. For example, firms in less concentrated markets are likely to have greater uncertainty regarding their rivals, as are firms that compete in markets for more differentiated and/or technically complex products. Firms that frequently compete against each other for public procurement contracts are likely to know each others costs better than firms competing for the first time.

The only cases where information about rival firms is irrelevant are when bribery is effectively eliminated, that is, either when the fixed fine is sufficiently large to deter all firms from bribing, or when firms are penalized by more than their gains.

Given that it is better for firm types to be private information, then, except for the case of no penalties (where it is indifferent), it is also always better for the government official's type to be private information. Therefore, transparency increases the sizes of equilibrium bribes. If it cannot be ensured that a government official is honest, then in terms of the magnitude of bribes it is better for firms not to know whether the official is corrupt. For example, this would suggest that public tenders with foreign firms, which are less likely to know the official's type, could result in bribe levels lower than public tenders where domestic firms compete, *ceteris paribus*. It could also be the case that countries with more political instability (and consequently, a greater turnover of officials) have lower bribe levels.

One of the features of our model that is relevant in terms of policy implementation is that we assume the inspection is made by an external agent. As we are considering government procurement of goods and services that are usually the preserve of high-level officials, the main question is *who* will be in charge of the monitoring. That is, the entity that performs the auditing must be independent and corruption-free, so that further problems of corruptibility are avoided. This entails a strong commitment to ensure that external and independent monitoring is credibly carried out. Indeed, the probability of an external inspection plays a crucial role in the expected value of a fine in our models with a penalty scheme (namely, B, C and D). In the model with a proportional fine (B), if we assume that the proportion of the bribe that is levied as a fine is two ($\varphi = 2$), then depending on the magnitude of the probability of inspection, the expected value of the fine can range from zero to two times the bribe. This is a big variation and will certainly have an impact on firms' decision of how much to offer as a bribe. In model C, although the expected value of the fine can be made as large as desired by choosing a very large fixed fine (as long as the probability of inspection is strictly bigger than zero), if the probability of inspection is very small, the fixed fine may have to be set at an absurdly high value. Similarly, in the case of model D, if the probability of inspection is very small, as the fine must be greater than or equal to the reciprocal of the probability of inspection, then it may have an unrealistically high value (for example, if $\pi = 0.01$, then $\theta = 100$). This compromises the credibility of the enforcement of the fine.

This highlights a further need for a credible commitment for not only imposing the fine, but also to ensure prosecution and conviction of corrupt firms. There must be an effective legal system in place, as well as political will. For example, expectations that the FCPA would involve aggressive enforcement did not materialise. In over 20 years there have been only 30 prosecutions under the FCPA. There are three main reasons for this: the split in enforcement between the Department of Justice and the Securities and Exchange Commission; the fact that transnational bribery is a complex and difficult offence on which to gather evidence; and the fact that bargaining may go on after charges have been laid.[117] If in such a developed country as the US there are prosecution and enforcement problems, then this is a particularly relevant question for developing countries, where corruption is widespread and occurs at many levels of government. The existence and good functioning of an independent national body to serve as a 'watchdog' may prove problematic in these countries. This calls attention for the role of international organisations, mainly when there are foreign firms bidding for the government contract and/or when there is funding or loans to the recipient country to carry out, say, an infrastructure project.

[117] For example, there may be "*defining down of deviance*", by which there is a significant reduction in the seriousness of charges.

Appendix 3.A

This appendix contains the proof for Result B.3. In order to derive the equilibrium bribes, we shall consider three different cases.

Case A

Suppose that $C_1 < C_2 < ... < C_n$, or, equivalently, that $g_1 > g_2 > ... > g_n$. Suppose also, that Firm 1 is the closest to the optimal (which we shall denote by $g_1(*)$). Firm 1 has an advantage over the other firms in two dimensions, namely, it will win if the government official is honest, and if he is corrupt, Firm 1 has a greater gross gain and, therefore, capacity to bribe and win. Firm 1, by offering a bribe just a bit more than $\frac{g_2}{1+\pi\varphi}$, can guarantee that it will win the government contract and have a strictly positive expected payoff of $(g_1 - g_2) + \gamma\frac{g_2}{1+\pi\varphi}$. However, by offering a zero bribe, Firm 1 will have an expected payoff of γg_1. Firm 1 will prefer to offer a bribe if its expected payoff from offering a strictly positive bribe exceeds that of not offering a bribe, that is, if $\gamma < \gamma^c_{B(3)} = \frac{(g_1-g_2)(1+\pi\varphi)}{g_1(1+\pi\varphi)-g_2}$. Note that $\frac{\delta\gamma^c_{B(3)}}{\delta(g_1-g_2)} > 0$ and that $\frac{\delta\gamma^c_{B(3)}}{\delta\pi\varphi} < 0$. We can, therefore, see that the equilibrium will depend on γ.[118,119]

[118]Note that γ, the probability of the government official being honest, is common to all firms.
[119]A simple numerical example may be useful. Assume that $\pi = 0.1$, $\varphi = 2$ and $g_1 = 49$. If $g_2 = 48.9$, then $\gamma^c = 0.012$. If $g_2 = 10$, then $\gamma^c = 0.96$. If the difference between g_1 and g_2 is small, then Firm 1 will only want to offer a bribe if it is very likely that the official is corrupt.

If $\gamma \leq \gamma^{c}_{B(3)} = \frac{(g_1 - g_2)(1+\pi\varphi)}{g_1(1+\pi\varphi)-g_2}$, then $b_1 = \frac{g_2}{1+\pi\varphi}$ and $b_i = \frac{g_i}{1+\pi\varphi}, i = 2,\dots,n$, whereas if $\gamma > \gamma^{c}_{B(3)} = \frac{(g_1 - g_2)(1+\pi\varphi)}{g_1(1+\pi\varphi)-g_2}$, Firm 1 will offer a zero bribe. The bribes offered by the remaining firms will depend further on another critical value. If $\gamma^{c}_{B(3)} < \gamma < \gamma^{c'}_{B(3)}$, where $\gamma^{c'}_{B(3)} = \frac{(g_1 - g_3)(1+\pi\varphi)}{g_1(1+\pi\varphi)-g_3}$, then the bribes are $b_i = \frac{g_i}{1+\pi\varphi}, i = 2,\dots,n$. If $\gamma > \gamma^{c'}_{B(3)}$, then $b_2 = \frac{g_3}{1+\pi\varphi}, b_i = \frac{g_i}{1+\pi\varphi}, i = 3,\dots,n$.

It is easy to see that this constitutes an equilibrium. Consider the case where $\gamma \leq \frac{(g_1 - g_2)(1+\pi\varphi)}{g_1(1+\pi\varphi)-g_2}$. Given that Firms $j \neq 1$ offer a bribe of $\frac{g_j}{1+\pi\varphi}$, Firm 1 does not want to increase its bribe offer as it would not increase its probability of winning (i.e., already one) and would only serve to decrease its expected profit. Similarly, Firm 1 does not want to decrease its bribe offer, as it would worsen its probability of winning the contract and decrease its expected profit. Given that Firm 1 offers a bribe of $\frac{g_2}{1+\pi\varphi}$, Firms $j \neq 1$ are indifferent between $\frac{g_j}{1+\pi\varphi}$ and decreasing their bribes, as they would still have a zero expected payoff. Note that Firms $j \neq 1$ would never increase their bribes more than $\frac{g_j}{1+\pi\varphi}$, as this would yield a negative expected profit. The same reasoning applies for the case where $\gamma > \frac{(g_1 - g_2)(1+\pi\varphi)}{g_1(1+\pi\varphi)-g_2}$.

Case B

Suppose that $g_1 < g_2 < \ldots < g_m(*) < \ldots < g_{n-1} < g_n$. In this case, the equilibrium bribes are $b_n = \frac{g_{n-1}}{1+\pi\varphi}$, $b_m = 0$ and $b_i = \frac{g_i}{1+\pi\varphi}, i = 1,\ldots,g_{m-1},g_{m+1},\ldots,g_{n-1}$.

Given that all firms other than m are offering the above bribes, then Firm m's best response is to offer a zero bribe. As Firm m is not the one with the greatest gross gain, it will not be able to outbribe the other firms and win if the official is corrupt. However, Firm m is the closest to the optimal, which means that if the government official is honest, it will win the contract. Therefore, Firm m prefers to offer a zero bribe and not incur a penalty.

Given that Firm m offers a zero bribe and that firms $i = 1,\ldots,g_{m-1},g_{m+1},\ldots,g_{n-1}$ offer bribes of $b_i = \frac{g_i}{1+\pi\varphi}$, Firm n's best response is to offer $b_n = \frac{g_{n-1}}{1+\pi\varphi}$ (plus a little more). This guarantees that Firm n will win if the official is corrupt and does not affect its chances of winning if the official is honest (which are nil). Firm n does not want to increase its bribe offer as it would not increase its probability of winning (i.e., already one) and would only serve to decrease its expected profit. Similarly, Firm n does not want to decrease its bribe offer, as it would worsen its probability of winning the contract and decrease its expected profit.

Given that Firm n offers a bribe of $\frac{g_{n-1}}{1+\pi\varphi}$ and that Firm m offers a zero bribe, the remaining $n-2$ firms are indifferent between $b_i = \frac{g_i}{1+\pi\varphi}, i = 1,\ldots g_{m-1},g_{m+1}\ldots,g_{n-1}$ and decreasing their bribes, as they would still have a zero expected payoff (will not win whether the government official is honest or corrupt). They do not want to increase their bribes, as that would give them negative expected payoffs.

Case C

Suppose that $g_1 > g_2 > ... > g_n(*)$. In this case, Firm n is the closest to the optimal, but it has the lowest gross gain. On the other hand, Firm 1 is the farthest from the optimal but has the greatest gross gain. If Firm 1 offers a bribe of $\frac{g_2}{1+\pi\varphi}$ plus a little bit, it can guarantee it will win if the government official is corrupt. If the official is honest, Firm 1 does not lose anything by having offered a strictly positive bribe, as it would never win. Firm n will offer a zero bribe, as it cannot outbribe any of the remaining firms and can increase its expected payoff if it does not offer a strictly positive bribe. This case is almost identical to the previous one, with the difference that there are no firms with lower gross gain than the one closest to the optimal. Therefore, the equilibrium bribes are $b_1 = \frac{g_2}{1+\pi\varphi}$, $b_n = 0$ and $b_i = \frac{g_i}{1+\pi\varphi}, i = 2,...,n-1$.

Appendix 3.B

This appendix contains the proof for Result B.4.

When both the government official's and firms' types are private information, Firm i's expected profit is given by

$$\gamma\Pi_i^{\alpha=1}\Pr\left(\text{winning}\middle|\alpha = 1\right) + (1-\gamma)\Pi_i^{\alpha=0}\Pr\left(\text{winning}\middle|\alpha = 0\right).$$

In contrast to the basic model, if the winning firm offers a bribe it will have to pay a fine if the government official is honest. Therefore, its expected profit becomes

$$\gamma(T - C_i - \pi\varphi b_i)\Pr(|C_i - C^*| < |C_j - C^*|) + (1-\gamma)(T - C_i - (1+\pi\varphi)b_i)\Pr(b_i > B_j).$$

We may write

$$\begin{aligned}\Pr\left(\text{winning}\middle|\alpha = 1\right) &= \Pr(|C_i - C^*| < |C_j - C^*|)\\ &= \Pr(|g_i - g^*| < |g_j - g^*|)\\ &= [1 - F(g^* + |g_i - g^*|) + F(g^* - |g_i - g^*|)]^{n-1}\\ &= [1 - F(g^+) + F(g^-)]^{n-1}.\end{aligned}$$

Suppose that, when Firm i's gross gain is actually g_i, it offers a bribe equal to $b(w_i)$. The probability that the bribe $b(w_i)$ will be the highest is $F(w_i)^{n-1}$. Thus, the expected payoff to Firm i from offering a bribe $b(w_i)$ would be

$$\gamma(g_i - \pi\varphi b(w_i))[1 - F(g^+) + F(g^-)]^{n-1} + (1-\gamma)(g_i - (1+\pi\varphi)b(w_i))F(w_i)^{n-1}. \qquad (3.26)$$

However, by the definition of an equilibrium, the optimal bid for Firm i with gross gain g_i should be $b(g_i)$. So the derivative of this expected payoff with respect to w_i should equal 0 when w_i equals g_i. That is,

$$\begin{aligned} b'(g_i)\Big[\gamma\pi\varphi\big[1-\big(F(g^+)-F(g^-)\big)\big]^{n-1}+(1-\gamma)F(g_i)^{n-1}\Big]&+ \\ b(g_i)(1-\gamma)(1+\pi\varphi)F'(g_i)(n-1)F(g_i)^{n-2} &= \\ g_i(1-\gamma)F'(g_i)(n-1)F(g_i)^{n-2}&. \end{aligned} \tag{3.27}$$

When solving the differential equation (3.27) we need to consider the different cases for C_i, or, equivalently, g_i.

- When $C_i = C^*$ $(g_i = g^*)$, then $\Pr(|C_i - C^*| < |C_j - C^*|) = \Pr(|g_i - g^*| < |g_j - g^*|)$ is equal to one and (3.27) becomes

$$b'(g_i) + b(g_i)\frac{(1-\gamma)(1+\pi\varphi)F'(g_i)(n-1)F(g_i)^{n-2}}{\gamma\pi\varphi+(1-\gamma)(1+\pi\varphi)F(g_i)^{n-1}} = g_i\frac{(1-\gamma)F'(g_i)(n-1)F(g_i)^{n-2}}{\gamma\pi\varphi+(1-\gamma)(1+\pi\varphi)F(g_i)^{n-1}}. \tag{3.28}$$

Solving (3.28) yields the bribe function

$$b(g_i) = \frac{(1-\gamma)\Big(g_iF(g_i)^{n-1} - \int_{\underline{g}}^{g_i}[F(s)]^{n-1}\,ds\Big)}{\gamma\pi\varphi+(1-\gamma)(1+\pi\varphi)F(g_i)^{n-1}}. \tag{3.29}$$

If cost levels are uniformly distributed on $[\underline{C},\overline{C}]$, and, therefore, the gross gains, g_i, are also uniformly distributed on $[\underline{g},\overline{g}]$, the bribe function (3.29) becomes

$$b(g_i) = \frac{(1-\gamma)(g_i-\underline{g})^{n-1}\big[(n-1)g_i+\underline{g}\big]}{n\gamma\pi\varphi\big(\overline{g}-\underline{g}\big)^{n-1}+n(1-\gamma)(1+\pi\varphi)(g_i-\underline{g})^{n-1}}. \tag{3.30}$$

- When $C_i < C^*$ $(g_i > g^*)$, then $\Pr(|g_i - g^*| < |g_j - g^*|) = [1 - F(g_i) + F(2g^* - g_i)]^{n-1}$ and (3.27) becomes

$$b'(g_i) + b(g_i)\frac{(1-\gamma)(1+\pi\varphi)F'(g_i)(n-1)F(g_i)^{n-2}}{\gamma\pi\varphi[1-F(g_i)+F(2g^*-g_i)]^{n-1}+(1-\gamma)(1+\pi\varphi)F(g_i)^{n-1}} = g_i\frac{(1-\gamma)F'(g_i)(n-1)F(g_i)^{n-2}}{\gamma\pi\varphi[1-F(g_i)+F(2g^*-g_i)]^{n-1}+(1-\gamma)(1+\pi\varphi)F(g_i)^{n-1}}.$$

For the case of uniformly distributed cost levels, the bribe function is

$$b(g_i) = \frac{(1-\gamma)(g_i-\underline{g})^{n-1}\left[(n-1)g_i+\underline{g}\right]}{n\gamma\pi\varphi\left(\overline{g}-\underline{g}+2g^*-g_i\right)^{n-1}+n(1-\gamma)(1+\pi\varphi)(g_i-\underline{g})^{n-1}}. \quad (3.31)$$

When $C_i > C^*$ $(g_i < g^*)$, we need to consider two further cases. There are some cost levels for which $2C^* - C_i$ is smaller than $\underline{C}$ (or, equivalently, there are some levels of gross gain for which $2g^* - g_i$ is greater than $\overline{g}$). In those cases, $F(2C^* - C_i) = 0$ and $F(2g^* - g_i) = 1$.

- When $C_i > C^*$ and $C_i < 2C^* - \underline{C}$ $(g_i < g^*$ and $g_i > 2g^* - \overline{g})$, (3.27) becomes

$$b'(g_i) + b(g_i)\frac{(1-\gamma)(1+\pi\varphi)F'(g_i)(n-1)F(g_i)^{n-2}}{\gamma\pi\varphi[1+F(g_i)-F(2g^*-g_i)]^{n-1}+(1-\gamma)(1+\pi\varphi)F(g_i)^{n-1}} = g_i\frac{(1-\gamma)F'(g_i)(n-1)F(g_i)^{n-2}}{\gamma\pi\varphi[1+F(g_i)-F(2g^*-g_i)]^{n-1}+(1-\gamma)(1+\pi\varphi)F(g_i)^{n-1}}.$$

For the case of uniformly distributed cost levels, the bribe function is

$$b(g_i) = \frac{(1-\gamma)(g_i - \underline{g})^{n-1}\big[(n-1)g_i + \underline{g}\big]}{n\gamma\pi\varphi\big(\overline{g} - \underline{g} - 2g^* + g_i\big)^{n-1} + n(1-\gamma)(1+\pi\varphi)(g_i - \underline{g})^{n-1}}. \quad (3.32)$$

- When $C_i > C^*$ and $C_i \geq 2C^* - \underline{C}$ ($g_i < g^*$ and $g_i \leq 2g^* - \overline{g}$), (3.27) becomes

$$b'(g_i) + b(g_i)\frac{(1-\gamma)(1+\pi\varphi)F'(g_i)(n-1)F(g_i)^{n-2}}{(1+\pi\varphi-\gamma)F(g_i)^{n-1}} = g_i\frac{(1-\gamma)F'(g_i)(n-1)F(g_i)^{n-2}}{(1+\pi\varphi-\gamma)F(g_i)^{n-1}}.$$

For the case of uniformly distributed cost levels, the bribe function is

$$b(g_i) = \frac{(1-\gamma)\big(g_i(n(1-\gamma\pi\varphi)+\gamma\pi\varphi-1)+\underline{g}\big)(g_i-\underline{g})^{\frac{\gamma\pi\varphi(n-1)(\gamma-\pi\varphi)}{1+\pi\varphi-\gamma}}}{(1+\pi\varphi-\gamma)(n(1-\gamma\pi\varphi)+\gamma\pi\varphi-1)(n(1-\gamma\pi\varphi)+\gamma\pi\varphi)\big(\overline{g}-\underline{g}\big)^{n-2+\frac{\gamma\pi\varphi(n-1)(\gamma-\pi\varphi)}{1+\pi\varphi-\gamma}}}. \quad (3.33)$$

Appendix 3.C

The proof for Result C.3 is analogous to the proof for Result B.3 (see Appendix 3.A). We present the equilibrium bribes for three different cases.

Case A

If $g_1(*) > g_2 > \ldots > g_n$, then the equilibrium bribes will be the following. If $\gamma \leq \gamma^c = \frac{g_1 - g_2}{\pi M + g_1 - g_2}$, $b_1 = g_2 - \pi M$ and $b_i = g_i - \pi M, i = 2,\ldots,n$. If $\gamma > \gamma^c = \frac{g_1 - g_2}{\pi M + g_1 - g_2}$, $b_1 = 0$. If $\gamma^c < \gamma < \gamma^{c'}$, where $\gamma^{c'} = \frac{g_1 - g_3}{\pi M + g_1 - g_3}$, then the bribes are $b_i = g_i - \pi M, i = 2,\ldots,n$. If $\gamma > \gamma^{c'}$, then $b_2 = g_3 - \pi M, b_i = g_i - \pi M, i = 3,\ldots,n$.

Note that, as expected, $\frac{\delta \gamma^c}{\delta(g_1 - g_2)} > 0$ and that $\frac{\delta \gamma^c}{\delta \pi \varphi} < 0$. Note also that a firm only offers a strictly positive bribe if $g_i > \pi M$.

Case B

If $g_1 < g_2 < \ldots < g_m(*) < \ldots < g_{n-1} < g_n$, the equilibrium bribes are as follows: $b_n = g_{n-1} - \pi M$, $b_m = 0$ and $b_i = g_i - \pi M, i = 1,\ldots, g_{m-1}, g_{m+1}, \ldots, g_{n-1}$.

Case C

Suppose that $g_1 > g_2 > \ldots > g_n(*)$. The equilibrium bribes will be $b_1 = g_2 - \pi M$, $b_n = 0$ and $b_i = g_i - \pi M, i = 2,\ldots,n-1$.

Chapter 4

An Empirical Study of Aggregate Aid Receipts in Sub-Saharan Africa – How Taxing is Corruption?

4.1 Introduction

Many foreign assistance programmes not only claim to target poverty reduction, but also to reward good policies and favour reforming and honest governments. However, there appears to be no evidence that countries pursuing good policies are rewarded with greater levels of aid [Burnside and Dollar (2000), Collier and Dollar (2002)]. Furthermore, the few studies that examine the impact of corruption on foreign aid levels find that countries perceived as less corrupt do not necessarily receive more aid [Alesina and Weder (2002), Svensson (2000), Neumayer (2003b, 2003d)]. This result is somewhat puzzling, begging the question of whether there are specific characteristics inherent in corruption and its interaction with aid that provides an economic rationale for the pattern of donors' aid flows.

We develop a simple and intuitive model that looks specifically at donor preferences when giving aid, as well as the interaction between corruption and aid. We consider a donor that derives wellbeing from projects carried out in developing countries (for example, building a new school). The amount of aid that the donor disburses to a recipient country is its expenditure on the foreign projects. Corruption increases the price of each project, as corrupt government officials divert funds from the economy to their private use. Corruption, therefore, acts as a tax on aid. This framework produces a source of ambiguity regarding aid flows and corruption. This derives from the donor's price elasticity of demand for foreign government projects. If the donor's demand for government projects in recipient countries is price inelastic (say, because the project is to provide basic health conditions), then more corrupt countries will receive more aid. If, on the other hand, the donor's demand for government projects in recipient countries is price elastic, then more corrupt countries will receive less aid. Finally, if price elasticity is -1, then there will be no relationship between corruption and aid. However, although this framework has some attractive features, most notably its simplicity, it suffers from some non-negligible limitations. In particular, the focus on price elasticities makes it ill-suited for empirical application. So, whilst our simple theoretical framework motivates our analysis, we are not able to empirically test it.

We examine empirically the relationship between perceived corruption levels in recipient countries and their aggregate bilateral aid receipts. We focus on sub-Saharan Africa. The countries of sub-Saharan Africa are not only disproportionately among those receiving the most foreign aid in the world, they are also among the most corrupt. Since this group of countries is typical of the problem being analysed, this seems like a more relevant sample than all countries. We use a panel data set of 32 sub-Saharan African countries and four four-year time periods from 1982 to 1997. We consider bilateral aggregate total aid flows, as well as sector-specific flows. The rationale is that, following the focus of the UN Millennium Development Goals on certain sectors, sector-specific aid flows might permit a clearer indication of price elasticities than total aid (even if we are unable to effectively empirically verify it). For example, if donors are especially concerned about levels of primary education of the population, then they might consider those projects as a basic need, making their demand price inelastic. Donors would then give higher levels of aid for education to countries that are more corrupt.

At first glance our results on bilateral total aid are very striking – we find strong evidence that countries that are perceived to be more corrupt receive less aid. This result is in stark contrast to those in the existing literature. Our results are robust to several sensitivity checks, including different measures of aid and also to taking into account the ordinal nature of the corruption measure. However, on closer inspection, and taking into account potential endogeneity problems, we find that we are unable to robustly assert that perceived corruption has a causal effect on aid receipts.

As our primary results (that is, those obtained before addressing potential endogeneity problems) differ importantly from those of Alesina and Weder (2002), we explore these discrepancies in detail. Alesina and Weder (2002) examine total aid flows to 180 countries in the period 1975-1994. We replicate their results for the whole sample and we also examine aid receipts by region. Using their data, we find only weak evidence that in sub-Saharan Africa countries perceived as more corrupt receive less aid. However, when we update the data set for sub-Saharan Africa,[120] we again find that there is indeed a strong relationship between perceived corruption and aid receipts. As was the case

[120] Our updating exercise consisted of collecting data for the same time periods as Alesina and Weder (2002), from the same (updated) sources for the countries of sub-Saharan Africa. The only source that is different is the one for UN voting similarity, as we could not access the original source. Note that we do not update the data set for the original 180 countries, as our main interest is in the region of sub-Saharan Africa.

with our main results, this correlation is robust to taking into account the ordinal nature of the corruption measure, but it is not robust to endogeneity issues.

We also examine the impact of perceived corruption on sectoral aid receipts. Due to data limitations, we are unable to use the same time period (1982-1997) as for bilateral aggregate total aid. Unfortunately, there is only limited information about the evolution of sectoral aid over our time period - data is available for 1993-1994 and for only a few sectors. We find no evidence that aid receipts across sectors may be driven by paternalistic concerns of donors. It seems that a country's perceived corruption level is not significantly related to how aid receipts are distributed, in aggregate terms, across sectors. In addition, it seems that donors do not care disproportionately about improving basic health and education conditions. However, given the limited data available, this result may be driven by insufficient observations, in addition to other data limitations.

This chapter is organized as follows. Section 4.2 summarizes some important results of the relevant literature on foreign aid allocation and aid receipts. Section 4.3 describes the theoretical framework that motivates our empirical analysis. Section 4.4 describes our data set. Section 4.5 provides evidence on bilateral aggregate total aid receipts. Section 4.6 explores the difference in our results compared with those obtained in Alesina and Weder (2002). Section 4.7 describes the results for bilateral aggregate aid receipts specific to different sectors, such as education and health. The last section contains concluding remarks.

4.2 Literature Review

There is a very large literature on the reasons why foreign aid is given. Typically, studies focus on individual donor countries in order to explain their aid allocation decisions. However, some studies look at aid levels aggregated over several donors, therefore effectively studying the determinants of aid receipts by recipient countries, rather than aid allocation by donor countries [see, for example, Neumayer (2003c)]. Aid allocations are distinct from aid receipts, as the former relates to essentially individual donors' decisions, whereas the latter refers to aid funds received by recipient countries, and are aggregated, either by bilateral, multilateral donors, or both. Although aid receipts are implicitly based on aid allocation decisions, aggregate aid receipts can potentially mask different aid allocation decisions by different donors.

The purpose of this section is not to comprehensively review this wide literature (which mostly focuses on aid allocation). Rather, its purpose is to enable an identification of the key broad objectives that are pursued when disbursing aid, and therefore which main variables (in addition to our main variable of interest, namely (perceived) corruption) should be included in an empirical analysis. Also, as one of the main purposes of this chapter is to relate our results to those of Alesina and Weder (2002), we do not attempt to comprehensively review the literature on aid allocation.[121]

Foreign aid is a post World War II phenomenon. From the start of aid giving, the allocation of aid among countries reflected multiple objectives, such as meeting humanitarian objectives, rebuilding post-conflict societies or

[121] Reviews on the aid allocation literature can be found in, among others, White and McGillivray (1993), McGillivray (2003b), McGillivray (2004).

supporting the strategic interests of the donor country. However, among the many different reasons for disbursing aid, two core objectives have been identified, namely, developmental and strategic.

The first objective promotes poverty reduction and long-term economic growth in developing countries. The motivation for this objective has been stated as a combination of altruism, whereby the reward for aid donations is the "warm glow" from giving to people in need, and a self-interested concern that the growth of poorer countries would, in the long term, benefit the donors' economic and political security. If the purpose of aid is to meet the objective of poverty reduction, then it is necessary to control for recipient need in explaining aid allocation. As concerns recipient need, most studies focus on the recipient country's income level. Whilst some studies find that most donors give more aid to poorer countries [see, for example, Burnside and Dollar (2000), World Bank (1998a), Alesina and Weder (2002), Gates and Hoeffler (2004)], others find that poorer countries often tend to receive little aid [e.g., Maizels and Nissanke (1984)[122], Boschini and Olofsgard (2001)]. Other studies find evidence of a 'middle-income' bias, or a curvilinear relationship, i.e., that the amount of aid received is increasing in income but at a decreasing rate [e.g., Alesina and Dollar (2000)].

The existence of a negative relationship between aid and income should not be taken to indicate an anti-humanitarian bias in aid allocation. A more

[122] It should be noted, however, that the late 1970s and early 1980s empirical research tended to separately estimate recipient need and donor interest models (rather than allowing for a specification where both groups of variables where included). Subsequent studies that have corrected this methodological flaw [for example, McGillivray (2003a), McGillivray and Ozcowski (1991,1992), Berthélemy and Tichit (2004)], have mostly found that aid is directed to poorer countries.

plausible explanation may be that aid tends to favour countries with adequate infrastructures (and thus at higher levels of economic development) that may be able to use such aid more efficiently than poorer countries. If this is the case, then perhaps the aid objective fits better with political and strategic interests rather than poverty reduction.

In some studies, recipient need is interpreted more broadly to include other aspects of human development needs. Trumbull and Wall (1994) find that a higher infant mortality rate leads to greater bilateral and multilateral aid flows if both recipient and period specific factors are controlled for (i.e., in a panel set-up), but not if only period effects are considered (i.e., in a pooled cross-section set-up). McGillivray (2003a), using US data for 1980 and 96 developing countries, finds that aid allocations are not related to infant mortality rates. This result is robust to several modelling techniques. Schraeder, Hook and Taylor (1998) look at aid flows in the 1980s from the US, France, Japan and Sweden to 36 African countries. Although they find that all donors give more aid to poorer countries, they also find that indicators reflecting more humanitarian needs, such as caloric intake and life expectancy, test insignificantly for all donors (except life expectancy for Japan).[123] Berthélemy and Tichit (2004) using a very rich data set covering 20 years (1980-1999), 22 donors and 137 recipients, and employing limited dependent variable techniques (estimating a Tobit model), find evidence that infant mortality rates (as well as primary school enrolment rates) tend to be considered by donors as a major indicator of recipient needs, rather than as a social performance variable.

[123] Note that Schraeder, Hook and Taylor (1998) use income primarily as a measure of economic potential.

The second objective promotes the short–term political and strategic interests of donors, where aid is primarily channelled to donors' political allies. McKinley and Little (1977) was one of the earlier contributions to the strand of literature that argues that foreign aid has also been used for the donors' own foreign policy interests. Alesina and Dollar (2000) find that recipient countries get more aid if voting in line with donors in the UN General Assembly, and that aid allocation is greatly influenced by former colonial status. Neumayer (2003a) confirms the finding with respect to former colonial status, finds that some donors give more aid to geographically closer countries and that almost all donor countries favour recipients that import a higher share of their (donors') exports. Neumayer (2003c) confirms the positive effect of colonial experience on both bilateral and multilateral aid flows. Other examples of studies where donor interest is key in the allocation of aid include Maizels and Nissanke (1984), who find total aid flows to be positively related to transfers of arms from the major donors in 1969-1970 and 1978-1980, and Boschini and Olofsgard (2001) who also find evidence that aid is used strategically. McGillivray (2003a) finds that arms transfers are a significant factor in explaining US aid allocation in 1980. McGillivray (2005), examining aid receipts of four African countries (Egypt, Morocco, Kenya and Tanzania) using 1968-1999 time series data, finds that the estimates attached to the donor interest variables are largely as expected.

Recently, several bilateral donors have made democracy an explicitly stated goal of foreign assistance. As such, attention has been given to a third objective in aid allocation, namely, that of good governance.[124] Most of the existing literature looks at the role of political and civil rights and personal integrity rights, focusing on aid allocation by the US [see, for example, Cingranelli and Pasquarello (1985), Carleton and Stohl (1987), Poe (1992), Abrams and Lewis (1993), Poe and Sirirangsi (1994), Poe et al. (1994), Apodaca and Stohl (1999)]. Despite differences in data sets, time periods and estimation techniques, most studies conclude that countries with more respect for political freedom and, less clearly so, more respect for personal integrity rights receive more US aid.

Fewer studies examine the effect of good governance on aid allocation by other donor countries. Svensson (1999) studies the influence of democracy in aid allocations by various donor countries, using a two-stage selection model.[125] He finds that in the first stage, more democratic countries (as measured by political and civil rights) positively impact the likelihood of receiving aid from Canada, Japan and the US, but not from Denmark, France, Germany, Italy, Norway, Sweden and the UK. In the second stage, the findings are that political and civil rights lead to the receipt of higher aid flows from Canada, Denmark, Norway and Sweden, but not from the remaining countries. It is suggested that for Germany, Japan and the US pursuing political and strategic goals are more important and that for France and Italy it is colonial past rather than democracy that dictates who gets more aid. Alesina and Dollar (2000) find that aggregate bilateral aid flows reward democracies (as measured

[124] Note that, although the emphasis on democracy is relatively recent, McKinley and Little (1977) examine the effect of political stability and democracy on aid allocation.

[125] Note that Svensson (1999) assesses the partial correlation between aid flows and level of democracy but does not provide a detailed description of the patterns of allocations of aid.

by political rights). Furthermore, their results suggest that donors pay more attention to democratic institutions strictly defined rather than to a broader definition of civil rights or law enforcement. In their donor by donor results, Alesina and Dollar (2000) find that all the countries studied except Austria, Belgium, France and Italy allocate more aid to more democratic countries.[126]

Neumayer (2003a) analyses the role of human rights in aid allocation of the 21 countries that form the OECD's Development Assistance Committee (DAC). He finds that respect for political and civil rights plays a significant role for most donors at the aid eligibility stage, whereas personal integrity rights have a positive impact for few donors. At the level stage (i.e., when donors decide how much aid to allocate to eligible countries), most donors fail to consistently reward respect for human rights and often give more aid to countries with a poor record on either political/civil or personal integrity rights. Furthermore, no systematic difference is apparent between the like-minded countries,[127] commonly regarded as committed to human rights, and the other donors.

These results are confirmed by Neumayer (2003b), who focuses on aid allocation in the 1990s. Gates and Hoeffler (2004) compare aid allocations of Nordic donors (Denmark, Finland, Norway and Sweden) to those of other bilateral donors during the period 1980-1999. The four Nordic countries, both in aggregate and individually, provide more aid to democracies. The evidence on human rights record is less clear-cut – in aggregate, Nordic countries do

[126] The other countries included are the US, the UK, Japan, Germany, Australia, the Netherlands, Canada and the Scandinavian countries lumped together.
[127] Canada, Denmark, the Netherlands, Norway and Sweden.

reward a good human rights record with more aid, although Denmark is the only individual Nordic country to do so. Other countries favouring good human rights are Canada and Japan (although the latter is only significant at the 10% level).

We turn now to the main interest of this chapter, namely, the impact of corruption on aid flows. Here the literature is sparser, with, to our knowledge, only four studies specifically considering corruption (as opposed to other measures of governance) in aid allocations or aid receipts. Svensson (2000) develops a game-theoretic rent-seeking model to explore the relationship between the widespread level of corruption and other types of rent-seeking activities and concessional assistance. He provides some preliminary evidence in support of the hypothesis that foreign aid and windfalls are, on average, associated with higher perceived corruption in countries that are more likely to suffer from competing social groups. No evidence is found to support the hypothesis that countries perceived as less corrupt systematically receive more aid.

Alesina and Weder (2002) find no evidence that aggregate bilateral or multilateral aid goes disproportionally to governments perceived to be less corrupt. This result holds both for their entire sample period of 1975-1994 and for the periods 1980-1989 and 1990-1994. In terms of specific donors, they find that Australia and Scandinavia give more aid to governments perceived as less corrupt, although the US does not punish perceived corruption with less aid. They find no relationship between perceived corruption and multilateral aid flows.

Neumayer (2003b, 2003d) examines the pattern of aid giving in the 1990s, with a particular emphasis on the role of good governance. Neumayer fails to find evidence that countries with lower perceived corruption are systematically rewarded with higher aid. This is true of both aggregate bilateral and multilateral aid, as well as in terms of specific donors (except for Japan, who gives more aid to countries perceived as more corrupt, and Sweden, who gives more aid to governments perceived as less corrupt).

The papers mentioned above fail to provide a theoretical framework for the relationships (or lack of relationships) they find between perceived corruption and aid. This is true for both aggregate and specific donors. The only exception is Svensson (2000), though the theoretical model developed seeks to explain the effect of aid on corruption instead of the reverse. There is also a tendency to ignore the heterogeneity of the countries included [with the exception of Neumayer (2003b, 2003d)]. We believe that this is an important aspect to explore, as explicitly taking into account the panel nature of a data set has several advantages (as referred in Chapter 2, Section 2.6). Also, these studies do not consider how the effect of perceived corruption in explaining aid allocations or aid receipts differs by region, particularly for regions that are especially afflicted by corruption. At most, some studies include a dummy variable for certain regions. This is useful for knowing whether those regions receive more or less aid, but this approach is not useful in terms of ascertaining the effect of corruption by region.

4.3 Theoretical Framework

Consider a donor country that derives utility from two (groups of) goods, namely, domestic government consumption goods and foreign government projects. Domestic government consumption goods denote goods (and services) that the donor country believes will enhance the well-being of its population, such as hospitals and an effective transport network. Foreign government projects may reflect developmental objectives such as helping to meet humanitarian needs, rebuilding post-conflict societies, or promoting strategic interests of the donor. Each of the two goods, domestic consumption (*D*) and foreign government projects (*F*), has a price (p_D and p_F, respectively) and the donor has a limited amount of money (*M*) to spend. Consider also that the recipient country has potentially corrupt government officials. Corrupt government officials divert funds from the donor's flows to their private use. Corruption acts as a tax (*c*) on donor flows, therefore, increasing the price of foreign government projects. The donor country is aware of the corruption of the officials in the recipient country, i.e., it knows about the existence of the corruption tax. The amount of aid that the donor disburses to a recipient country is given by $p_F F$.

Assume, without loss of generality, that $p_D=p$ and $p_F=p+c$. The donor's choice of how much aid to give is a standard demand problem. The donor will:

$$Max\ \ U(D,F)$$

$$\text{s.t.}\quad p_D D + p_F F \leq M.$$

The first-order conditions are given by $\dfrac{\partial U/\partial D}{\partial U/\partial F} = \dfrac{p_D}{p_F} \Leftrightarrow \dfrac{\partial U/\partial D}{\partial U/\partial F} = \dfrac{p}{p+c}$.

We are interested in the comparative statics on aid of a change in the corruption tax. That is, we are interested in how total expenditure on F changes when its price changes, which is given by $\frac{\partial p_F F}{\partial p_F}$. Since F is itself a function of p_F, differentiating $p_F F$ with respect to p_F yields

$$\frac{\partial p_F F(p_F)}{\partial p_F} = F + p_F \cdot \frac{\partial F}{\partial p_F}.$$

Dividing both sides by F, we have

$$\frac{\partial p_F F \big/ \partial p_F}{F} = 1 + \frac{\partial F}{\partial p_F} \cdot \frac{p_F}{F} = 1 + \varepsilon_{F,p_F}.$$

Since F is positive, the sign of $\frac{\partial p_F F}{\partial p_F}$ will depend on whether ε_{F,p_F} is greater than or less than -1. If ε_{F,p_F} >-1, demand is inelastic and the derivative is positive. The corruption tax and aid move in the same direction. If ε_{F,p_F} <-1, demand is elastic and the derivative is negative. In this case, an increase in corruption will decrease aid. Note that if demand is unit elastic, then the corruption tax will have no impact on aid.

Note that, for simplicity, we have assumed that D is the aggregate of all domestic projects and that F represents the aggregate of all foreign projects. The analysis extends easily to the case where multiple projects/sectors are explicitly considered.

We have assumed that corruption acts as a quantity tax. However, it is possible that corruption may also act as a lump sum tax (C). That is, donors must pay to have access to the recipient country.[128] In this case, aid is given by $p_F F(p_F, C) + C$.

By applying standard concepts of demand theory we are able to provide a plausible explanation for aid allocation choices by donor countries.

If the donor's price elasticity of demand for foreign government projects is less than -1, then countries that are more corrupt will be allocated less aid. If, on the other hand, the donor's price elasticity of demand for foreign government projects is more than -1, say because the project is eradicating extreme hunger and poverty[129] or because the recipient is considered as an overall needy country, then the donor will allocate more aid to countries that are more corrupt.

The main predictions of the model may be summarised as the following:

1. Corruption acts as a tax on aid;
2. Donors with interests in helping to promote projects that provide basic needs in recipient countries will allocate more aid to more corrupt countries;

2'. Donors with interests in helping recipient countries they believe are in extreme need of assistance overall will allocate more aid to more corrupt countries;

3. Donors who are interested in generally contributing to government projects in recipient countries, but don't consider any to be particularly essential, will give more aid to less corrupt countries.

[128] A donor might wish to provide aid to a given country or region as a signal to the international community that it cares, or because of potential new business, if the aid it gives is "tied", so that the recipient must buy/procure goods and/or services from firms from the donor country.

[129] Halving poverty and hunger by 2015 is one of the eight UN Millennium Development Goals.

Note how this model can be applied generally to cases where aid is diverted from the donor's intended use, whether or not the diverted funds go into the pockets of government officials. For example, a donor might earmark aid funds for education, but the recipient might want to use some of the aid for building roads, rather than using it all for education. Diverting funds for personal gain (i.e., corruption) is an extreme case in the more general model. Another case that can be studied by the model is, for example, when some funds are diverted for corruption and some for purposes/sectors other than those intended by the donor.

Although this model has some appealing features, most notably its simplicity, it suffers from some non-negligible limitations in terms of its empirical applicability. It should be noted that aid allocation decisions are made by each donor individually. Each donor has an aid budget, which it will allocate across all potential recipient countries. So for each donor there is an inter-recipient allocation decision. In terms of empirical modelling of aid allocations, this means that each donor should be considered individually, and that even if one is interested in only one specific region or group of countries (in our case, we are only interested in sub-Saharan Africa), there is a need to take into account all potential recipients.

Even in terms of modelling aid allocations, the focus of our framework on a donor's price elasticity of demand for foreign projects is too limited for empirical application. Consider the aid allocation decision of a given donor. Decisions of how much aid to allocate to recipients are made on the basis of several factors. As an illustration of this. one has only to think of the amounts of aid that the US have directed towards Iraq since 2003. Furthermore, donors are not able to measure the unit price of a project. This means that donors' decision variables tend to be how much aid to allocate to a recipient country, and then, within that country, how much to allocate to each sector. Adding further complexities to aid allocation decisions, donors may instead decide to allocate aid firstly across sectors and only then across recipient countries. In addition, it is unlikely that a given donor will have the same price elasticity of demand across recipients. This might happen, for example, because aid to some recipients may be "tied", i.e., where procurement of goods or services is limited to the donor country (and so donor demand may be more inelastic in these cases). In addition, different donors may have a different elasticity for the same recipient. This may occur because different donors have different *perceptions* of corruption, or because donors have different preferences across recipients (for example, due to colonial ties). A related issue is that different donors may have different preferences across sectors. These different preferences may due to differing perceptions of how easy and/or frequent it is for government officials to extract bribes in certain sectors, or due to preferences unrelated to corruption levels, but instead related to other motivations (such as claiming that it was a major contributor, through its aid transfers, towards achieving the Millennium Development Goal of achieving universal primary education, for example). The elasticities may also change over time, as donors may become more aware of problems of corruption generally (for example, due to a more aggressive stance against corruption adopted by international institutions, such as the World Bank), or because better monitoring mechanisms may become available, so that it may be easier to identify potential areas where they may be scope for corrupt activities. Finally, it may be the case that donors are not able to effectively distinguish between small differences in levels of corruption in different recipient countries (in the extreme, donors may even view recipients as simply either corrupt or not), so that donors' perceptions of corruption may not impact their aid allocation decisions.

All of these limitations are compounded by the lack of measures on corruption that are able to capture these different factors (for example, that different donors may have different perceptions of corruption levels in the recipient countries). Indeed, data on corruption is generally available in the form of subjective, perceptions-based indices. These indices tend to capture several aspects of corruption, such as bribes paid in relation to police protection, obtaining import and export licenses, and so are not a true measure of the tax on aid flows. Indeed, corruption indices are subject to other limitations, as described in detail in Chapter 2, Section 2.4. In addition, there are no country (donor)- or sector-specific measures of corruption, or even of perceived corruption.

Another limitation that should be highlighted is that, even if the simple theoretical model were able to explain how corruption (or perceptions of corruption) was factored into aid allocation decisions, it might not necessarily fully explain the link between corruption levels and aid receipts. Even though aid receipts are inherently/implicitly based on aid allocations, a focus on aggregate aid receipts can potentially mask different aid allocations decisions by different donors. So the estimated coefficient on perceived corruption will be capturing a weighted average elasticity. As we are interested in whether corruption in sub-Saharan Africa has impacted on the aid flows it receives (that is, we model aid receipts), this theoretical framework can provide a flavour of some of the forces that may be at work in aid allocations (subject to the limitations identified above), but cannot really be empirically tested and it is important to bear this in mind when examining the empirical results in this chapter.

4.4 Data

We have data for 32 sub-Saharan countries for the period 1982-1997.[130] We divide the sample period into four four-year periods, namely, 1982-1985, 1986-1989, 1990-1993 and 1994-1997. Thus, each country has four observations, data permitting, and our data set consists of panel data.[131] Dividing the sample period into either four- or five-year periods is common in the literature, as it smoothes annual variability in the aid variables (as Bulír and Hamann (2003) point out, aid flows tend to be quite volatile), allows for an increase in the size of the sample (as it allows the inclusion of countries that have missing observations for some years), whilst also allowing to explore the time dimension in the data.

The dependent variable - aid

[130] The countries in the sample are: Angola, Botswana, Burkina Faso, Cameroon, Congo (Republic), Cote d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Democratic Republic of Congo (formerly Zaire), Zambia, Zimbabwe.

[131] Refer to Appendix 4.A for more details on the sample, including outliers.

The Development Assistance Committee (DAC) of the OECD is the main source of comprehensive and internationally comparable data on aid flows. The OECD defines aid[132] as non-military grants and concessional loans that have at least a 25% grant component. Data on both commitments and disbursements are available. Commitments represent firm written obligations by the donors, backed by the appropriation or availability of the necessary funds, to provide resources of a specified amount under specified financial terms and conditions and for specified purposes for the benefit of a recipient country or a multilateral agency. As such, commitments measure donors' intentions during a reporting year. On the other hand, disbursements refer to the release of funds to – or the purchase of goods or services for – a recipient. Disbursements, therefore, refer to the amount spent, that is, the actual international transfer of resources. So, whereas commitments refer to donor *intentions* of funds transfers, disbursements refer to *actual* transfers.

Disbursements differ from commitments for a variety of reasons. Firstly, recipients may not actually draw upon all the commitments [White and McGillivray (1993, 1995)]. Secondly, sudden emergencies (such as natural disasters or a severe famine) can affect disbursements. Thirdly, aid disbursements could be linked to performance in terms of results, or fulfilment of conditionalities.

When studying aid allocation, aid commitments rather than actual disbursements are a better candidate for the dependent variable, as the former

[132] Aid to Part I recipients (developing countries and territories) is denoted by Official Development Assistance, whereas aid to Part II recipients (countries and territories in transition) is denoted by Official Aid.

better reflects the donors' decision making. Note that we model aid receipts rather than aid allocations, so that data on aid disbursements could be used. However, as donor allocation decisions are implicit in the modelling of aid receipts, we primarily use data on commitments. We also perform sensitivity tests using data on disbursements, to ascertain whether the choice of commitments versus disbursements affects the results (we find it does not).

In terms of donor practices regarding aid expenditures, although donors work with annual aid budgets, budgetary planning tends to be multi-year (typically 3-5 years) [OECD (2007)]. That is, although annual aid commitments are made, donors tend to have multi-year aid commitments frameworks with recipients. In principle, the annual aid commitments should be disbursed within the year, although that may not always be the case, for some of the reasons referred to above.

Aid is also characterised by whether it is bilateral or multilateral. Bilateral transactions are those undertaken by a donor country directly with an aid recipient. Bilateral assistance is administered by agencies of donor governments (such as the US Agency for International Development or Japan's Overseas Economic Cooperation Fund). Multilateral assistance is funded by contributions from donor countries and administered by agencies such as the United Nations Development Programme and the World Bank.[133] We focus on bilateral aid. Our objective is to estimate a full model of aid receipts so that we

[133] Note that in the case of a multilateral aid agency, if any donor country contributing to it effectively controls the disposal of the funds by specifying the recipient or other aspects of the disbursement (e.g. purpose, terms, total amount, reuse of any repayments), then the contribution should be classified as bilateral. It is crucial that a multilateral agency pools contributions so that they lose their identity and become an integral part of its financial assets.

can see the relative importance of corruption in the recipient country versus poverty, institutions and policy, as well as the political-strategic interests of donors.[134] Furthermore, most authors find that the determinants of bilateral and multilateral aid are quite different.[135]

As well as examining total aid flows, we are also interested in the sectoral breakdown of aid. Analysing sectoral aid receipts will provide some indication of the donors' (albeit aggregate) beliefs of the relative importance of certain sectors. For example, it is plausible that donors will be concerned about the level of primary education in the recipient country. Indeed, one of the eight Millennium Development Goals is to achieve universal primary education by 2015. Although the annual reporting in the DAC tables is insufficiently detailed to produce all the data required for consideration of specific policy issues, it is supplemented by reporting on individual transactions in the Creditor Reporting System (CRS).[136]

The CRS sector classification contains the following broad categories:[137]

- *social infrastructure and services* (covering the sectors of education, health, population, water, government and civil society);
- *economic infrastructure and services* (covering transport, communications, energy, banking and finance, business services);

[134] Note that although we model aid receipts, rather than aid allocations (i.e., the donors' essentially bilateral decisions), donors' allocation decisions are implicit in aid receipts.
[135] See Maizels and Nissanke (1984) on the difference between bilateral and multilateral aid. Frey and Schneider (1986), among others, study the determinants of multilateral aid.
[136] The definitions used in both reporting systems are consistent.
[137] Please refer to Appendix 4.B for greater detail on the sectoral breakdown contained in the CRS.

- *production* (covering agriculture, forestry, fishing, industry, mining, construction, trade, tourism);
- *multisector/cross-cutting* (covering general environmental protection, women in development, other multisector including urban and rural development); and
- *non-sector allocable* (for contributions not susceptible to allocation by sector such as balance of payments support, actions relating to debt, emergency assistance and internal transactions in the donor country).

As in the case of total aid flows, we are interested in bilateral sector-specific aid. Finally, all aid variables are converted into purchasing parity constant 2000 US$ using deflators in OECD (2005a) and then divided by the recipients' real (PPP) GDP, using GDP figures from the World Bank's (2005a) World Development Indicators. The aid variables are then logged to render their distribution less skewed.

It is worth elaborating on the choice of scaling the aid variables, and in particular, of scaling by GDP rather than by population. On the choice of scaling the aid variables, this is so that we capture a measure of the value of aid receipts, that is, of the relative importance of aid flows to the recipients. Although some papers in the literature (whether they consider aid allocation or aid receipts) use measures of aid per capita, this is conceptually inappropriate. Firstly, it does not provide a good approximation to donors' aid decision-making process in practice. Donors' decisions typically involve distributing aid from a predetermined pool of funds, and distributing aid in per capita terms would be, as McGillivray and Oczkowski (1992), and White and McGillivray (1993) point out, *"both a difficult and cumbersome task"*. Secondly, aid per capita is not the measure of the relative importance of aid flows that recipients focus on. Indeed, aid flows are just a component of funds flows to recipients (just think of foreign direct investment) and these are typically considered as a proportion of GDP, not in per capita terms. In addition, a focus on aid per capita ignores biases in the cross-country patterns of aid receipts. Even early studies, such as Isenman (1976), argued that the use of per capita aid gives *"too much weight"* to small countries. The pattern of cross-country aid per capita receipts differs from that of aid as per cent of GDP receipts. The existence of systematic biases must be acknowledged. These biases are that relatively rich countries with small populations tend to have low aid as per cent of GDP, but high aid per capita; whereas very poor, yet populous countries will tend to have high aid as per cent of GDP and low aid per capita. Depending on the countries included in a given sample, these biases may distort the results obtained. To test whether our choice of aid as per cent of GDP affects the results, and mainly to compare our results with other studies [in particular, Alesina and Weder (2002)], we also include results obtained by estimating our model of aid receipts using aid per capita.

The main explanatory variable – perceived corruption[138]

Our main objective is to explain whether less corrupt countries in sub-Saharan Africa receive more aid from bilateral donors (in the aggregate). Although corruption is difficult to measure, several indices that attempt to measure some facets of corruption are available. Some of the indices are based

[138] Note that the corruption index we use measures perceived corruption.

on polls of experts, some on surveys of entrepreneurs, whereas others incorporate/aggregate several independent sources. Therefore, these are indices of *perceived* corruption. Some examples of sources of these subjective indices are the Economist Intelligence Unit, Political Risk Services, Business and Environmental Risk Intelligence, Transparency International and the World Bank. Fortunately, as detailed in Mauro (1995), the data for the various indices, including measures of various aspects of bureaucratic efficiency, are highly correlated.

As we are interested in examining aid flows to sub-Saharan African countries, our choice of corruption index hinges primarily on the availability of data for these countries and secondarily on the longest time-series. As in Chapter 2, we opt for the index of corruption drawn from the ICRG,[139] compiled by Keefer and Knack (1998) and distributed by the Institutional Reform and Informal Sector Centre at the University of Maryland, as it is available for the time period 1982-1997 for 37 African countries, 32 of which are sub-Saharan. Moreover, it is the only measure of perceived corruption that is comparable over time.

The ICRG corruption index, based on polls of experts, is scored from zero to six, where low scores indicate *"high government officials are likely to demand special payments"* and *"illegal payments are generally expected throughout lower levels of government"* in the form of *"bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans"* [Keefer and Knack (1995)]. As in Chapter 2, we transform

[139] Described in detail by Keefer and Knack (1995).

the ICRG corruption index so that 0 = least corrupt; 10 = most corrupt. Further details on the ICRG corruption index can be found in Chapter 2, Section 2.4.

It is important to bear in mind that the subjective nature of corruption measures has implications in terms of the conclusions and assertions that may be made in empirical studies employing these measures as if they had cardinal meaning. So, as in Chapter 2, we perform sensitivity tests by reclassifying the corruption index into bands or categories, and using these bands instead of the index.

The remaining explanatory variables

We control for other determinants of receipts of foreign aid. We use variables measuring recipients' humanitarian need, their size, the quality of their institutions and policy, as well as variables capturing the strategic interests of donors.

Our measure of recipient need is its level of income, as measured by GDP per capita in purchasing parity constant 2000 US$ from the World Bank's (2005a) World Development Indicators. This is the single most common (and frequently only) variable of recipient need included in studies of aid allocation/receipts. In terms of variables measuring the quality of the political system, we include a measure of whether the recipient country is a democracy, as donor countries may discriminate against non-democratic governments. We use the variable POLITY[140] from the Gurr, Jaggers and Marshall (2003) Polity

[140] The POLITY score is computed by subtracting the AUTOC score from the DEMOC score. The AUTOC variable measure institutionalized autocracy in an additive eleven-point scale (-10 to 0), whereas the DEMOC variable measures institutionalized democracy also in an additive *Footnote continues on next page.*

IV data set, rescaled so that it ranges from 0 (strongly autocratic) to 10 (strongly democratic).

We also include a variable measuring respect for personal integrity rights with data from the Purdue Political Terror Scales (PTS) [Gibney (2005)].[141] One of the two PTS is based on information from Amnesty International's annual human rights reports, whilst the other is based on information from the US Department of State's Country Reports on Human Rights Practices. Both measures report on a scale of 1 (best) to 5 (worst). We rescale the PTS such that 1 means worst and 5 means best human rights performance. We use the US Department of State PTS, but results are unaffected by using either the Amnesty International PTS, or an average of the two.

Some researchers use the Freedom House index of civil and political freedom to measure countries' human rights records. Yet there has been some confusion as to whether these indices should be considered measures or determinants of human rights. Indeed, the index has been used by researchers both as a measure of the human right to civil and political freedom and as a measure of democracy (which is considered to be an important determinant of human rights practices) [Vanhanen (2000)].

We control for historical, political and strategic links with donors. Former colonial powers usually have remaining political, economic, cultural and other interests in their former colonies. As such, a variable measuring the

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eleven-point scale (0 to 10). Note that the two scales do not share any categories in common. The POLITY score originally ranges from -10 (strongly autocratic) to +10 (strongly democratic).

141 The PTS were originally developed by Michael Stohl and were updated under the management of Mark Gibney, both from Purdue University. The PTS data set is available at http://www.unca.edu/politicalscience/images/Colloquium/faculty-staff/gibney.html.

number of years a recipient country has been a colony since 1900 is used. This variable is constructed using information from the CIA (2005) World Factbook. As a measure of donor strategic interests we use a political similarity variable that draws from voting behaviour in the UN General Assembly [Gartzke (2006)]. Values for the Affinity data range from –1 (least similar interests) to 1 (most similar interests). We rescale the Affinity data to show the percentage of times the recipient country voted in the same way as country X. Alesina and Dollar (2000) and Alesina and Weder (2002) argue that UN voting patterns may be an accurate signal of alliances and common interest. We also include another measure of strategic importance, namely, arms imports as a proportion of GDP. This measure reflects the assumption that donors interested in promoting their security would favour recipients that maintain relatively large military establishments and would, therefore, be able to act as surrogates for the donor within their specific regions.

Finally, we control for economic policies in the recipient countries by using a measure on openness. Our measure of openness is a zero-one index developed by Sachs and Warner (1995), and updated by Easterly, Levine and Roodman (2004). According to this measure, a country is classified as "closed" if at least one of the following five criteria apply: (i) nontariff barriers cover 40% or more of trade; (ii) average tariff rates are 40% or more; (iii) the black market exchange rate is depreciated by 20% or more relative to the official exchange rate; (iv) the country has a socialist economic system; and (v) the state holds a monopoly on major exports. As we are more interested in an indicator of policy stance rather than openness strictly defined, we favour this index over a simple measure of trade, such as imports and exports as a proportion of GDP.

It should be noted that some of the variables do not vary greatly over time or by country. Two examples are the number of years a recipient country has been a colony since 1900 and the Sachs and Warner openness measure. Most of the countries in sub-Saharan Africa became independent in the early 1960s, so that our variable will cluster around 60-65. The openness measure will also tend to cluster around "not open" until the late 1980s to early 1990s. These limitations will have implications on the ability of the variables to control for different country characteristics and over time.

Table 4.1 provides a summary of the variables used (including for the sensitivity checks). Table 4.2 provides descriptive statistics and Table 4.3 reports the correlations between the main variables. We also present a scatterplot of aid against long-run perceived corruption (Figure 4.1) and graphically present how aid has evolved by period, for countries with lower and higher perceived corruption (Figure 4.2). The raw data seems to indicate that sub-Saharan African countries perceived as more corrupt receive less aid.

Table 4.1: Description and sources of data

Variable	Description	Source
Log(DAC bilateral aid commitments, as per cent of GDP)	Natural Logarithm of Bilateral Official Development Assistance by DAC donors, as per cent of GDP - commitments	OECD (2005a)
Log(DAC bilateral aid commitments p.c.)	Natural Logarithm of Bilateral Official Development Assistance by DAC donors per capita - commitments (2000 US$)	OECD (2005a)
Log(DAC bilateral aid commitments to sector X, as per cent of GDP)	Natural Logarithm of Bilateral ODA commitments by DAC donors for sector X , as per cent of GDP	OECD (2005b)
Corruption	ICRG Corruption index Originally, 0-most corrupt; 6-least corrupt. Transformation: 0-least corrupt; 10-most corrupt	Keefer and Knack (1998)
Democracy	Measure of democracy, polity. Originally, ranged from −10 (strongly autocratic) to +10 (strongly democratic). Transformation: 0 (strongly autocratic); 10 (strongly democratic).	Gurr, Jaggers and Marshall (2003)
Years as a colony	Number of years as a colony since 1900	CIA (2005)
Openness	Proportion of years in the period in which the country is open	Sachs and Warner (1995); Easterly, Levine and Roodman (2004)
Log(GDP per capita)	Natural Logarithm of Real (PPP) GDP per capita, 2000 US$, beginning of period	World Bank (2005a)
Human rights	Measure of respect for human rights, PTS – US Department of State Originally, ranged from 1 (best) to 5 (worst). Transformation: 1-worst and 5-best human rights performance.	Gibney (2005)
Arms imports	Arms imports as % GDP	World Bank (2005a)
X_UN_friend	Measure of UN voting similarity with country X. Originally, ranged from -1 (most dissimilar) to 1 (most similar). Affinity data rescaled to show the percentage of times the recipient country voted in the same way as country X.	Gartzke (2006)
Log(Population)	Natural Logarithm of Population (millions)	World Bank (2005a)
Log(DAC bilateral aid net disbursements, as per cent of GDP)	Natural Logarithm of Bilateral ODA by DAC donors, as per cent of GDP – net disbursements	OECD (2005a)
Log(Bilateral EDA, as per cent of GDP)	Natural Logarithm of Bilateral Effective Development Assistance by DAC donors, as per cent of GDP – disbursements	Chang et al. (1998)
Log(Multilateral/Total aid commitments, as per cent of GDP)	Natural Logarithm of Multilateral/Total OD – commitments, as per cent of GDP	OECD (2005a)
Log(Multilateral/Total aid net disbursements, as per cent of GDP)	Natural Logarithm of Multilateral/Total ODA – net disbursements, as per cent of GDP	OECD (2005a)

Variable	Description	Source
Log(Multilateral/Total EDA, as per cent of GDP)	Natural Logarithm of Multilateral/Total Effective Development Assistance–disbursements, as per cent of GDP	Chang et al. (1998)
Years as an independent country	Number of years as an independent country since 1900	CIA (2005)
Log(Infant mortality)	Natural Logarithm of Mortality rate, infant (per 1,000 live births)	World Bank (2005a)
Military expenditure	Military expenditure (% of central government expenditure)	World Bank (2005a)
Political Rights	Measure of political rights, recoded as: 1 (lowest degree of freedom), 7 (highest degree of freedom)	Freedom House (2005)
Civil Liberties	Measure of civil liberties, recoded as: 1 (lowest degree of freedom), 7 (highest degree of freedom)	Freedom House (2005)
Trade	Trade (imports + exports) as % GDP	World Bank (2005a)

Table 4.2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
DAC bilateral aid commitments, % GDP	116	2.8	2.1	0.01	8.9
Population	128	14.7	18.8	0.7	112.9
GDP p.c.	116	2014.4	2175.2	480.9	11071.1
Openness	111	0.2	0.4	0	1
Democracy	125	3.3	2.5	0.5	9.5
Human rights	128	3.2	1.0	1	5
Corruption	126	5.4	1.9	0	10
Arms imports	123	8.7	29.7	0	281.1
US_UN_friend	126	50.1	13.0	37.9	100
JAPAN_UN_ friend	126	91.2	3.4	83.4	100
UK_UN_ friend	126	75.7	6.2	67.6	100
FRANCE_UN_friend	126	80.9	5.4	74.1	100
Years as a colony	128	58.1	19.1	0	90
DAC bilateral aid commitments p.c.	126	36.1	28.0	0.39	147.6
DAC bilateral aid net disbursements, % GDP	116	2.6	2.0	0.01	8.3
EDA aid, % GDP.	106	2.0	1.6	0.02	7.5
Multilateral aid commitments, % GDP.	116	1.9	1.8	0.01	11.2
Multilateral aid net disbursements, % GDP.	116	1.6	1.5	0.01	7.4
Multilateral EDA aid, % GDP	106	1.5	1.6	0.03	12.7
Total aid commitments, % GDP	116	4.8	3.8	0.02	21.3
Total aid net disbursements, % GDP	116	4.3	3.4	0.02	15.80
Total EDA aid, % GDP	106	3.6	2.9	0.09	16.8
Infant mortality	128	106.6	33.3	49.5	191.5
Civil Liberties	127	2.9	1.2	1	6
Years as an independent country	128	31.4	19.6	0	95.5
Trade	119	60.8	28.4	14.8	149.3
Political rights	127	2.7	1.5	1	6.8
Military expenditures	114	13.7	11.8	2.9	62.3

Table 4.3: Correlations between main variables

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Log(DAC bilateral aid commitments % GDP)	1												
2	Log(population)	-0.36*	1											
3	Log(GDP p.c.)	-0.47*	-0.32*	1										
4	Openness	-0.04	-0.29*	0.17	1									
5	Democracy	-0.11	-0.1	0.06	0.25*	1								
6	Human rights	0.4*	-0.42*	0.08	0.21*	0.08	1							
7	Corruption	-0.13*	-0.04	-0.2*	-0.13	-0.04	-0.15	1						
8	Arms imports	-0.09	0.05	-0.05	-0.12	-0.08	-0.26*	-0.07	1					
9	US_UN_friend	-0.3*	0.04	0.33*	0.14	-0.12	-0.32*	-0.06	-0.16	1				
10	JAPAN_UN_ friend	-0.12	0.03	0.24*	0.26*	-0.11	-0.19*	-0.09	-0.23*	0.73*	1			
11	UK_UN_ friend	-0.26*	0.02	0.36*	0.11	-0.11	-0.29*	-0.1	-0.18*	0.96*	0.81*	1		
12	FRANCE_UN_friend	-0.29*	0.03	0.33*	0.21*	-0.11	-0.26*	-0.07	-0.21*	0.95*	0.71*	0.91*	1	
13	Years as a colony	0.21*	-0.28*	-0.03	0.01	0.09	0.27*	-0.08	0.02	-0.33*	-0.21*	-0.3*	-0.29*	1

*Significant at the 5% level.

Figure 4.1: Scatterplot of aid against perceived corruption

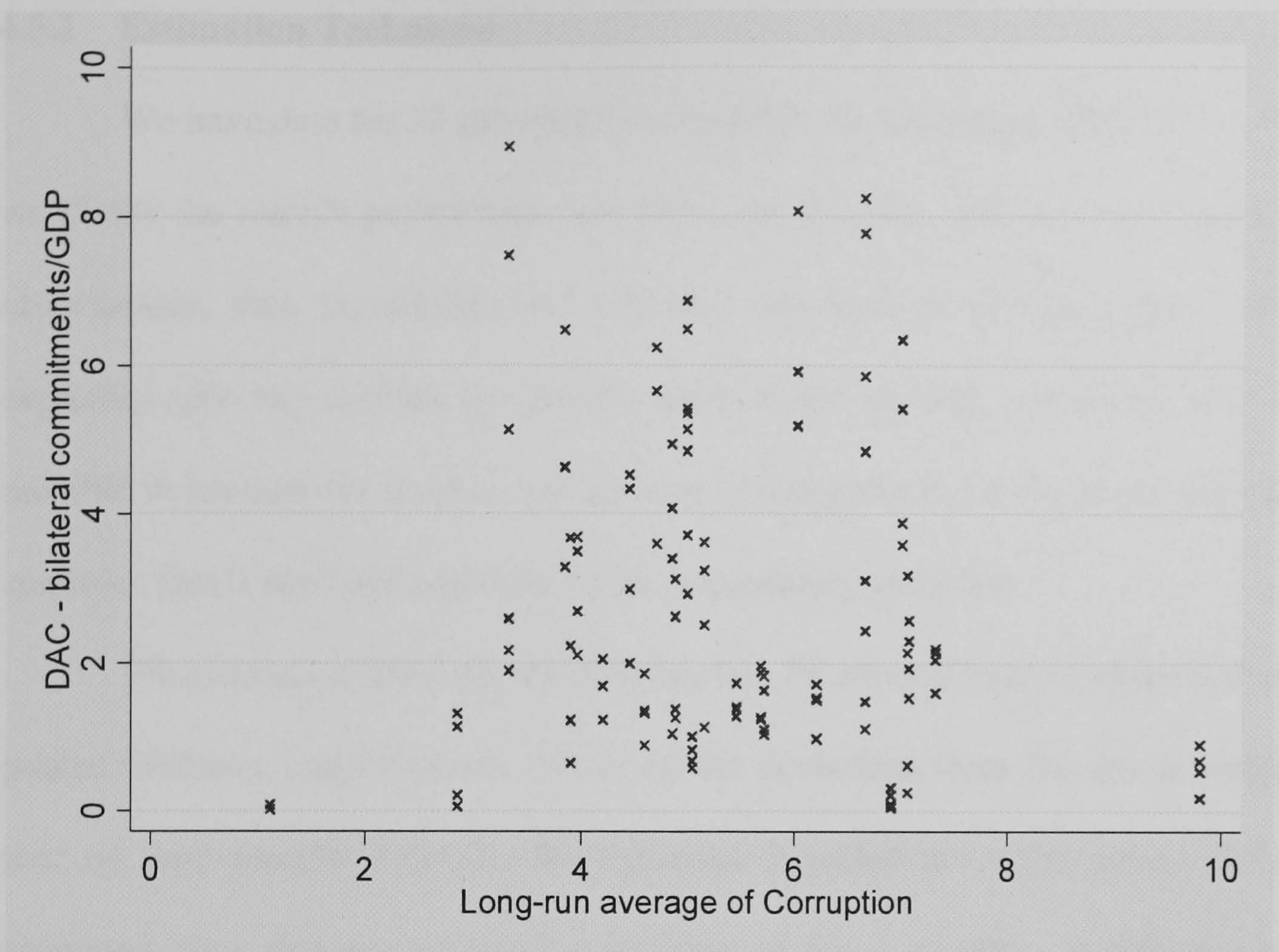
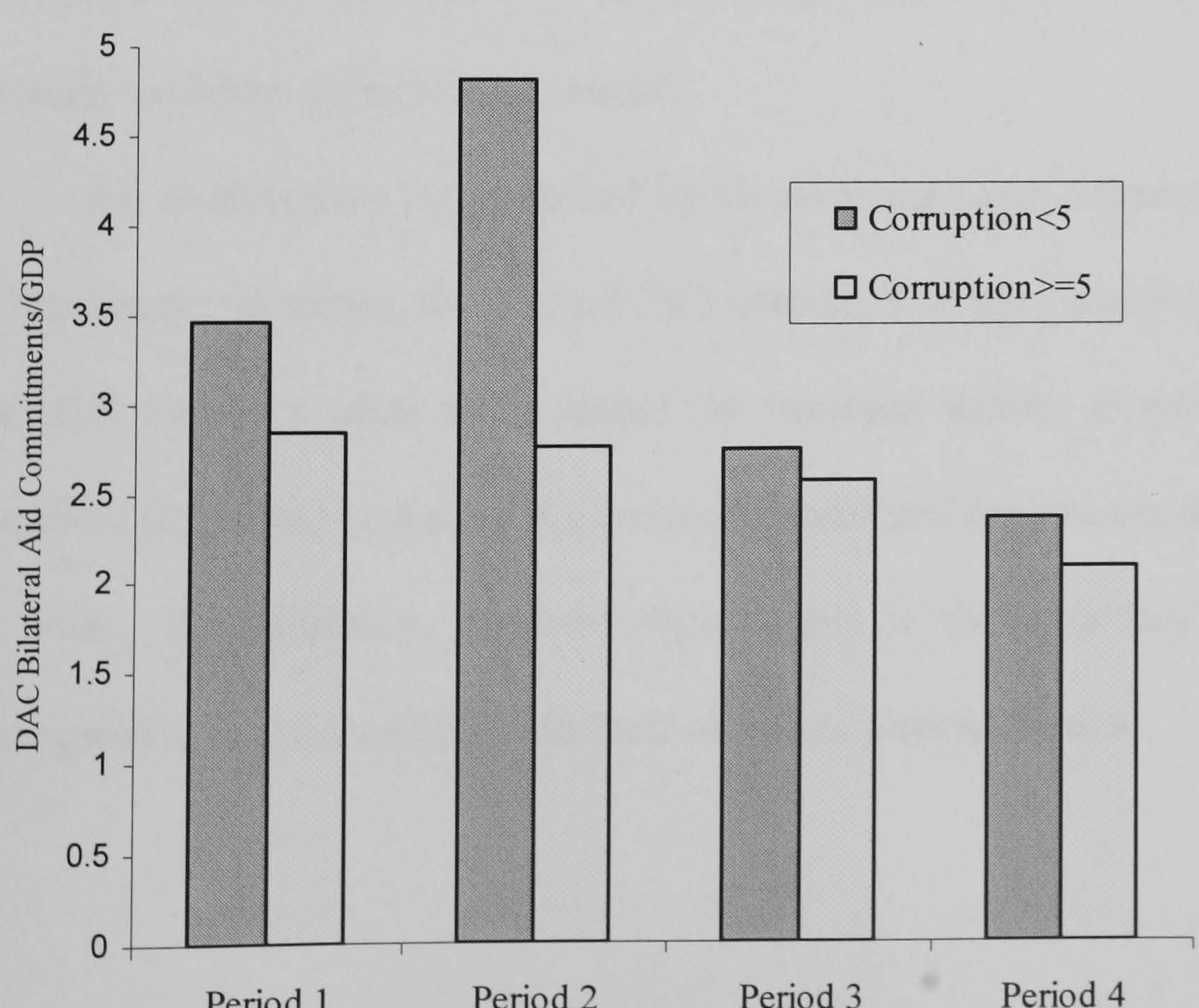


Figure 4.2: Aid by period and level of perceived corruption



4.5 Evidence on Bilateral Aggregate Total Aid Flows

4.5.1 Estimation Technique

We have data for 32 sub-Saharan countries for the period 1982-1997. As we divide the sample period into four four-year periods, each country has four observations, data permitting, and our data set consists of panel data. We explicitly take into account the panel nature of the data set. By doing so it is possible to account for unobserved country heterogeneity, i.e., heterogeneity of countries that is not fully captured by the explanatory variables.

We estimate a fixed effects (FE) model. FE models may be estimated by pooled Ordinary Least Squares (OLS) on the deviations from the group means (i.e., on time-demeaned data) – this estimator is called the within-group (WG) estimator. Note that any potential correlation of the explanatory variables with the time-invariant individual country effects is avoided by wiping them out of the equation to be estimated. One disadvantage is that the coefficients of time-invariant variables cannot be estimated.

RE models may be estimated by Generalised Least Squares (GLS). The GLS estimator is simply the pooled OLS estimator of the quasi-demeaned data. The GLS estimator takes into account the variation within, as well as between countries, therefore, exploring the cross-sectional and time-series dimensions of the data. Its efficiency, however, holds only if the countries' unobserved heterogeneity is uncorrelated with their observed characteristics.

Our choice between the RE and FE models is based on the Hausman test.[142] All the regressions presented reject the hypothesis that the coefficients estimated by GLS and WG do not systematically differ from each other (Hausman specification test). Therefore, it cannot be assumed that the individual country effects can be treated as random effects and that the coefficients of the GLS estimator are free from unobserved heterogeneity bias. Note also, that when estimating the FE model, we find that the correlation between estimates of the unobserved time-invariant country effects and the fitted values are typically quite high. This seems to indicate that there may well be correlation between the unobserved effect and the explanatory variables, and that estimating a FE model is appropriate.

4.5.2 Results

We begin with several regressions explaining bilateral aid flows. The dependent variable is the log of DAC bilateral aid commitments as per cent of GDP and our main explanatory variable of interest is perceived corruption. We use two specifications – in the first one, we include indicators of recipient need and governance; in the second specification, we add indicators of strategic interests.

Table 4.4 reports our results for the whole sample. Column [1] shows the results of our base specification and column [2] shows the results of the full

[142] Note that some authors, such as Lloyd, Morrissey and Osei (2001), prefer to consider the Hausman test as a test for efficiency against consistency. Briefly, this is because the WG estimator may be used to estimate a RE model as well as a FE model, even though it is a consistent but inefficient estimator of the RE model, whereas GLS is both a consistent and efficient estimator of the RE model.

model. Note that, following the literature, we are assuming that the corruption measure has cardinal meaning, so that we refer to the magnitude of coefficient estimates in the discussion of results, rather than to simply their sign and significance. Section 4.5.4 contains a sensitivity analysis that explicitly considers the corruption measure as ordinal.

Perceived corruption has a significant negative impact on aid flows – a one point increase in corruption, say from Zimbabwe's average of six points to Sudan's average of seven points, decreases aid commitments as per cent of GDP by 14% to 15%. *Ceteris paribus*, a country that is relatively corrupt (one standard deviation above the mean) receives 23 to 25% less aid as per cent of GDP.

The coefficient on the population variable indicates evidence of a strong population bias – a country that is relatively smaller (one standard deviation below the mean) receives 223 to 372% more aid as per cent of GDP. The result of a population bias is consistent with Trumbull and Wall (1994) and Dowling and Hiemenz (1985), among others. One of the explanations advanced for the population bias is that smaller countries tend to receive proportionately more aid, as donors want to *"show the flag"* widely [Knack (2001)].

Our measure of recipient need, GDP per capita, is not significant in either specification. In the full specification, our measure for economic policies, openness, is weakly significant, with more open countries receiving more aid. A relatively more open country (one standard deviation above the mean) receives 12% more aid as per cent of GDP. In the full specification there is a slight evidence of discrimination against non-democratic countries – a strongly democratic country receives 57% more aid than a strongly autocratic country. Being relatively democratic (one standard deviation above the mean) implies receiving 15% more aid as per cent of GDP. Respect for human rights is only significant in explaining aid receipts in the base specification, where an improvement of one point in the Political Terror Scale leads to 16% more aid. A country relatively more respectful of human rights (one standard deviation above the mean) receives 15% more aid as per cent of GDP.

In terms of donor strategic interests, the variable arms imports as per cent of total imports behaves in the opposite way as expected. Arms imports significantly reduce the amount of aid receipts – a country with 10% more arms imports receives 3% less aid. This significant negative correlation is robust to using military expenditure (as per cent of central government expenditure) instead. It is generally argued that donors tend to favour countries with large military establishments, thereby enabling them to act as surrogates for the donor within their specific region. However, in the sub-Saharan African context, a substantial military might raise concerns about civil wars or guerrilla warfare. In that case, it is plausible that donors might not want to reward bellicose countries. Another explanation is that the share of government expenditures spent on military purposes may be viewed as an indicator for good governance, rather than for donor strategic interests – recipients with lower military expenditures (the minimum above what is necessary to fulfil the reasonable security interests of a country) have better governance [Neumayer (2003b)]. In this case, then one would expect that countries with smaller military expenditures would receive more foreign aid.

Of the variables on voting pattern in the UN General Assembly, only voting with Japan is significant. UN voting similarity to Japan leads to increases in aid commitments. Alesina and Dollar (2000) also find that for the period 1970-1995, the variable "Japan UN friend" has a significant positive coefficient with values similar to the one we obtain. In terms of other results in the literature, Alesina and Dollar (2000) find the coefficient on "US UN friend" to be significant (and positive) only when they omit their dummies on whether the recipient is Israel or Egypt. Alesina and Weder (2002) find that neither "Japan UN friend" nor "US UN friend" are significant.

Appendix 4.C (Table 4.C.1) provides the results for the sample excluding outliers. Neither the significance nor the sign of the coefficient on the corruption variable is affected by the exclusion of outliers. Columns [1'] and [2'] show the results excluding the outliers for logged aid as per cent of GDP. Removing the outliers for logged aid as per cent of GDP slightly increases the magnitude of the coefficient on perceived corruption. The remainder of the results stays more or less unchanged, except that for [1'] respect for human rights is no longer significant and for [2'] openness is no longer significant. For the remainder of the chapter we omit the regression results excluding outliers, as these do not essentially affect the coefficient on the corruption variable and the results on the remaining variables are substantially unaffected. Note that there are no outliers for aid as per cent of GDP.

Table 4.4: Bilateral Aggregate Aid Commitments as per cent of GDP

Dependent variable: Log(DAC bilateral aid commitments, per cent of GDP)	[1]	[2]
Log(Population)	-1.857***	-3.123***
	[0.362]	[0.484]
Log(GDP per capita)	-0.472	-0.44
	[0.469]	[0.391]
Openness	0.264	0.292*
	[0.174]	[0.162]
Democracy	0.048**	0.057***
	[0.023]	[0.019]
Human Rights	0.161*	0.087
	[0.082]	[0.072]
Corruption	-0.139***	-0.149***
	[0.046]	[0.038]
Arms imports		-0.003***
		[0.001]
Friend of US		-0.008
		[0.011]
Friend of Japan		0.103***
		[0.022]
Friend of UK		-0.044
		[0.026]
Friend of France		0.007
		[0.020]
Constant	7.960**	4.419
	[3.292]	[3.495]
Observations	99	97
Countries	28	28
R^2	0.434	0.658
Hausman Test (p-value)	0.001	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

4.5.3 Robustness Checks

Dependent variable

Our results on the impact of perceived corruption on the receipts of bilateral aggregate aid provide strong consistent evidence that, in aggregate, donors tend to reward countries perceived as less corrupt with more aid. Given that our results differ from the literature, we are interested in checking whether they are robust to several sensitivity checks.

Our first sensitivity check regards testing whether our results are affected by using aid per capita instead of aid as per cent of GDP. Although expressing the aid variable in per capita terms is conceptually inappropriate (as was discussed in Section 4.4), it has been used in the literature. Therefore, to compare our results to those in other studies, and in particular to those in Alesina and Weder (2002), we estimate our model of aid receipts using aid per capita.[143,144] Table 4.5 reports the results obtained when (log of) ODA commitments per capita is the dependent variable. Neither the significance nor the sign of the coefficient on the perceived corruption variable is affected by using aid per capita instead of aid as per cent of GDP. Using aid per capita slightly increases the magnitude of the coefficient on perceived corruption. The

[143] Note that, given we define the old dependent variable (aid/GDP) in logarithmic form, and we have population and GDP per capita in logarithmic form as regressors, when we define the new dependent variable (aid per capita) in logarithmic form, if we were using annual data, only the coefficient on GDP per capita would change under the new specification. The coefficients on the other regressors would remain unaffected. However, as we are considering period averages, this does not happen when we redefine the dependent variable, and all the estimated coefficients are different. Please refer to Appendix 4.D for further details.

[144] When the dependent variable is defined as aid per capita, including population as an explanatory variable allows for verifying the existence of a population bias. Studies as early as those of Isenman (1976) show that less populous countries tend to receive more aid per capita. Reasons for this bias include that donors might not want to concentrate aid in a group of few very populous countries.

remainder of the results stays more or less unchanged, except that for the full specification [2] openness is no longer significant and UN voting similarity with the UK leads to smaller receipts of aid. The coefficient on our variable for "UK UN friend" is not straightforward to justify. One possible explanation is that aid is being used as a means to achieve economic and political access in politically hostile countries, e.g., the UK securing orders for domestic manufacturers in certain sub-Saharan African countries that are not politically aligned with the UK. Instead of regarding a negative coefficient on the UN friend variable for the UK as the imposition of a penalty or a punishment on their "friends", it could be interpreted as meaning that UK "friends" do not need any rewards, but those hostile to them (i.e., those recipients that vote less in accordance to them in the UN) do.[145]

Although using aid per capita instead of aid as per cent of GDP broadly did not alter our results, we present results on further sensitivity checks using aid as per cent of GDP rather than aid per capita, as the former is the more correct measure of aid to use when studying aid receipts.[146]

Our second sensitivity check regards different data for bilateral aggregate aid flows. In the first instance, we check whether our results are robust to using OECD data on net disbursements, rather than commitments. Commitments measure donors' intentions, whereas disbursements represent the realisation of donors' intentions and the implementation of policies. As would

[145] Just as it is plausible one might make less of an effort when having old friends for dinner compared with having new acquaintances round whom one wants to impress and wants to become friends with. Of course this means one is not interested in friendship *per se*, but rather on what benefits one may derive from them.

[146] Note that the results from the sensitivity checks are also robust to using aid per capita.

be expected, the two are highly correlated. As we are modelling aid receipts, it is appropriate to compare results using aid commitments with those for aid disbursements, as variables which capture the recipients' behaviour (such as, but not only, corruption) could have different effects on the different aid flows (especially if aid disbursements are more responsive to these behaviours).

Table 4.6 reports the results obtained using (log of) net ODA disbursements as per cent of GDP as the dependent variable. Using net disbursements does not affect our main result on perceived corruption. The coefficients on the other variables are mainly unaffected.

Net ODA disbursements measure the disbursements of grants and highly concessional loans (loans with a grant element[147] of at least 25%) minus amortization. Chang et al. (1998) argue that net ODA is not an appropriate measure of aid flows. They provide several reasons why net ODA does not represent the true value of resource transfer from donor to recipient. Two of the reasons are that net ODA includes the full face value of grants and highly concessional loans without distinguishing between the two (even though concessional loans entail repayments); and net ODA ignores loans with low concessionality even though they have a certain, even if low, grant element.[148]

Given the shortcomings of net ODA, Chang et al. (1998) develop a new data set of aid flows, which they call Effective Development Assistance (EDA). This data set is based on the World Bank's Debtor Reporting System, which attempts to correct most of the methodological shortcomings of the ODA measure. Technical assistance is excluded from EDA, as it is usually tied (i.e.,

[147] That is, the subsidy implicitly included in the loan, relative to the loans' face value.
[148] Refer to Chang et al. (1998) for the complete list of reasons.

the donors require that goods and services are bought from the donor countries) and Chang et al. (1998) are unable to precisely estimate its grant equivalence. In principle, EDA provides a better measure of aid than ODA, although they are highly correlated, as Chang et al. (1998) note.[149] We check whether our results are robust to using EDA as opposed to ODA data.

Our results are also robust to using (log of) EDA as per cent of GDP as the dependent variable. As can be seen from Table 4.7, the correlation with perceived corruption is maintained when using this measure of aid flows. The coefficients on the other variables are broadly consistent with our results using ODA commitments. One exception is worth noting. In the full specification there is evidence that UN voting similarity with the US actually decreases EDA aid received. One possible explanation is that aid is being used as a means to achieve economic and political access in politically hostile countries, e.g., the US securing orders for Boeing in certain African countries that are not politically aligned with the US. Instead of regarding a negative coefficient on the UN friend variable for the US as the imposition of a penalty or a punishment on their friends, it could be interpreted as meaning that US friends do not need any rewards, but those hostile to them (i.e., those recipients that vote less in accordance to them in the UN) do.

Our third sensitivity check involves using multilateral and total aid flows as the dependent variable. We use data on ODA commitments, net ODA disbursements and EDA. Table 4.8 reports the coefficient and standard error of the corruption variable in the regressions with multilateral and total aid as the

[149] On a nominal basis, the sample correlation coefficient is 0.89, and in three-year moving averages, the sample correlation coefficient is 0.93.

dependent variable. The numbers of countries and observations, as well as the R^2 and Hausman Test (p-value) are also reported. Perceived corruption is always negatively correlated with aid flows. We, therefore, conclude that our results are robust to using different aid flows.

Table 4.5: Bilateral Aggregate Aid Commitments per capita

Dependent variable: Log(DAC bilateral aid commitments per capita)		
	[1]	[2]
Log(Population)	-1.852***	-3.259***
	[0.379]	[0.499]
Log(GDP per capita)	0.319	0.349
	[0.518]	[0.419]
Openness	0.28	0.271
	[0.191]	[0.179]
Democracy	0.050*	0.060***
	[0.025]	[0.021]
Human Rights	0.185**	0.1
	[0.086]	[0.077]
Corruption	-0.140***	-0.159***
	[0.050]	[0.043]
Arms imports		-0.003***
		[0.001]
Friend of US		-0.011
		[0.010]
Friend of Japan		0.115***
		[0.024]
Friend of UK		-0.054*
		[0.028]
Friend of France		0.017
		[0.020]
Constant	4.745	0.552
	[3.634]	[3.730]
Observations	99	97
Countries	28	28
R^2	0.455	0.677
Hausman Test (p-value)	0.006	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

Table 4.6: Bilateral Aggregate Net ODA Disbursements

Dependent variable: Log(DAC bilateral aid net disbursements, per cent of GDP)

	[1]	[2]
Log(Population)	-1.155***	-2.255***
	[0.378]	[0.465]
Log(GDP per capita)	-0.386	-0.367
	[0.473]	[0.437]
Openness	0.19	0.234
	[0.166]	[0.163]
Democracy	0.042*	0.050***
	[0.021]	[0.018]
Human Rights	0.096	0.033
	[0.079]	[0.071]
Corruption	-0.128**	-0.135***
	[0.050]	[0.044]
Arms imports		-0.002**
		[0.001]
Friend of US		-0.012
		[0.012]
Friend of Japan		0.087***
		[0.023]
Friend of UK		-0.023
		[0.027]
Friend of France		0.004
		[0.020]
Constant	5.999*	2.461
	[3.500]	[4.014]
Observations	99	97
Countries	28	28
R^2	0.273	0.524
Hausman Test (p-value)	0.007	0.037

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

Table 4.7: Aggregate Bilateral Effective Development Assistance

Dependent variable: Log(Bilateral EDA, per cent of GDP)		
	[1]	[2]
Log(Population)	-0.621	-1.422**
	[0.385]	[0.642]
Log(GDP per capita)	-1.026**	-1.028***
	[0.422]	[0.373]
Openness	0.142	0.258
	[0.172]	[0.184]
Democracy	0.039*	0.045**
	[0.021]	[0.018]
Human Rights	0.103	0.06
	[0.092]	[0.086]
Corruption	-0.150***	-0.150***
	[0.052]	[0.049]
Arms imports		-0.001
		[0.001]
Friend of US		-0.029**
		[0.013]
Friend of Japan		0.053**
		[0.025]
Friend of UK		0.021
		[0.033]
Friend of France		0.018
		[0.018]
Constant	6.448	1.317
	[3.377]*	[3.580]
Observations	98	96
Countries	27	27
R^2	0.28	0.453
Hausman Test (p-value)	0.003	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

Table 4.8: Multilateral and Total Aid Flows

	[1]	[2]
Log(Multilateral ODA commitments/GDP)	-0.149**	-0.136**
	[0.060]	[0.060]
Hausman Test (p-value)	0.003	0.041
R^2	0.201	0.427
Observations	99	97
Countries	28	28
Log(Multilateral ODA net disbursements/GDP)	-0.187***	-0.196***
	[0.054]	[0.055]
Hausman Test (p-value)	0.004	0.022
R^2	0.183	0.34
Observations	99	97
Countries	28	28
Log(Multilateral EDA disbursements/GDP)	-0.168**	-0.232***
	[0.077]	[0.083]
Hausman Test (p-value)	0.002	0.004
R^2	0.243	0.42
Observations	95	94
Countries	27	27
Log(Total ODA commitments/GDP)	-0.133***	-0.134***
	[0.043]	[0.040]
Hausman Test (p-value)	0.000	0.000
R^2	0.402	0.633
Observations	99	97
Countries	28	28
Log(Total ODA net disbursements/GDP)	-0.136***	-0.146***
	[0.043]	[0.036]
Hausman Test (p-value)	0.001	0.008
R^2	0.258	0.507
Observations	99	97
Countries	28	28
Log(Total EDA disbursements/GDP)	-0.183***	-0.191***
	[0.053]	[0.046]
Hausman Test (p-value)	0.006	0.009
R^2	0.359	0.54
Observations	98	96
Countries	27	27

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included
Coefficient of corruption variable reported. Controls:[1] population, income, openness, democracy, human rights, corruption; [2] as above and including military imports, UN voting similarity with the US, Japan, UK and France.

Explanatory variables

We also perform sensitivity checks on several of the explanatory variables – our results remain robust. Table 4.9 reports the results on the perceived corruption coefficient from changing the model specification, both by adding extra explanatory variables and by replacing some of the explanatory variables originally used. Although, for the sake of brevity we only include the results on the coefficient on the perceived corruption variable, we briefly discuss how the results of other explanatory variables are affected.

We use infant mortality as a further indicator of poverty, in addition to initial income. Infant mortality is insignificant, without affecting any other coefficient. We also include a measure of respect for civil liberties in addition to the measure of respect for human rights. Although there is some overlap between the concepts of human rights and civil rights, it is often argued that the political terror scales have a "*much clearer focus on what constitutes arguably the very core of human rights*" [Neumayer (2003b)]. The civil liberties index from Freedom House is based on expert surveys assessing the extent to which a country effectively provides for civil liberties, measured on a 1 (best) to 7 (worst) scale. We reverse the scale so that 1=worst and 7=best. Civil liberties is marginally significant (countries with greater respect for civil liberties receive more aid), without affecting any other coefficient.

As in fixed effects models the coefficients of time-invariant variables cannot be estimated, our variable that measures the number of years a country has been a colony since 1900 is dropped. In order to keep some measure of colonial heritage, we create a variable that measures the number of years a country has been independent since 1900. We find that colonial heritage is insignificant in explaining aid receipts, without affecting the other coefficients.[150]

As well as including further explanatory variables in our specifications, we replace some of the existing explanatory variables. We replace the Sachs and Warner index of openness with trade (sum of exports and imports) as per cent of GDP. We find that a greater openness to trade is significant and has the expected (positive) sign. In the full specification, respect for human rights becomes significant, and arms imports looses significance. We replace Polity IV's measure of democracy with a measure of political rights from Freedom House. The political rights index, as the civil liberties one, is based on expert surveys. We also reverse the scale so that it measures the extent to which a country provides for political rights on a 1 (worst) to 7 (best) scale. Democracy as measured by political rights becomes insignificant in the full specification, and income per capita becomes significantly (negatively) correlated with aid. The only other coefficient affected is the respect for human rights in the basic specification (becomes insignificant). Using civil liberties instead of respect for human rights yields a significant coefficient without affecting the coefficients on any other variables. Finally, we use military expenditures as per cent of government expenditures instead of arms imports as per cent of total imports. All the coefficients are unaffected.

[150] This result could derive from the fact that, as all the countries in the sample except Liberia and Ethiopia were colonies, in the African context colonial heritage loses its importance in terms of aggregate receipts of aid.

Table 4.9: Sensitivity checks on explanatory variables

Dependent variable: Log(DAC bilateral ODA commitments, per cent of GDP)

			R^2	Hausman Test (p-value)	Observations (countries)
Added Variables:					
Log (infant mortality)	[1]	-0.138***	0.438	0.000	99 (28)
		[0.048]			
	[2]	-0.151***	0.659	0.000	97 (28)
		[0.040]			
Civil Liberties	[1]	-0.157***	0.48	0.002	99 (28)
		[0.051]			
	[2]	-0.159***	0.684	0.000	97 (28)
		[0.043]			
Years as an independent country	[1]	n/a			
	[2]	-0.146***	0.662	0.000	97 (28)
		[0.040]			
Replaced Variables:					
Trade as % GDP (instead of Sachs & Warner measure of openness)	[1]	-0.119***	0.452	0.000	108 (30)
		[0.039]		0.001	
	[2]	-0.109***	0.629		106 (30)
		[0.039]			
Political Rights (instead of Polity measure of democracy)	[1]	-0.124**	0.311	0.002	102 (28)
		[0.057]			
	[2]	-0.133***	0.596	0.003	100 (28)
		[0.047]			
Civil Liberties (instead of Political Terror Scale measure of human rights)	[1]	-0.167***	0.463	0.001	99 (28)
		[0.051]			
	[2]	-0.165***	0.681	0.000	97 (28)
		[0.041]			
Military expenditure (instead of military imports)	[1]	-0.139***	0.434	0.001	99 (28)
		[0.046]			
	[2]	-0.130***	0.711	0.000	94 (28)
		[0.035]			

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included
Coefficient of corruption variable reported. Controls of original specification:[1] population, income, openness, democracy, human rights, corruption; [2] as above and including military imports, UN voting similarity with the US, Japan, UK and France.

4.5.4 Further Robustness Checks – The Ordinal Nature of the Corruption Measure

Until now, we have treated the corruption index as if it were a cardinal variable. However, corruption indices are ordinal in nature, as they measure subjective perceptions of corruption. We know that, for example, a corruption score of four is better than a corruption score of five,[151] but can we say that the difference between a score of four and five is the same as the difference between a score of one and two? If not, then it might not make sense to assume a one unit increase in the corruption index has a constant effect on aid receipts.

Rather than using the corruption measure as a continuous variable, we explicitly take into account the ordinal nature of the corruption index. We reclassify the index into bands, and create dummy variables for each of the bands. We divide the corruption index into three bands (low, medium, high) and also into two bands (low, high). Note that we experimented with the six bands as created in Chapter 2.[152,153] However, as the dummy variables corresponding to bands one and two were time-invariant, they were dropped (as in fixed effects models the coefficients of time-invariant variables cannot be estimated). This means that it is not possible to interpret the estimated

[151] Note that we are referring to the rescaled corruption index, where higher values denote greater perceived corruption.

[152] For more information on how the corruption index was reclassified into bands please refer to Chapter 2, Section 2.4.3. Note that originally seven bands were created, but as the first band had a very low frequency, bands 1 and 2 were merged.

[153] Note that, as referred to in Chapter 2, the ICRG corruption index is a discrete score, from zero to six, with half digits. So this effectively gives the ICRG corruption index 13 possible outcomes. However, as we are using average annual scores of this corruption index, it can actually take on a wider range of values. It is for these reasons that we create bands as opposed to using the original scores.

coefficients on the dummy variables corresponding to the other bands, as there is more than one excluded, or base, band.

Some summary statistics are given in the table below for the corruption index reclassified into three and two bands.

Table 4.10: Summary Statistics on Perceived Corruption Bands

Dummy	Band	Interval	Obs	Mean	Std. Dev.	Min	Max
c_band_31	Band 1	[0, 3.3]	126	0.20	0.40	0	1
c_band_32	Band 2	(3.3, 6.7]	126	0.63	0.49	0	1
c_band_33	Band 3	(6.7, 10]	126	0.17	0.38	0	1
c_band_21	Band 1	[0, 5]	126	0.55	0.50	0	1
c_band_22	Band 2	(5, 10]	126	0.45	0.50	0	1

Table 4.11 presents the results for when the corruption index is reclassified into three bands. The dummy variable corresponding to the most corrupt band (band 3) is the excluded dummy. We can see that all of the dummy variables defining the different perceived corruption bands are significant, and also that they are jointly significant. The difference between recipient countries with perceived corruption in band 1 and band 3 is quite substantial. A country with a perceived corruption score in band 1 receives about 38.7% more aid as per cent of GDP than a country with a perceived corruption score in band 3. A country with a perceived corruption score in band 2 receives about 28% more aid as per cent of GDP than a country with a perceived corruption score in band 3, and about 10.7% less aid than a country with a perceived corruption score in band 1. The results for the other

explanatory variables are broadly similar to those obtained when the corruption measure was used as a continuous variable.

Table 4.12 presents the results for when the corruption index is reclassified into two bands. As before, the dummy variable corresponding to the most corrupt band (band 2) is the excluded dummy. The dummy variable defining perceived corruption band 1 is significant. The difference between recipient countries with perceived corruption in band 1 and band 2 is quite large. A country with a perceived corruption score in band 1 receives about 22.5% more aid as per cent of GDP than a country with a perceived corruption score in band 2. The results for the other explanatory variables are broadly similar to those obtained when the corruption measure was used as a continuous variable. These results are robust to using aid disbursements instead of aid commitments.

This additional sensitivity test of reclassifying the corruption measure into bands and using these bands instead of the continuous index shows that there is a correlation between perceived corruption and the aid as per cent of GDP that recipient countries receive – countries perceived to be more corrupt receive less aid.

Table 4.11: Bilateral Aggregate Aid Commitments as per cent of GDP and Perceived Corruption in Three Bands

Dependent variable: Log(DAC bilateral aid commitments, per cent of GDP)	[1]	[2]
Log(Population)	-1.813***	-2.769***
	[0.377]	[0.542]
Log(GDP per capita)	-0.568	-0.553
	[0.499]	[0.396]
Openness	0.300*	0.375**
	[0.179]	[0.173]
Democracy	0.043*	0.051**
	[0.023]	[0.019]
Human Rights	0.141	0.083
	[0.090]	[0.083]
Corruption Dummy for Band 1	0.487**	0.387**
	[0.193]	[0.174]
Corruption Dummy for Band 2	0.314*	0.280*
	[0.166]	[0.144]
Arms imports		-0.003***
		[0.001]
Friend of US		-0.008
		[0.012]
Friend of Japan		0.087***
		[0.021]
Friend of UK		-0.035
		[0.028]
Friend of France		-0.004
		[0.022]
Constant	7.579**	5.11
	[3.492]	[3.611]
Observations	99	97
Countries	28	28
R^2	0.416	0.623
Hausman Test (p-value)	0.018	0.003
F-Test for joint significance of corruption dummies (p-value)	0.042	0.039

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

Table 4.12: Bilateral Aggregate Aid Commitments as per cent of GDP and Perceived Corruption in Two Bands

Dependent variable: Log(DAC bilateral aid commitments, per cent of GDP)		
	[1]	[2]
Log(Population)	-1.899***	-3.187***
	[0.394]	[0.541]
Log(GDP per capita)	-0.481	-0.416
	[0.466]	[0.397]
Openness	0.358*	0.432**
	[0.180]	[0.171]
Democracy	0.053**	0.062***
	[0.024]	[0.019]
Human Rights	0.183**	0.119
	[0.086]	[0.077]
Corruption Dummy for Band 1	0.213**	0.225***
	[0.093]	[0.076]
Arms imports		-0.002***
		[0.001]
Friend of US		-0.009
		[0.012]
Friend of Japan		0.098***
		[0.021]
Friend of UK		-0.03
		[0.026]
Friend of France		0.003
		[0.022]
Constant	7.125**	3.18
	[3.336]	[3.606]
Observations	99	97
Countries	28	28
R^2	0.395	0.617
Hausman Test (p-value)	0.002	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

4.5.5 The Endogeneity Problem: Does More Aid Really Go To Less Corrupt Countries?

While corruption may be an important consideration in aid receipts, the amount of aid received by a country can also impact its level of corruption. Theory cannot unambiguously determine what the impact of aid will be on the quality of governance. On the one hand, aid could be associated with improved governance. For example, foreign aid can be used to improve training and increase salaries for public employees. Increased salaries can be used to attract more competent public officials, and to reduce the demand for bribes [Van Rijckeghem and Weder (2001)]. Aid sometimes finances programmes intended to strengthen the legal and justice system and other responsibilities of the public sector.[154]

On the other hand, aid may worsen governance in the recipient countries. Foreign aid can weaken the state bureaucracies of recipient governments. For example, often the most skilled civil servants are hired by donor organisations, which pay salaries many times greater than those offered by the recipient country's government, thereby stealing scarce talent from the civil service [World Bank (1998c), Brautigam (2000)].

More importantly, foreign aid represents a potential source of rents, with adverse effects on the incidence of corruption. Moreover, as rents available to those controlling the government increase, the resources devoted to obtaining political influence increase – as the returns to acquiring political connections

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[154] Sweden's aid agency dedicated huge resources over 15 years to building Tanzania's auditing capacity. However, this had no impact on public sector accountability as the Auditor General's office fails to use auditing firms to audit government expenditures [Brautigam (2000)].

and lobbying skills increase, talent is increasingly reallocated from productive to redistributive activities [Knack (2001)].

The empirical findings to date on the impact of aid on corruption have also been ambiguous. Alesina and Weder (2002) find weak evidence that aid causes perceived corruption to increase. Knack (2001) finds that higher aid levels erode bureaucratic quality and the rule of law, but that aid levels are not significantly related to perceived corruption. Tavares (2003) finds strong support for the argument that aid decreases perceived corruption. Svensson (2000) finds that foreign aid and windfalls are, on average, associated with higher perceived corruption in countries more likely to suffer from competing social groups.

In Chapter 2, using the same set of countries and the same time period as in this chapter, we investigated empirically whether total aid (that is, both bilateral and multilateral aggregate aid) impacts on the levels of perceived corruption.[155] Using instrumental variable estimation on a pooled model, we found that aid flows reduce perceived corruption. However, that result was not robust to using instrumental variables estimation on a random effects model,[156]

[155] Note that our choice of explanatory variables for both Chapter 2 and this chapter followed two literatures that have evolved separately. Therefore, the set of explanatory variables used in Chapter 2 mostly differs from that used in this chapter, although some of the explanatory variables used are the same. These are income per capita and a measure of democracy. Although the specifications in both Chapter 2 and this chapter include a measure of openness to trade, in the former imports and exports as a proportion of GDP is used, whereas here the Sachs-Warner index of openness is used (as we are more interested in an indicator of policy stance rather than openness strictly defined). Note also that Chapter 2 used annual, rather than period data.

[156] Note that in Chapter 2 a random effects, rather than a fixed effects, model was estimated. All the regressions failed to reject the hypothesis that the coefficients estimated by GLS and WG estimator did not systematically differ from each other (Hausman specification test). So, unlike in the case of the regressions in this chapter, it could be assumed that the individual country effects could be treated as random effects and that the coefficients of the GLS estimator were free from unobserved heterogeneity bias. Note that the choice between the random and fixed *Footnote continues on next page.*

or indeed to a series of robustness checks, including using lagged aid in place of the contemporaneous aid variable. So we were unable to find strong empirical evidence of the causal effect of aid on levels of perceived corruption.

In the context of this chapter, by estimating a fixed effects model, we eliminate any country-specific characteristics that do not change over time. By eliminating the influence of the unobserved heterogeneity, we attenuate the problem of the potential endogeneity between aid and perceived corruption. Attempts to tackle the direction of causation using instrumental variable estimation, or two-stage least squares, on pooled data have typically used a measure of ethnolinguistic fractionalisation as instrument [Svensson (2000)]. The variables used to measure ethnic diversity are typically measures of the probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group, which are time-invariant, and, therefore, would not be useful in a fixed effects context.

As the problem of potential endogeneity of perceived corruption clearly needs to be addressed, we adopt the approach of using lagged values. [157] Therefore, in order to control for the possibility of endogeneity bias, we use the perceived corruption variable lagged for one period instead of contemporaneous corruption. Insofar as lagged values of perceived corruption are predetermined with respect to current aid receipts, we should be able to address the causality

effects models represents a trade-off between bias and precision. Essentially, the fixed effects specification eliminates any time-invariant unobserved country-specific characteristics. If these unobserved effects are correlated with the other explanatory variables, then the results from estimating a fixed effects model will be biased by not taking them into account, but will be consistent. Estimating a random effects model will produce inconsistent estimates. On the other hand, if the unobserved effects are uncorrelated with the other explanatory variables, then estimating a random effects specification will result in more efficient estimates.

[157] This approach has been used, for example, by Morrissey et al. (2006), and Gupta et al. (2003).

issue. So we control for the possibility of endogeneity bias, by using the perceived corruption variable lagged for one period, as the current period aid receipts will not influence the level of previous period perceived corruption.

Table 4.13 presents the results obtained when perceived corruption is lagged for one period. Note that due to the lack of availability of the corruption measure for years earlier than 1982, we effectively loose one period of data by virtue of lagging this variable. The results show that perceived corruption lagged for one period is insignificant in specification [1] and only weakly significant in specification [2]. Estimates for the other variables are not substantially altered, except for democracy which is no longer significant, and openness is significant in specification [1], not [2] as before. So there seems to be weak evidence of a causal effect of perceived corruption on aid receipts. However, when we use aid disbursements rather than aid commitments, the coefficient on lagged perceived corruption is insignificant.

It is useful to think about potential endogeneity problems with the rest of our explanatory variables. A recipient country's population can reasonably be regarded as exogenous. However, the other explanatory variables (income, openness, UN voting similarity, democracy, respect for human rights, and arms imports) are all potentially endogenous. If one of the aims of aid transfers is to raise the income of recipient countries (by fostering growth and, therefore, increased income levels), then it is reasonable to assume that there might be a problem of causality. Aid flows may provide a source of funding for the purchase of arms, so that arms imports may increase with aid receipts. One interpretation of UN voting similarity is that aid "buys" political support in the

UN in favour of the donor (Alesina and Dollar 2000), so that aid may cause UN support. Similarly, it is possible that aid causes political reform, fostering greater democracy and respect for human rights, and that aid causes economic reform in the form of greater trade liberalisation.

Therefore, in order to avoid problems of potential endogeneity with these variables, we also use period lagged values for these variables. On the basis that current period aid flows are not determinants of past period values of perceived corruption levels, income, openness, UN voting similarity, democracy, respect for human rights or arms imports, we are able to address potential endogeneity problems. Table 4.14 presents the results obtained when most of the explanatory variables are lagged for one period. Both the base and the full specification perform quite badly overall, with population being the only significant variable. The same results are obtained when aid disbursements instead of aid commitments are used. There is no evidence that perceived corruption impacts aid receipts. These results suggest that caution should be exercised when stating that perceived corruption has a causal effect on aid receipts.

We also experimented with exploring whether a recipient country that experienced a 'significant' change in the corruption measure from one period to the next received more aid (in the case of perceived corruption decreasing) or less aid (in the case of perceived corruption increasing) than a recipient that experienced no change in perceived corruption. A 'significant' change is defined as a movement from a perceived corruption band either into a band denoting lower perceived corruption or into a band denoting higher perceived corruption. The results obtained were insignificant for both aid commitments and aid disbursements. This lack of significance was maintained regardless of the number of bands the corruption index was classified into (we experimented with two to seven bands).

Table 4.13: Bilateral Aggregate Aid Commitments as per cent of GDP and Lagged Perceived Corruption

Dependent variable: Log(DAC bilateral aid commitments, per cent of GDP)	[1]	[2]
Log(Population)	-3.064***	-1.905*
	[0.469]	[0.981]
Log(GDP per capita)	-0.241	-0.417
	[0.544]	[0.571]
Openness	0.498**	0.333
	[0.238]	[0.212]
Democracy	0.049	0.042
	[0.030]	[0.028]
Human Rights	0.209**	0.115
	[0.101]	[0.094]
Corruption, lagged 1 period	-0.045	-0.115*
	[0.047]	[0.059]
Arms imports		-0.002**
		[0.001]
Friend of US		-0.002
		[0.010]
Friend of Japan		0.182**
		[0.076]
Friend of UK		-0.043
		[0.027]
Friend of France		-0.053
		[0.038]
Constant	8.236**	-1.368
	[4.038]	[6.769]
Observations	76	76
Countries	28	28
R^2	0.575	0.678
Hausman Test (p-value)	0.000	0.004

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

Table 4.14: Bilateral Aggregate Aid Commitments as per cent of GDP and Lagged Perceived Corruption, with most explanatory variables also lagged

Dependent variable: Log(DAC bilateral aid commitments, per cent of GDP)	[1]	[2]
Log(Population)	-2.150***	-3.051***
	[0.563]	[0.941]
Log(GDP per capita), lagged 1 period	-0.344	-0.095
	[0.821]	[0.851]
Openness, lagged 1 period	-0.114	0.009
	[0.206]	[0.245]
Democracy, lagged 1 period	-0.026	-0.022
	[0.035]	[0.036]
Human Rights, lagged 1 period	0.034	0.058
	[0.108]	[0.117]
Corruption, lagged 1 period	-0.067	-0.044
	[0.067]	[0.073]
Arms imports, lagged 1 period		-0.002
		[0.002]
Friend of US, lagged 1 period		-0.005
		[0.037]
Friend of Japan, lagged 1 period		0.032
		[0.056]
Friend of UK, lagged 1 period		-0.014
		[0.097]
Friend of France, lagged 1 period		0.031
		[0.101]
Constant	8.122	4.114
	[5.956]	[9.980]
Observations	81	78
Countries	28	28
R^2	0.366	0.451
Hausman Test (p-value)	0.000	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

4.6 Revisiting the Results of Alesina and Weder (2002)

4.6.1 The Old Data Set

In the previous section we showed that, in sub-Saharan Africa, countries perceived as more corrupt receive less aid (without taking into account endogeneity issues – there is a correlation, though no causal effect). As noted in the literature review, very few studies have studied the impact of corruption on aid allocation or receipts. These studies, which look at all aid recipients, fail to find any consistent and significant evidence to support the hypothesis that there is even a correlation between aid receipts and the recipients' perceived corruption. Given that sub-Saharan Africa is both among the most corrupt regions and is the largest aid recipient region in the world [receiving about 30% of all aid, OECD (2005a)], we find this result quite puzzling.

We revisit the results obtained by Alesina and Weder (2002, henceforth AW). This is the study closest in spirit to ours[158] and the authors have also kindly supplied us with a copy of their data set. AW provide answers to three different questions: First, do less corrupt governments receive more aid or debt relief, in aggregate? Second, do donors differ in their discrimination against corruption? Third, does foreign aid reduce or foster corruption? We are interested in the first part of the first question. Moreover, we are interested in the answer for the sub-Saharan African region.

AW use data on total ODA flows.[159] The AW data set consists of 180 countries over the period 1975-1994, giving them potentially 720 observations.

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[158] In the sense that AW are specifically concerned with whether corrupt governments receive more aid, as opposed to considering corruption as part of the wider issue of good governance.
[159] Refer to Appendix 4.E for the description and sources of variables used by AW.

However, the data set is greatly reduced by the availability of data on the corruption variable. In order to increase the number of observations, AW use the long-run average of the ICRG corruption measure, giving them 424 observations. Data availability on the remaining explanatory variables further reduces the sample size to 270 observations. We are interested in whether our results for sub-Saharan Africa are robust to using the data set and specification of AW. We are also interested in identifying which regions might be driving their result of no correlation between perceived corruption and aid flows.

We add six dummy variables to the AW data set, one for each main region of the world, except for Western Europe and North America.[160] We then attempt to replicate Table 3, column [1] (time period 1975-1994) of AW (p. 1132). We are unable to exactly replicate the AW results. Our regression includes 270 observations, whereas AW use 269. Most of the coefficients are marginally different. The coefficient on the dummy for Israel, however, is found to be significant by AW but not by ourselves. Closer inspection of the data set reveals that there is only one observation for Israel, namely, for the period 1990-1994.

Along with the data set, AW provided us with some examples of the regressions used for the tables in their paper. We note that, in their replication of Table 3, column [3] (time period 1990-1994) the results obtained were not identical to those reported in the published paper.[161] Therefore, we are not

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160 Namely, East Asia & Pacific; East Europe & Central Asia; Middle East & North Africa; South Asia; sub-Saharan Africa; Latin America & Caribbean.

161 For example, the coefficient on corruption is 0.05, compared with -0.05 in the published paper. However, it is still insignificant.

overly concerned with the discrepancies we find.[162] We report our results (denoted by Q), as well as AW's, in Table 4.15. [163] Note that in the previous section we transformed the ICRG corruption index, so that 0-least corrupt and 10-most corrupt.[164] However, AW use the original coding of the ICRG corruption variable, where 0-most corrupt and 6-least corrupt. All the results reported in this section follow the original coding. To make these results comparable to our main results, we need to multiply these results by -3/5 (although given the ordinal nature of the corruption index, the only real validity of the coefficient is its sign and significance, not its magnitude).

We run separate regressions for each of the regions, except East Europe & Central Asia and West Europe, which have too few observations, and North America, which has no observations. There is only evidence of a significant impact of perceived corruption on aid receipts for Latin America & Caribbean, where perceived corruption reduces aid receipts. Surprisingly, there is no evidence that donors in aggregate systematically give more aid to governments in sub-Saharan Africa that are perceived as less corrupt. The results for the regional estimates are reported in Table 4.16.

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[162] AW provided their data set in a format not used by us (EViews). We transferred the data into Excel and subsequently into Stata. Given the vast amount of data, we were concerned that we had inadvertently made a mistake in transferring some of the data and in compiling it in useable form. We, therefore, conducted the exercise of transferring the data a second time. The results were identical.

[163] In order to explore the possibility of non-linearity in the effect of perceived corruption on aid, we also include the term "corruption squared" in the main regression (i.e., Table 4.15). The coefficient is not significant. We also note that the average level of perceived corruption is 2.88 for the whole sample and 2.74 for sub-Saharan Africa, which means that our results for sub-Saharan Africa are not driven by considering mostly high corruption countries.

[164] This transformation was originally carried out in Chapter 2 to increase comparability with other studies, which perform similar transformations.

As mentioned above, AW use the long-run average of the ICRG corruption measure. In order to test whether averaging the corruption measure is driving the results,[165] we repeat our analysis using the actual measure of corruption. Results are reported in Table 4.17. As would be expected, the number of observations reduces considerably. The result on Latin America is maintained, and aid flows to sub-Saharan Africa become significantly correlated with perceived corruption – perceived corruption reduces aid receipts. In the remainder of the regions aid flows are unresponsive to perceived corruption.

In order to increase the number of observations, we fill in the missing values of perceived corruption for the earlier years by replacing them with the value of the following period. We feel this provides a better indication of the potential trend in perceived corruption than simply replacing all observations by their 20-year period average.[166] The results are similar to those obtained under no manipulation of the corruption measure, and are reported in Table 4.18.

In addition to estimating regional regressions, we estimate the model for all countries, including interaction terms between perceived corruption and the different regions. We estimate the regressions for the long-run average of perceived corruption, actual values of perceived corruption and interpolated values of perceived corruption. Our results are reported in Table 4.19. For all three cases, the joint hypothesis that the coefficients on all interaction terms are zero is rejected by a wide margin. There is evidence of a significant impact of perceived corruption on aid receipts for three regions, namely, East Asia &

[165] The ICRG is only available from 1982.
[166] We do, however, favour using the actual values of the corruption variable, even if this decreases the sample size.

Pacific, Middle East & North Africa and South Asia. For all cases, governments perceived as more corrupt are punished with lower aid flows. For the interpolated values of perceived corruption in column [c], there is also evidence of a weak significant impact of perceived corruption on aid flows for West Europe (the base region) – countries perceived as more corrupt receive more aid. However, there is no evidence that perceived corruption has an impact on aid receipts of sub-Saharan African countries.

In sum, using the AW data set, we fail to find consistent evidence of a correlation between perceived corruption and aid receipts. This is true of both total and regional aid receipts, including for the region of sub-Saharan Africa, which is our main interest.

Table 4.15: OLS regressions of five-year averages for 1975-1994

Dependent variable: Log of aid per capita	AW	Q
Constant	14.58***	17.57***
	[5.73]	[6.48]
Log(initial income per capita)	-0.56***	-0.56***
	[-4.99]	[-5.27]
Log(population)	-0.62***	-0.61***
	[-13.44]	[-13.47]
Openness	0.53***	0.57***
	[3.24]	[3.43]
Political rights	-0.03	-0.04
	[-0.85]	[-0.90]
Years as a colony	0.01***	0.01***
	[2.85]	[3.25]
Friend of US	0.01	0.02
	[0.70]	[1.57]
Friend of Japan	0.01	-0.01
	[0.38]	[-0.37]
Egypt	2.18***	2.21***
	[9.77]	[9.75]
Israel	2.69**	0.79
	[2.18]	[0.49]
Corruption[a]	-0.02	-0.05
	[-0.39]	[-0.86]
Time dummies	yes	yes
Observations	269	270
Adjusted R^2	0.65	0.65

Robust t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
AW-Results of Alesina and Weder (2002); Q-our results.
a – long-run average of perceived corruption

Table 4.16: Regional OLS regressions of five-year averages for 1975-1994 (a)

Dependent variable: Log of aid per capita

	East Asia & Pacific	Middle East & North Africa	Latin America & Caribbean	sub-Saharan Africa
Constant	24.83**	66.85***	27.51***	10.43***
	[2.18]	[5.76]	[5.69]	[3.21]
Log(initial income per capita)	-1.04	-1.46*	-1.76***	-0.30***
	[1.42]	[1.93]	[9.87]	[2.67]
Log(population)	-0.46**	-1.49***	-0.57***	-0.70***
	[2.87]	[6.50]	[6.97]	[7.93]
Openness	0.61	0.53	0.75**	-0.08
	[1.16]	[0.95]	[2.41]	[0.41]
Political rights	-0.18	-0.45	-0.13**	0.05
	[0.91]	[1.58]	[2.17]	[0.69]
Years as a colony	0.00	0.02**	0.00	0.01*
	[0.25]	[2.52]	[0.71]	[1.75]
Friend of US	0.33**	0.16	0.00	-0.01
	[2.20]	[1.72]	[0.07]	[0.22]
Friend of Japan	-0.13	-0.34***	-0.03	0.07*
	[0.94]	[3.07]	[0.50]	[1.68]
Egypt	-	2.52***	-	-
	-	[4.64]	-	-
Israel	-	-16.67*	-	-
	-	[2.06]	-	-
Corruption[a]	-0.13	-0.28	0.24***	0.10
	[0.47]	[0.92]	[2.99]	[1.41]
Time dummies	yes	yes	yes	yes
Observations	28	32	82	105
Adjusted R^2	0.78	0.87	0.83	0.69

Robust absolute t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

a – long-run average of perceived corruption

Table 4.17: Regional OLS regressions of five-year averages for 1975-1994 (b)

Dependent variable: Log of aid per capita

	All	East Asia & Pacific	Middle East & North Africa	Latin America & Caribbean	sub-Saharan Africa
Constant	20.99***	27.22***	77.87***	29.32***	9.16*
	[5.56]	[4.90]	[5.30]	[4.92]	[1.89]
Log(initial income per capita)	-0.69***	-0.51***	-2.50**	-1.73***	-0.35**
	[5.80]	[3.45]	[2.27]	[9.04]	[2.57]
Log(population)	-0.60***	-0.49***	-1.54***	-0.57***	-0.72***
	[14.50]	[6.07]	[4.65]	[6.27]	[6.20]
Openness	0.50***	-0.27	0.37	0.85**	-0.15
	[2.86]	[1.70]	[0.47]	[2.64]	[0.76]
Political rights	-0.05	-0.47***	-0.25	-0.20***	0.03
	[0.99]	[6.22]	[0.76]	[2.85]	[0.36]
Years as a colony	0.01***	0.00	0.02	0.00	0.00
	[2.03]	[0.25]	[1.43]	[0.22]	[0.70]
Friend of US	0.03	-0.12**	0.19	0.01	-0.04
	[1.36]	[2.23]	[1.44]	[0.45]	[1.41]
Friend of Japan	-0.05	-0.10*	-0.38**	-0.05	0.10*
	[0.95]	[2.01]	[2.89]	[0.67]	[1.86]
Egypt	2.02***	-	2.34**	-	-
	[10.92]	-	[2.80]	-	-
Israel	-0.18	-	-17.70	-	-
	[0.08]	-	[1.51]	-	-
Corruption[b]	0.01	-0.17	-0.11	0.17**	0.14*
	[0.18]	[1.64]	[0.25]	[2.37]	[1.83]
Time dummies	yes	yes	yes	yes	Yes
Observations	193	21	24	61	69
Adjusted R^2	0.66	0.92	0.85	0.83	0.67

Robust absolute t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

b – actual values of perceived corruption

Table 4.18: Regional OLS regressions of five-year averages for 1975-1994 (c)

Dependent variable: Log of aid per capita

	All	East Asia & Pacific	Middle East & North Africa	Latin America & Caribbean	sub-Saharan Africa
Constant	17.72***	25.03**	66.11***	27.64***	10.14***
	[6.51]	[2.26]	[5.89]	[5.59]	[3.18]
Log(initial income per capita)	-0.56***	-1.28**	-1.44*	-1.71***	-0.29**
	[5.36]	[2.17]	[2.00]	[9.82]	[2.62]
Log(population)	-0.61***	-0.45**	-1.50***	-0.58***	-0.70***
	[13.47]	[2.90]	[6.42]	[7.21]	[7.95]
Openness	0.57***	0.75	0.50	0.75**	-0.10
	[3.46]	[1.57]	[0.84]	[2.47]	[0.57]
Political rights	-0.04	-0.12	-0.41	-0.14**	0.04
	[0.91]	[0.55]	[1.41]	[2.21]	[0.61]
Years as a colony	0.01***	0.02	0.02**	0.00	0.00
	[3.24]	[1.39]	[2.28]	[0.46]	[1.57]
Friend of US	0.02	0.35**	0.16	0.00	-0.01
	[1.62]	[2.38]	[1.71]	[0.14]	[0.30]
Friend of Japan	-0.01	-0.13	-0.33**	-0.03	0.07*
	[0.41]	[0.97]	[2.83]	[0.50]	[1.78]
Egypt	2.20***	-	2.55***	-	-
	[9.70]	-	[3.95]	-	-
Israel	0.69	-	-16.75*	-	-
	[0.43]	-	[1.98]	-	-
Corruption[c]	-0.05	0.11	-0.20	0.20**	0.10*
	[1.06]	[0.64]	[0.60]	[2.58]	[1.71]
Time dummies	yes	yes	yes	yes	yes
Observations	270	28	32	82	105
Adjusted R^2	0.65	0.78	0.87	0.83	0.69

Robust absolute t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
c – missing values of perceived corruption for one year assumed to take on the same value as the year immediately following.

Table 4.19: OLS regressions of five-year averages for 1975-1994 with interactions

Dependent variable: Log of aid per capita

	[a]	[b]	[c]
Constant	19.292***	23.033***	19.008***
	[5.73]	[5.65]	[5.56]
Log(initial income per capita)	-0.756***	-0.865***	-0.717***
	[5.94]	[6.12]	[5.61]
Log(population)	-0.692***	-0.673***	-0.684***
	[14.48]	[13.14]	[14.32]
Openness	0.429***	0.368**	0.455***
	[2.81]	[2.31]	[2.92]
Political rights	-0.048	-0.066	-0.047
	[1.07]	[1.15]	[0.99]
Years as a colony	0.007**	0.005	0.007**
	[2.47]	[1.42]	[2.44]
Friend of US	0.026*	0.032	0.027*
	[1.80]	[1.37]	[1.78]
Friend of Japan	-0.001	-0.039	-0.002
	[0.03]	[0.79]	[0.05]
Egypt	1.738***	1.73***	1.84***
	[6.51]	[7.89]	[6.82]
Israel	-0.437	-1.073	-0.304
	[0.27]	[0.43]	[0.19]
Corruption	-0.157	-0.041	-0.162*
	[1.41]	[0.47]	[1.69]
Corruption x East Asia & Pacific	0.212**	0.193**	0.192**
	[2.45]	[2.25]	[2.48]
Corruption x East Europe & Central Asia	0.224*	0.137	0.179
	[1.72]	[0.96]	[1.45]
Corruption x Middle East & North Africa	0.455***	0.272***	0.392***
	[4.29]	[3.06]	[4.07]
Corruption x South Asia	0.464***	0.287**	0.415***
	[3.38]	[2.40]	[3.27]
Corruption x sub-Saharan Africa	0.079	-0.017	0.069
	[0.73]	[0.20]	[0.72]
Corruption x Latin America & Caribbean	0.137*	0.049	0.108
	[1.70]	[0.64]	[1.51]
Time dummies	yes	Yes	yes
Observations	270	193	270
Adjusted R^2	0.68	0.68	0.67
F-test for interactions	7.798	4.764	6.982
Prob>p	0.000	0.000	0.000

Robust absolute t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
[a] – long-run average of perceived corruption ; [b] – actual values of perceived corruption ; [c] – missing values of perceived corruption for one year assumed to take on the same value as the year immediately following.

4.6.2 The Updated Data Set

It is worth noting that for 1990-1994, almost half the countries for sub-Saharan Africa are excluded from the regressions. This is primarily due to lack of data on income per capita and population.[167] Therefore, we perform one final test on the results for sub-Saharan Africa. We collect data for the same time periods as AW, from the same (updated) sources for the countries of sub-Saharan Africa. The only source that is different is the one for UN voting similarity, as we could not access the original source. Instead, we use Gartzke (2006). Also, data for the openness variable was updated by Easterly, Levine and Roodman (2004). Table 4.20 reports the variables used and their sources (both for AW and ours, which we denote by Q).

Figure 4.3 illustrates the differences between the AW data set and ours. Our data does not match up exactly with AW's - there are inevitably data revisions, where values change, new data become available, and some values are reclassified as missing.

The data for UN voting similarity appears to have the most discrepancies – in particular, our values are systematically lower than AW's. As noted above, we use a different data source than AW, which would account for the differences. There are two main reasons for the differences.[168] Firstly, in the Inter-University Consortium for Political and Social Research data set (# 5512) used by AW, there is a substantial number of discrepancies in the codes assigned to nations listed as voting in UN roll calls. The coding scheme is based

[167] Furthermore, we encountered some errors in the data set. For example, the number of years as a colony since 1900 for Somalia is reported as 122.
[168] We thank Eric Gartzke for his help in explaining these differences.

on the country codes assigned to countries in the Correlates of War project. However, codes assigned to countries are often changed from year to year. Moreover, many of the changes in the country codes are either not documented or incorrectly documented. Gartzke (2006) uses the Voeten (2006) data set, which attempts to correct for these changes in coding.

Secondly, there are different ways to think about the proportion of possible agreements among the countries, i.e., the number of times countries A and B voted in the same way. The common methodology is to use the number of votes in the year to calculate the proportion of possible agreements. This could be problematic in cases where members join part-way through a year, or where they are not participating during the whole year for some reason. For example, suppose that there are ten votes in a given year. Suppose country A voted the ten times but country B only voted three times in that year. Suppose also that country B always voted in the same way as country A. If the proportion of possible agreements among the countries is taken as ten, then countries A and B have a 30% voting similarity. However, if the proportion of possible agreements among the countries is taken as three, then countries A and B have a 100% voting similarity. Gartzke (2006) uses the number of votes cast by members to determine the proportion of possible agreements among the countries, so it changes for every dyad (pairing of two voting countries). This tends to make the score higher on average, although the two calculations are strongly correlated. Table 4.21 shows that the AW data and ours are highly correlated.

Finally, Table 4.22 reports the results obtained by using the updated data set. The AW result on perceived corruption does not hold when we use the updated data set. In aggregate, donors reward recipients in sub-Saharan Africa that are perceived as less corrupt with greater aid flows. This result is robust to using actual and interpolated values of perceived corruption instead of average values. As in Section 4.5, we perform two additional sensitivity tests. We experiment with using corruption bands rather than the continuous corruption index. This does not alter the result that countries perceived as more corrupt receive less aid. However, when we address the issue of potential endogeneity (of both the corruption variable and the other explanatory variables except population and years as a colony), we find no consistent evidence that perceived corruption has a causal impact on aid receipts. The results are, therefore, consistent with those from Section 4.5

Table 4.20: Description and sources of updated data set

Variable / Description	Source - AW	Source - Q
Aid per capita Official development assistance (constant $1987)	World Bank (1998b?)	World Bank (2005a)
Years as a colony Number of years as a colony of any colonizer since 1900	Alesina and Dollar (2000), CIA (1996)	CIA (2005)
CORRICRG Corruption index from ICRG, 1982-1995: 6 (lowest corruption), 0 (highest corruption)	Knack and Keefer (1995)	Knack and Keefer (1998)
Democracy Political Rights, recoded as: 7 (democratic), 1 (autocratic government)	Gastil (1990)	Freedom House (2005)
FRDXXX Percentage of times in which the recipient has voted in the UN as XXX	Alesina and Dollar (2000) Original source: Inter-University Consortium for Political and Social Research (data set # 5512)	Gartzke (2006)
Income Real GDP per capita, beginning of period	Heston and Summers (1991)	Heston, Summers and Aten (2002)
Openness Proportion of years in which the country is open	Sachs and Warner (1995)	Sachs and Warner (1995) and updates from Easterly, Levine and Roodman (2004)
Population	World Bank (1998b?)	World Bank (2005a)

Figure 4.3: Comparison of AW and Q variables

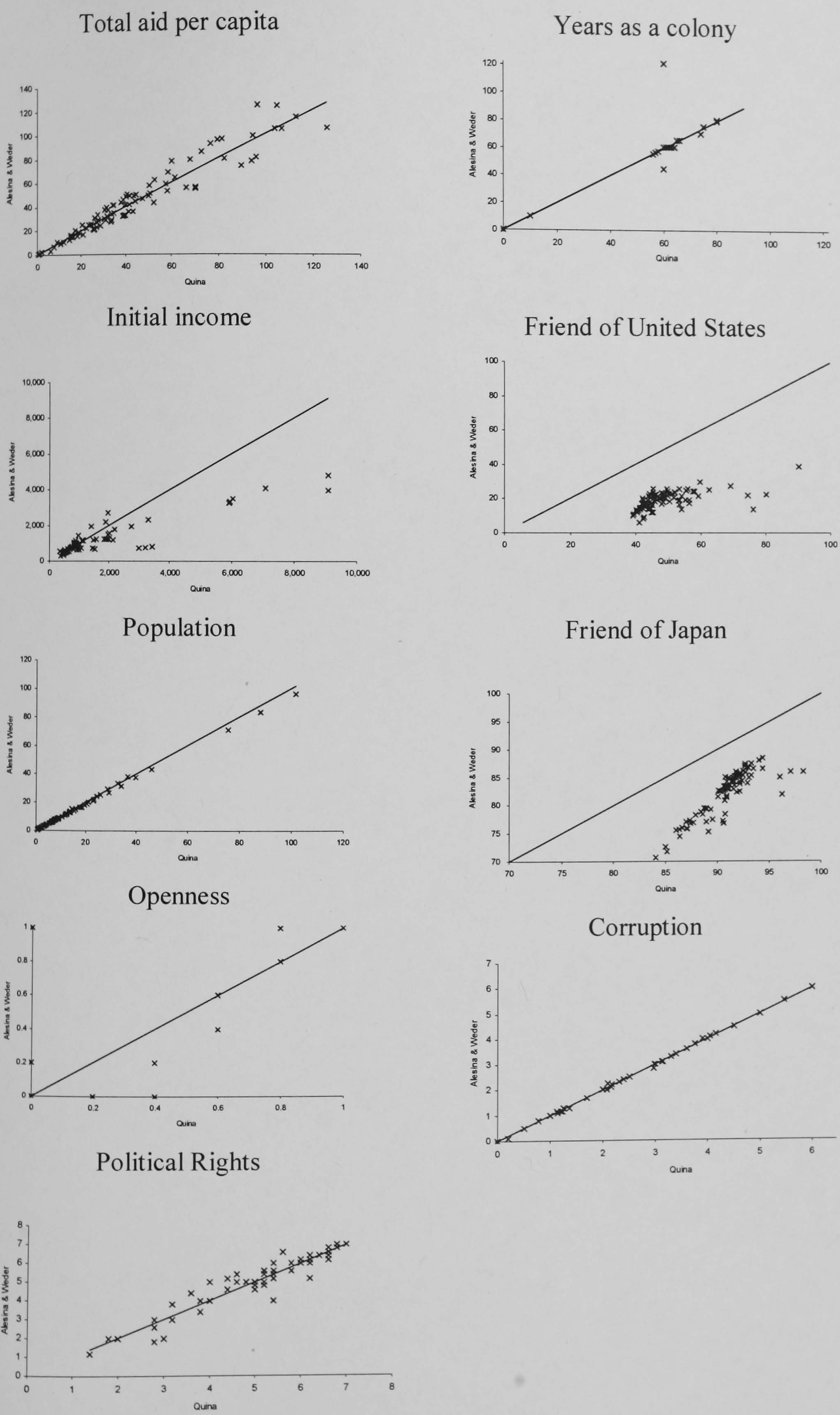

Table 4.21: Correlations between AW and Q variables

Log(aid per capita)	0.9707
Log(initial income per capita)	0.8435
Log(population)	0.9991
Openness	0.9026
Political rights	0.9608
Years as a colony	0.8957
Friend of US	0.9278
Friend of Japan	0.9569
Corruption	0.9963

Note: Correlations are for the sample included in AW regressions.

Table 4.22: OLS regressions of five-year averages for 1975-1994 using updated data set for sub-Saharan Africa

Dependent variable: Log of aid per capita

	[a]	[b]	[c]
Constant	1.901	3.879	2.022
	[0.34]	[0.55]	[0.36]
Log(initial income per capita)	-0.187***	-0.236***	-0.176***
	[2.69]	[2.67]	[2.68]
Log(population)	-0.691***	-0.725***	-0.683***
	[7.85]	[5.82]	[7.79]
Openness	-0.135	-0.231	-0.156
	[0.78]	[1.16]	[0.94]
Political rights	0.044	0.034	0.033
	[0.68]	[0.42]	[0.54]
Years as a colony	-0.002	-0.002	-0.001
	[0.61]	[0.53]	[0.45]
Friend of US	-0.042***	-0.035**	-0.041***
	[3.37]	[2.33]	[3.39]
Friend of Japan	0.166**	0.151*	0.163**
	[2.54]	[1.90]	[2.52]
Corruption	0.16**	0.172**	0.135**
	[2.47]	[2.33]	[2.48]
Time dummies	Yes	Yes	Yes
Observations	108	76	108
Adjusted R^2	0.65	0.65	0.65

Robust absolute t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

a – long-run average of perceived corruption

b – actual values of perceived corruption

c – missing values of perceived corruption for one year assumed to take on the same value as the year immediately following.

4.7 Sectoral Aid

In this section, we examine sectoral aggregate bilateral aid receipts from DAC donors. Due to the nature of the data, it is not possible to conduct this analysis for the same time period as for total bilateral aid. As discussed in Section 4.4, the source for data on aid by sector and by recipient is the CRS. whereas DAC data provide statistics on aid by sector or on aid by recipient. but not for both dimensions. In order to verify the completeness of the CRS data, it is essential to examine the *coverage ratio*. which measures the comprehensiveness of aid activity data, that is. the extent to which the CRS data are complete. The coverage ratio is calculated by comparing the aid flows reported in CRS to those reported in DAC. It essentially indicates the extent to which the data can be exploited in analytical work. High coverage permits an in-depth analysis. Low coverage means that the data, though descriptive, may not present a balanced picture of DAC members' aid.

Coverage ratios may be calculated for sector *or* recipient. A coverage of 100% for a certain sector (country) means that 100% of the aid flows to that sector (country) has been recorded. If we are interested in aid to sector X in country Y. as long as the coverage ratio for *either* that sector or that country is 100%, we can confidently use the data. Coverage ratios vary over time. Unfortunately, the years prior to 1999 do not always have full coverage.

Our strategy for collecting data on sectoral data for our sample of 32 sub-Saharan countries is the following. Firstly. we select all sectors that have 100% coverage. Secondly. we select all contiguous years for each sector. Thirdly, we select those sectors that have data for the same years (bearing in mind that we are primarily interested in those sectors that represent basic and essential needs, such as education and health).[169] Using this strategy yields data for our 32 sub-Saharan African countries for 1993 and 1994 for the following sectors: Basic Education; Secondary Education; Post-Secondary Education; Basic Health; Population Programmes; Banking & Financial Services; Multisector; and General Budget Support. We use the two-year average of the sectoral aid variables, so that we have a cross-section of 32 countries for one period. Table 4.23 provides descriptive statistics on the variables used in this section.

In terms of our theoretical framework, of the sectors with available data, basic education and basic health are the ones we can more easily assume that donors consider to be basic necessities for the recipients. Indeed, these are contemplated by the UN Millennium Development Goals,[170] making them good candidates for corruption inelastic sectors. Having adequate basic health and education are likely to be pre-conditions for economic growth and development. Whilst it is important for a country's population to have adequate levels of secondary and post-secondary education, they are unlikely to be considered by donors as important as primary education. As such, it is possible that donors' demand for projects in these sectors is corruption unit-elastic, or even, elastic. Aid to population programmes covers aid to *"all activities in the field of reproductive health, family planning and research into population*

[169] Using the strategy of selecting countries with 100% coverage ratio yields a significantly lower number of countries.
[170] Basic education is contemplated by Goal 2, which is to achieve primary education. Basic health is related to Goals 4, 5 and 6 (reduce child mortality, improve maternal health and combat HIV/AIDS, malaria and other diseases, respectively).

programmes" [OECD (2005b)]. Although there is some relation between reproductive health, family planning, contraception and combating sexually transmitted diseases, it is not very clear-cut. So, we do not assume that donors consider population programmes to be essential projects/sectors for the recipients. Also, we assume that the remaining three sectors do not constitute core goals of the donors.

In sum, given the predictions of the model outlined in Section 4.3, we would broadly expect the following:[171]

a) More corrupt countries receive more aid for basic health and education;

b) More corrupt countries might receive less aid for secondary education and post-secondary education, and

c) More corrupt countries receive less aid for population programmes, banking & financial services, multisector and general budget support.

Not all countries receive aid for every sector, and the number of countries that receive no aid for a specific sector varies across sectors. Multisector aid is the only type of sectoral aid for which all countries receive strictly positive aid flows. For the rest of the sectors we consider, this varies from one country not receiving aid for post-secondary education, through to 11 countries not receiving aid for secondary education. Given that not all countries receive aid for every sector, we estimate tobit models in which the dependent

[171] Note that, given the limitations of the theoretical model, already discussed in Section 4.3, we are not able to empirically test its predictions. The theory can only give a broad indication of what we might expect to occur in terms of sectoral aid receipts.

variable is the amount of aid (scaled by GDP) received by each sector.[172,173] We use the same model specifications as for aggregate total aid. Our results are reported in Tables 4.24 to 4.26.

Our results for sectoral aid are quite weak. With the exception of multisector aid, there seems to be no evidence that perceived corruption is a significant factor in sectoral aid receipts.[174] While this result on multisector aid is robust to taking into account the ordinal nature of the corruption measure, it is not robust to endogeneity issues.

It should be noted that although the Chi-Squared statistic, which indicates whether the explanatory variables reliably predict the dependent variable, mostly indicates that our group of explanatory variables shows a statistically significant relationship with the dependent variable for those sectors, this result is not maintained when the dependent variable is sectoral aid as a proportion of total aid.[175] In addition, quite a few of the variables are insignificant. This suggests that caution should be exercised in interpreting the

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[172] When the number of "zeros" is not very large, estimating tobit models produces results quite similar to standard ordinary least squares. We run an OLS regression for multisector, as all countries receive aid.

[173] In order not to lose the zero observations when making the logarithmic transformation, we add $1 to the sectoral aid for each country. As sectoral aid as per cent of GDP produces very small numbers (between an average of 0.0008% for post-secondary education and 0.329% for general budget support), the logarithmic transformation yields negative numbers. In order to avoid this, we scale sectoral aid by $1 million of GDP, instead. For example, take aid for basic education - as per cent of GDP, average aid for basic education is 0.053%, and in terms of per $1million of GDP it is $530 for each $1 million of GDP. These figures are equivalent. This transformation allows for the distinction between zero and strictly positive sectoral aid without affecting the results.

[174] Although the coefficient on perceived corruption is significant when the dependent variable is (log of) sectoral aid scaled by GDP for basic education, post-secondary education and population programmes, it loses its significance when we experiment with sectoral aid as a proportion of total aid as the dependent variable. Only the perceived corruption coefficient for multisector aid remains significant.

[175] When the dependent variable is sectoral aid as a proportion of total aid, the base specification is only adequate at the 10% level for basic education, and is inadequate for all other sectors except population programme and multisector. The full specification is inadequate for secondary education and general budget support.

results. It should be noted that we also estimated a probit model, in order to check whether the results would be different to those obtained from estimating a tobit model. This could occur, for example, if the impact of a recipient's perceived level of corruption on whether that country received aid for a particular sector was different to the impact of perceived corruption on the level of aid received (given that a country was deemed eligible for receiving aid) for that sector. Because the tobit model imposes the constraint that the explanatory variables determine aid eligibility and the amount of aid received with the same sign, our finding of the absence of a significant effect of perceived corruption on sectoral aid receipts could be due to perceived corruption positively impacting on the eligibility of receiving aid but negatively impacting on the levels of aid receipts, once a country has been deemed eligible. Estimates obtained from estimating a probit model indicate that the results are broadly similar to those obtained from the tobit model, and so the tobit model seems appropriate.

Table 4.23: Descriptive Statistics for 1993-1994 period

Variable	Obs	Mean	Std. Dev.	Min	Max
DAC aid for basic education, per cent of GDP	32	0.053	0.090	0	0.3039
DAC aid for secondary education, per cent of GDP	32	0.012	0.026	0	0.1177
DAC aid for post-secondary education, per cent of GDP	32	0.008	0.013	0	0.0527
DAC aid for basic health, per cent of GDP	32	0.043	0.047	0	0.2042
DAC aid for population programmes, per cent of GDP	32	0.080	0.123	0	0.5919
DAC aid for banking and financial services, per cent of GDP	32	0.056	0.101	0	0.5059
DAC aid multisector purposes, per cent of GDP	32	0.152	0.178	0	0.6390
DAC aid for general budget support, per cent of GDP	32	0.329	0.488	0	1.9455
Proportion of DAC aid for basic education, %	32	2.46	4.24	0	20.58
Proportion of DAC aid for secondary education, %	32	0.67	1.46	0	7.24
Proportion of DAC aid for post-secondary education, %	32	0.46	0.74	0	3.21
Proportion of DAC aid for basic health, %	32	2.02	1.95	0	9.51
Proportion of DAC aid for population programmes, %.	32	3.33	3.26	0	11.92
Proportion of DAC aid for banking and financial services, %.	32	3.14	5.62	0	30.21
Proportion of DAC aid multisector purposes, %	32	5.99	4.10	0	16.15
Proportion of DAC aid for general budget support, %	32	9.70	11.69	0	42.63
Population	32	16.3	20.8	1.1	106.5
GDP per capita	30	1852.1	1979.3	497.6	9093.1
Openness	32	0.25	0.44	0	1
Democracy	29	3.56	2.89	0.50	9.50
Human rights	32	2.78	1.20	1	5
Corruption	32	5.29	2.03	1.67	10
Arms imports	32	1.88	6.22	0	35.10
US_UN_friend	32	59.47	13.74	45.77	100
JAPAN_UN_ friend	32	92.68	2.65	85.69	100
UK_UN_ friend	32	79.76	6.97	69.94	100
FRANCE_UN_friend	32	83.11	5.84	74.46	100
Years as a colony	32	58.16	19.41	0	90
Illiteracy rate of 15-24 year-olds, %	27	31.45	20.94	4.60	81.25
Net enrolment in primary education, %	24	59.62	23.94	22.55	99.90
Immunization, measles (% children under 12 months)	30	56.48	17.14	19	93
Physicians (per 1,000 people)	30	0.12	0.13	0.02	0.62
Net enrolment in secondary education, %	22	42.52	25.98	10.20	91.10
Gross enrolment in tertiary education, %	31	3.22	3.25	0.40	16.50

Table 4.24: Tobit estimates for sectoral aid (part 1)

Dependent variable: Log(1+DAC sectoral aid, scaled by GDP), average 1993-1994

	Basic Education	Basic Education	Basic Health	Basic Health	Secondary Education	Secondary Education	Post-Secondary Education	Post-Secondary Education	Population Programmes	Population Programmes
	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]
Log(Population)	1.127	0.398	0.006	0.131	0.369	0.235	0.368	0.244	-0.257	-0.194
	[0.785]	[0.888]	[0.250]	[0.262]	[0.932]	[0.965]	[0.324]	[0.410]	[0.356]	[0.398]
Log(GDP per capita)	-0.325	-0.2	-2.580***	-2.513***	-0.784	-0.76	-0.161	0.014	-2.116***	-1.890***
	[1.201]	[1.325]	[0.532]	[0.596]	[1.255]	[1.449]	[0.392]	[0.461]	[0.452]	[0.435]
Openness	1.493	1.182	-0.578	-0.274	0.299	1.287	-1.750**	-1.771**	0.655	0.671
	[1.401]	[1.478]	[1.293]	[1.278]	[1.850]	[1.995]	[0.769]	[0.861]	[0.477]	[0.554]
Democracy	0.228	0.215	0.067	0.067	-0.358	-0.598**	0.104	0.112	0.042	0.075
	[0.185]	[0.190]	[0.116]	[0.105]	[0.303]	[0.303]	[0.081]	[0.089]	[0.076]	[0.072]
Human Rights	1.786**	1.62	0.842	0.655	1.134	1.234	0.329	0.246	0.929**	0.807
	[0.826]	[1.069]	[0.617]	[0.699]	[0.987]	[1.099]	[0.394]	[0.508]	[0.414]	[0.524]
Corruption	-0.707*	-1.140**	0.039	0.311	-0.609	-0.897	-0.492**	-0.580**	-0.474***	-0.568**
	[0.413]	[0.481]	[0.289]	[0.361]	[0.443]	[0.657]	[0.222]	[0.270]	[0.179]	[0.256]
Arms imports		-0.397		-0.358		1.21		-0.046		-0.087
		[0.839]		[0.219]		[0.877]		[0.266]		[0.282]
Friend of US		-0.142		0.025		-0.138		-0.127		-0.011
		[0.210]		[0.077]		[0.240]		[0.101]		[0.117]
Friend of Japan		-1.929		-0.204		0.008		-0.393		0.003
		[1.174]		[0.346]		[1.168]		[0.455]		[0.413]

	Basic Education	Basic Education	Basic Health	Basic Health	Secondary Education	Secondary Education	Post-Secondary Education	Post-Secondary Education	Population Programmes	Population Programmes
	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]
Friend of UK		0.986		0.915**		0.673		0.454		0.27
		[1.417]		[0.405]		[1.460]		[0.544]		[0.526]
Friend of France		0.063		-1.168***		-0.353		-0.021		-0.225
		[1.217]		[0.403]		[1.505]		[0.500]		[0.506]
Years as a colony		-0.093***		0.052**		-0.015		-0.014		-0.002
		[0.036]		[0.026]		[0.051]		[0.019]		[0.019]
Constant	0.128	113.408	20.585***	57.406**	7.208	-7.782	5.199	15.525	20.518***	17.391
	[10.076]	[91.015]	[4.286]	[25.330]	[13.385]	[97.424]	[4.352]	[33.776]	[4.491]	[31.947]
Observations	27	27	27	27	27	27	27	27	27	27
Uncensored	19	19	25	25	16	16	26	26	25	25
Left-Censored	8	8	2	2	11	11	1	1	2	2
Log-likelihood value	-54.324	-51.701	-47.034	-42.473	-48.523	-46.256	-45.849	-43.866	-44.853	-44.208
Chi-Squared	26.268	50.772	42.881	174.93	13.26	29.015	21.032	63.2	67.596	247.755
Prob > p	0.000	0.000	0.000	0.000	0.039	0.004	0.002	0.000	0.000	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.25: Tobit estimates for sectoral aid (part 2)

Dependent variable: Log(1+ DAC sectoral aid, scaled by GDP), average 1993-1994

	Banking & Financial Services	Banking & Financial Services	General Budget Support	General Budget Support
	[1]	[2]	[1]	[2]
Log(Population)	-0.354	0.012	0.115	-0.298
	[0.655]	[0.538]	[0.803]	[0.933]
Log(GDP per capita)	-0.816	0.367	-2.682	-1.959
	[1.154]	[0.889]	[1.639]	[1.645]
Openness	1.833	0.922	-1.386	-2.784
	[1.493]	[1.086]	[1.977]	[2.774]
Democracy	-0.11	0.133	-0.846**	-0.732**
	[0.177]	[0.132]	[0.402]	[0.368]
Human Rights	0.286	-0.098	2.502**	2.258*
	[0.948]	[0.738]	[1.040]	[1.250]
Corruption	-0.391	-0.309	-0.138	-0.154
	[0.509]	[0.303]	[0.684]	[0.940]
Arms imports		-2.044**		-2.483*
		[1.040]		[1.485]
Friend of US		-0.366**		-0.094
		[0.148]		[0.361]
Friend of Japan		-0.491		-1.081
		[0.923]		[1.766]
Friend of UK		2.216***		1.294
		[0.668]		[1.614]
Friend of France		-1.386**		-0.915
		[0.606]		[2.175]
Years as a colony		0.05		-0.063
		[0.045]		[0.066]
Constant	12.206	7.639	19.554*	100.206
	[9.630]	[75.888]	[11.698]	[163.618]
Observations	27	27	27	27
Uncensored	23	23	18	18
Left-Censored	4	4	9	9
Log-likelihood value	-59.543	-47.525	-56.412	-54.623
Chi-Squared	9.645	47.256	23.654	30.405
Prob> p	0.14	0.000	0.001	0.002

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.26: OLS estimates for sectoral aid (Multisector)

Dependent variable: Log(DAC sectoral aid scaled by GDP), average 1993-1994

	Multisector	Multisector
	[1]	[2]
Log(Population)	-0.702***	-0.732***
	[0.137]	[0.161]
Log(GDP per capita)	-1.652***	-1.467***
	[0.206]	[0.252]
Openness	-0.158	-0.205
	[0.216]	[0.309]
Democracy	-0.108***	-0.087*
	[0.037]	[0.049]
Human Rights	0.261*	0.164
	[0.144]	[0.183]
Corruption	-0.317***	-0.433***
	[0.071]	[0.125]
Arms imports		-0.079
		[0.175]
Friend of US		-0.001
		[0.041]
Friend of Japan		-0.094
		[0.232]
Friend of UK		0.165
		[0.279]
Friend of France		-0.099
		[0.303]
Years as a colony		-0.015
		[0.010]
Constant	12.125***	16.559
	[1.885]	[18.625]
Observations	27	27
Adjusted R-squared	0.818	0.785
F-test	36.584	38.599
Prob>p	0.000	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

We consider the possibility that the specifications used to explain total aid receipts may not be entirely appropriate in the context of sectoral aid receipts. As such, we consider additional sector-specific explanatory variables, as reported in Table 4.27.

Table 4.27: Sector-specific explanatory variables

Sector	Additional independent variable	Source
Basic Education	Net enrolment in primary education, %	World Bank (2005a)
	Illiteracy rate of 15-24 year-olds, %	World Bank (2005a)
Basic Health	Immunization, measles (% of children under 12 months)	World Bank (2005a)
	Physicians (per 1,000 people)	World Bank (2005a)
Secondary Education	Net enrolment in secondary education, %	World Bank (2005a)
Post-Secondary Education	Gross enrolment in tertiary education, %	World Bank (2005a)

Tables 4.28 to 4.30 report the results of estimating tobit models for basic education, basic health and secondary education, respectively and Table 4.31 reports OLS estimates for post-secondary education.[176,177] Our previous results still stand – perceived corruption does not appear to be a significant factor in aid receipts across sectors.[178]

176 There are no left-censored observations in the regression of post-secondary education aid.

177 Note that we are unable to estimate the complete specification for all cases due to lack of sufficient observations.

178 The only exceptions are basic and post-secondary education. However, the results for the latter are not very robust, as in the complete specification the F-statistic is quite low and has a p-value of 0.112. In addition, in both cases the coefficient on perceived corruption loses its significance when we experiment with sectoral aid as a proportion of total aid as the dependent variable.

Aid receipts across sectors in the recipient country appear to show no signs of donor paternalism (in aggregate). It is important to note that our analysis on the impact of perceived corruption in sectoral aid receipts suffers from several non-negligible drawbacks.

The first significant drawback regards the availability of data. Due to data constraints, we are only able to examine sectoral aid receipts for the period 1993-1994. Data on sectoral aid suffers from the problem of adequate coverage, that is, not all sectoral data is correctly reported. If a longer time-series were available, the results could be different.

The second drawback is related to the first – the lack of a significant number of observations combined with the number of explanatory variables reduces the degrees of freedom in estimating the regressions, impacting the quality of the estimates.

The third drawback relates to the lack of data for corruption in specific sectors. By using the same measure of corruption, we are assuming that corruption (and perceptions of corruption) across sectors does not vary. It is highly unlikely that this is the case. Some types of government expenditure provide more lucrative opportunities, that is, there are items on which it is easier to levy large bribes. Krueger (1974), among others, has stressed that it is the existence of rents that motivates rent-seeking behaviour. Consequently, large bribes will be available on items produced by firms operating in markets with a low degree of competition. Specialised high-technology goods, whose value is difficult to monitor and that tend to be produced by a limited number of oligopolistic firms, are particularly susceptible to corruption [Shleifer and

Vishny (1993)]. We might, therefore, expect that it will be easier to collect bribes on large infrastructure projects, highly sophisticated defence or medical equipment than on textbooks, teachers' or doctors' and nurses' salaries [Mauro (1998)]. On the other hand, sometimes donors' aid to a specific sector/project is "tied", i.e., where procurement of goods or services is limited to the donor country. If the project is to build a school and a firm from the donor country is carrying out the project, then there is probably less scope for corrupt activities.[179,180] Therefore, our results on the impact of perceived corruption on sectoral aid have to be taken very cautiously.

[179] Note that if certain raw materials need to be sourced locally, then the local suppliers might demand bribes.

[180] Even if firms from donor countries might be less likely to offer bribes than national firms, tied aid is generally viewed as a condition that reduces the effectiveness of aid. The Commission for Africa (2005) estimates that tied aid to Africa effectively reduces the value of aid by as much as 30%.

Table 4.28: Tobit estimates for Aid for Basic Education

Dependent variable: Log(1+ DAC sectoral aid, scaled by GDP), average 1993-1994	[1]
Log(Population)	4.062***
	[1.418]
Log(GDP per capita)	1.419
	[1.440]
Openness	6.848**
	[2.846]
Democracy	0.007
	[0.224]
Human Rights	-0.166
	[0.646]
Corruption	-1.629***
	[0.475]
Illiteracy rate, 15-24 year-olds	0.264***
	[0.060]
Net enrolment in primary education	0.207***
	[0.067]
Constant	-5.807
	[3.133]*
Observations	20
Uncensored	15
Left-Censored	5
Log-likelihood value	-37.219
Chi-Squared	41.032
Prob> p	0.000
Chi-Squared for sector-specific explanatory variables	24.915
Prob>p	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.29: Tobit estimates for Aid for Basic Health

Dependent variable: Log(1+ DAC sectoral aid, scaled by GDP), average 1993-1994	[1]	[2]
Log(Population)	-0.059	-0.023
	[0.261]	[0.249]
Log(GDP per capita)	-2.026***	-2.238***
	[0.565]	[0.633]
Openness	-0.727	-0.214
	[1.296]	[1.160]
Democracy	0.028	-0.022
	[0.105]	[0.098]
Human Rights	0.68	0.579
	[0.594]	[0.591]
Corruption	0.004	0.234
	[0.296]	[0.387]
Immunization, measles	0.007	-0.028
	[0.019]	[0.023]
Physicians	-6.776**	-7.324**
	[2.788]	[3.198]
Arms imports		-0.105
		[0.319]
Friend of US		0.115*
		[0.066]
Friend of Japan		0.062
		[0.392]
Friend of UK		0.687
		[0.503]
Friend of France		-1.210**
		[0.497]
Years as a colony		0.077**
		[0.030]
Constant	1.201	48.957
	[0.901]	[32.526]
Observations	26	26
Uncensored	24	24
Left-Censored	2	2
Log-likelihood value	-44.087	-38.664
Chi-Squared	57.882	276.256
Prob> p	0.000	0.000
Chi-Squared for sector-specific explanatory variables	6.718	7.389
Prob>p	0.035	0.025

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.30: Tobit estimates for Aid for Secondary Education

Dependent variable: Log(1+ DAC sectoral aid, scaled by GDP), average 1993-1994	
	[1]
Log(Population)	0.105
	[0.905]
Log(GDP per capita)	0.49
	[1.266]
Openness	-1.387
	[1.978]
Democracy	-0.843***
	[0.276]
Human Rights	2.686***
	[0.855]
Corruption	0.476
	[0.566]
Net enrolment in secondary education	0
	[0.030]
Constant	-9.423
	[13.057]
Observations	19
Uncensored	12
Left-Censored	7
Log-likelihood value	-30.994
Chi-Squared	26.227
Prob> p	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.31: OLS estimates for Aid for Post-Secondary Education

Dependent variable: Log(DAC sectoral aid scaled by GDP), average 1993-1994

	[1]	[2]
Log(Population)	0.155	-0.196
	[0.400]	[0.517]
Log(GDP per capita)	0.178	-0.257
	[0.658]	[0.793]
Openness	-1.813**	-1.065
	[0.754]	[1.051]
Democracy	0.085	0.024
	[0.087]	[0.104]
Human Rights	0.209	0.024
	[0.460]	[0.679]
Corruption	-0.469*	-0.594*
	[0.233]	[0.309]
Gross enrolment in tertiary education	-0.217	-0.018
	[0.210]	[0.254]
Arms imports		-0.032
		[0.403]
Friend of US		-0.172
		[0.164]
Friend of Japan		-0.649
		[0.634]
Friend of UK		0.964
		[0.854]
Friend of France		-0.339
		[0.716]
Years as a colony		-0.017
		[0.020]
Constant		22.799
		[50.183]
Observations	26	26
Adjusted R-squared	0.185	0.14
F-statistic	3.142	2.045
Prob> p	0.0237	0.1126

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%

4.8 Concluding Remarks

Our main starting point is the puzzling result found by some studies [Alesina and Weder (2002), Svensson (2000), Neumayer (2003b, 2003d)] that countries perceived as less corrupt do not necessarily receive more aid. Firstly, we use a simple theoretical set-up to attempt to explain this (lack of) relationship between corruption and aid. By applying standard demand theory concepts to a donor's choice of how much aid to give to recipient countries, we interpret aid as a donor's expenditure on government projects in recipient countries. The price of each project is affected by corruption in the recipient government, so that corruption acts as a tax. Depending on the donor's price elasticity of demand for projects in the recipient country, more corrupt governments can receive more, less or the same aid flows as less corrupt governments. Unfortunately, the focus on price elasticities is too limited for empirical application, so that we are unable to test the predictions of the model empirically.

Secondly, motivated by this theoretical framework, we model aid receipts (which are inherently based on donors' aid allocation decisions) in sub-Saharan African countries. We study empirically whether, in the specific case of sub-Saharan Africa, countries perceived to be more corrupt receive less aid from aggregate bilateral donors. We initially find evidence that in sub-Saharan Africa governments that are perceived as less corrupt receive more foreign aid. Our initial results are robust to several sensitivity checks. These include scaling aid receipts by population rather than by GDP, using aid disbursements rather than aid commitments, and using aggregate total aid. More importantly, our initial results are robust to taking into account the ordinal nature of our measure of corruption. However, our results are not robust to endogeneity issues. This suggests that caution should be exercised when interpreting our initial results, as we cannot state that perceived corruption has a causal effect on aid receipts.

In addition to robustness checks using our data set and estimation technique, we revisit the results of Alesina and Weder (2002). We update their data set for sub-Saharan Africa. We find evidence that donors in aggregate reward governments that are perceived as less corrupt with greater aid flows. As was the case with our main results, this correlation is robust to taking into account the ordinal nature of the corruption measure, but it is not robust to endogeneity issues.

Finally, we present some preliminary evidence on aid receipts across sectors. Due to data availability and other limitations, we are unable to draw strong conclusions from the results, but there seems to be little evidence of the impact of perceived corruption across sectors.

One interesting question that we have not addressed is whether there are significant differences in the behaviours of different donors. That is, are some donors more responsive to the levels of perceived corruption in recipient countries? Given that, using a model of aid receipts, we were not able to determine the causal effect of perceived corruption on aid, it would be interesting to determine whether studying aid allocation (i.e., donors' essentially bilateral aid decisions) would enable identifying the causal impact of perceived corruption on aid.

Another related question that arises from this study is whether donors should change the way aid is delivered to different countries. In particular, should countries with stronger governance have a greater say in designing aid programmes and have greater freedom regarding how aid funds are used? Donors should create strong incentives for recipient countries to strengthen institutions and policies. They could do so by rewarding stronger governance with greater national policy ownership, more flexible, larger and longer term aid commitments.

This would mark a departure from traditional conditionality where countries are pushed into reforms, as resources are made available upon the (promise of) implementation of a set of policies the donor agrees upon. It is broadly consensual in the literature that traditional conditionality has not been effective.[181] In particular, the overarching conclusion is that conditionality helps when it supports governments already strongly committed to reform, but that it has little effect in encouraging reform if countries fail to display an initial tendency to do so. Contrary to the mainstream literature, Morrissey (2002, 2004) suggests that conditionality has had some effect on policies. Morrissey argues that donors have influenced the direction but not the pace of reforms – the effects tend *"to become apparent slowly"*. Another problem has been the enforcement of conditionality. For example, as The Economist[182] reported,

"Over the past few years Kenya has performed a curious mating ritual with its aid donors. The steps are the following. One, Kenya wins its yearly pledges of foreign aid. Two, the government begins to

[181] See for example, World Bank (1998a, 2005c), Easterly (2001), Collier (1997).
[182] Economist (1995), "Stop, go", Vol. 336, No. 7928, pp. 37-37.

misbehave, backtracking on economic reform and behaving in an authoritarian manner. Three, a new meeting of donor countries looms with exasperated foreign governments preparing their sharp rebukes. Four, Kenya pulls a placatory rabbit out of the hat. Five, the donors are mollified and the aid is pledged. The whole dance then starts again."

The concept of changing donor aid strategies along the lines of giving countries with good governance greater ownership of how aid moneys are spent has already begun to be applied by some donors. For example, the Netherlands and the UK Department for International Development have recently favoured sector-wide approaches. The sector-wide approach is defined as *"a process in which funding for the sector, whether internal or from donors, supports a single policy and expenditure programme, under government leadership, and adopting common approaches across the sector"* [Sector Wide Approach Support Group (2004)]. The sector-wide approach aims to stimulate recipient governments to take the leadership in strategy formulation and policy implementation. It is generally accompanied by efforts to strengthen government procedures for disbursement and accountability.

More recently, the US has introduced the Millennium Challenge Account (MCA). The MCA provides development assistance to countries that have demonstrated commitment to *"ruling justly, investing in people, and promoting economic freedom."* The Millennium Challenge Corporation was established in January 2004 to run the MCA. Initial funding for 2004 was US $1 billion, increasing to US $1.5 billion in 2005 and US $3 billion in 2006, with the aim of growing to US $5 billion per year.

A country's performance is measured by 16 policy indicators drawn from publicly available sources.[183] To qualify, a country must score above the median on half the indicators in each of the three categories and it must score above the median on perceived corruption [Millennium Challenge Corporation (2004)]. Although there are concerns about the quality of the data and whether the selection process is biased against the poorest countries because of their poverty creating difficulties in scoring well on some indicators, the indicators used have a clear advantage – they are public. This depoliticizes the selection process and makes it harder (though not impossible) for lobbying to bias selection.

Importantly, the MCA has a policy of country ownership, where countries have the lead in proposing how funds should be used. Countries are asked to propose programmes that promote overall economic growth and that significantly reduce poverty [Millennium Challenge Corporation (2006)].[184] There is no stated preference over sectors. Since its establishment in 2004, the MCA has given more than US $1.5 billion to eight countries, namely, Madagascar, Honduras, Cape Verde, Nicaragua, Georgia, Benin, Vanuatu and Armenia.

Initiatives such as the MCA provide strong incentives and rewards for countries that are serious about combating corruption. They give eligible

[183] The indicators are: Ruling Justly (6) – Control of corruption, Rule of law: Government effectiveness, Voice and accountability, Political rights, Civil liberties; Investing in People (4) – Public expenditure on health, Immunization (DPT3 and Measles), Public expenditure on primary education, Primary education completion rate; Promoting Economic Freedom (6) – Cost of starting a business, Inflation, Fiscal policy, Days to start a business, Trade policy, Regulatory quality rating.

[184] Note that the Millennium Challenge Corporation *"does not take it for granted that programs that stimulate growth will invariably reduce poverty"* [Millennium Challenge Corporation (2006)].

countries a leading role in determining the best uses for aid flows. In addition. ineligible countries are encouraged to reform so as to qualify for aid in the future. We believe these initiatives are a step in the right direction and that this is a fruitful area for future research.

Appendix 4.A

The sample for the main results

We collect data for 32 sub-Saharan African countries from 1982 to 1997. We then divide the cross-country sample into four periods, by calculating four-year averages of the variables,[185] so that periods 1-4 correspond to averages of the years 1982-1985, 1986-1989, 1990-1993 and 1994-1997, respectively.[186] Thus, each country has four observations, data permitting. There are, however, a few important exceptions. Namibia has no observations for our measure of corruption for periods 1 and 2. In addition, South Africa was only added to the DAC list of aid recipients in 1991, so it is never included in the sample for periods 1 and 2.

We are also concerned with the potential impact of outliers on our results. We adopt the Hadi (1992) method for identifying and eliminating outliers.[187] The relationship between aid as per cent of GDP and perceived corruption is our primary interest, although, for statistical reasons, we use logged aid as per cent of GDP as the dependent variable in our regressions. Therefore, we identify outliers for both logged aid as per cent of GDP and aid as per cent of GDP. The outliers for logged aid as per cent of GDP are Nigeria for period 4 and South Africa for periods 3 and 4. There are no outliers for aid as per cent of GDP. These outliers for logged aid as per cent of GDP are identified

[185] Except for income per capita, where the value at the beginning of the period is used.
[186] Averages instead of individual years are taken in order to eliminate short-term variations.
[187] The Hadi method measures the distance of data points from the main body of data and then iteratively reduces the sample to exclude distant data points.

by triangles in Figure 4.A.1. Figure 4.A.2 illustrates there are no outliers for aid as per cent of GDP.

Figure 4.A.1: Identifying outliers for logged aid as per cent of GDP

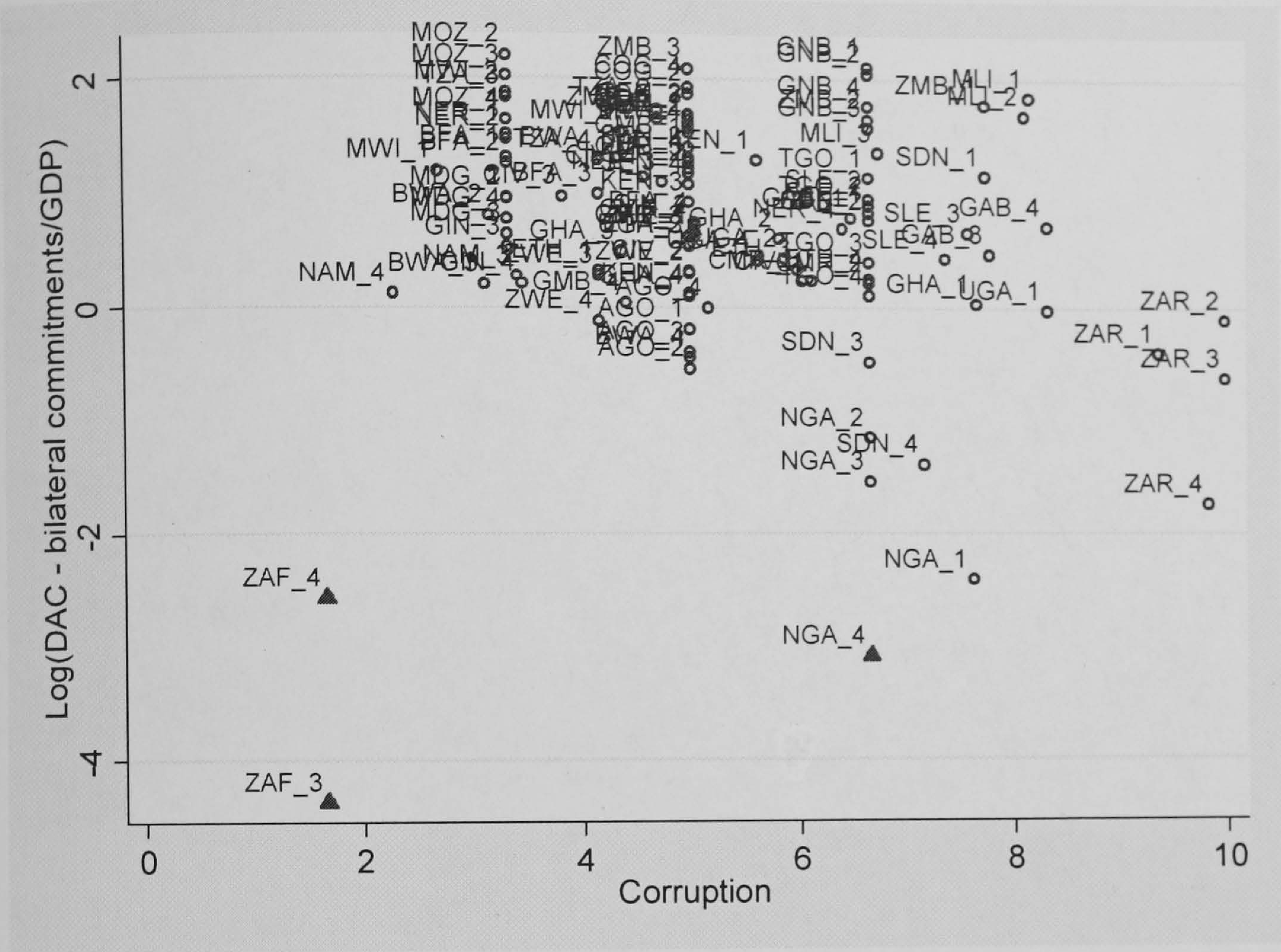
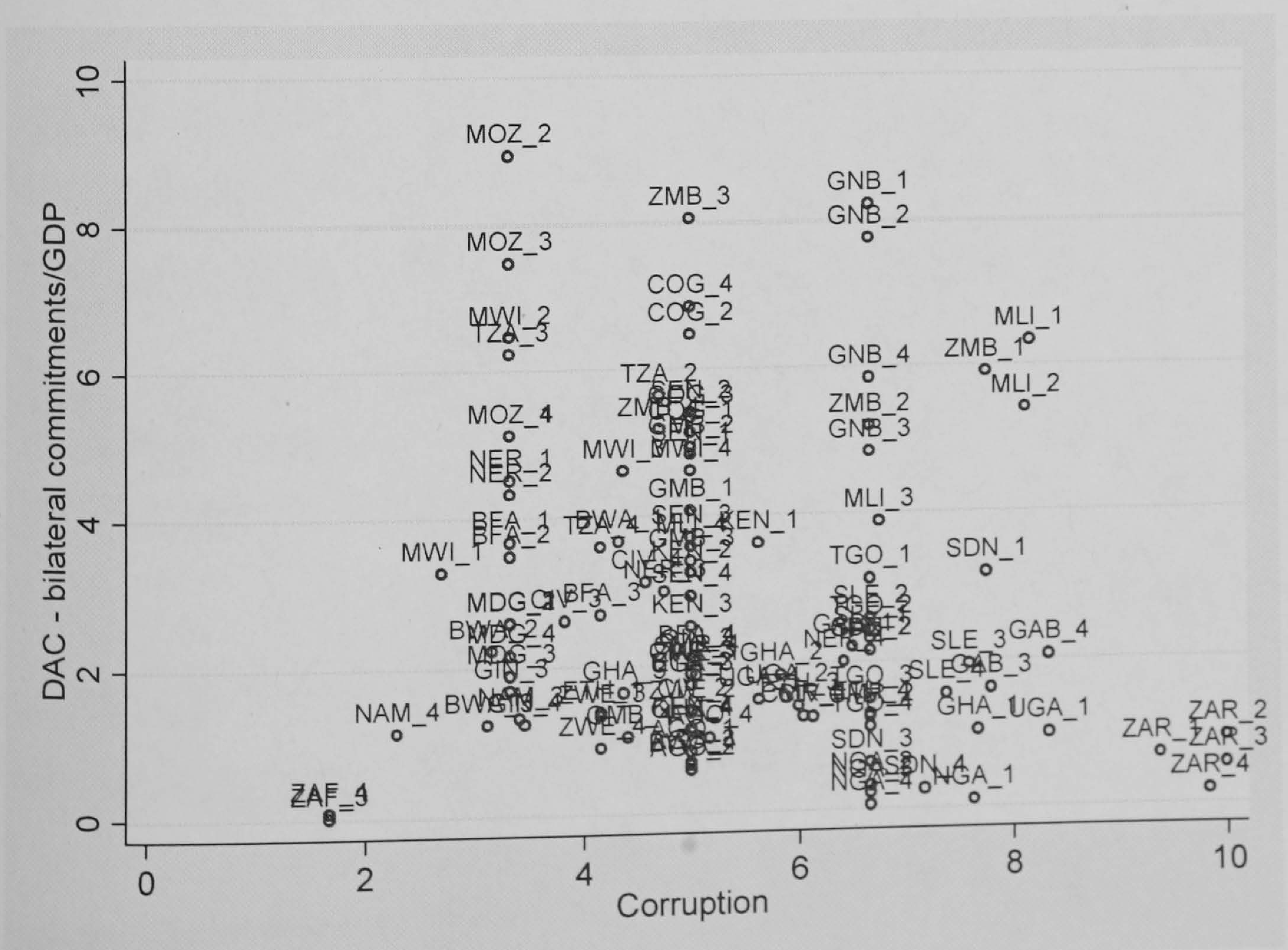


Figure 4.A.2: Identifying outliers for aid as per cent of GDP



Appendix 4.B

Table 4.B.1: CRS sector classifications and definitions

Sector Classification	Definition
I.SOCIAL INFRASTRUCTURE & SERVICES	I.Total
I.1 Education, Total	Includes general teaching and instruction at all levels; as well as construction specifically to improve or adapt educational establishments. Training in a particular field, such as agriculture, is reported against the sector concerned.
I.1.a) Education, Level Unspecified	Includes education sector policy and research, as well as buildings and teacher training when level of education unspecified.
I.1.b) Basic Education	Includes primary, basic life skills for youth and adults and early childhood education.
I.1.c) Secondary Education	Includes vocational training.
I.1.d) Post-Secondary Education	Includes higher education and advanced technical and managerial training.
I.2 Health, Total	Covers assistance to hospitals, clinics, other medical and dental services, public health administration and medical insurance programmes.
I.2.a) Health, General	Includes health policy, medical education and research, laboratories, hospitals and specialised clinics, ambulances, dental services, mental health, rehabilitation, non-infectious disease control, drug and substance abuse control (excluding narcotics trafficking)
I.2.b) Basic Health	Basic health care provision, training of basic health personnel and development of basic health infrastructure; nutrition, infectious disease control, public health campaigns.
I.3 Population Programmes	Covers all activities in the field of reproductive health, family planning and research into population problems.
I.4 Water Supply & Sanitation	Covers assistance given for water supply and use, sanitation and water resources development (including rivers).
I.5 Government & Civil Society	Includes assistance to strengthen the administrative apparatus and government planning, and activities promoting good governance and strengthening civil society.
I.6 Other Social Infrastructure & Services	Covers assistance to employment, housing, other social services and cultural development. Includes also research when sector cannot be identified.
I.6.a) Employment	Employment policy and planning; labour law; labour unions; institution capacity building and advice; support programmes for unemployed; employment creation and income generation programmes; occupational safety and health; combating child labour.
I.6.b) Housing	Housing sector policy, planning and programme aid; low-cost housing and slum clearance.
I.6.c) Other Social Services	Includes social legislation and administration; programmes for specific social groups; reconstruction assistance; police and customs; narcotics control; statistical capacity building, culture and recreation; assistance to research and scientific institutes
II.ECONOMIC	II.Total

Sector Classification	Definition
INFRASTRUCTURE	
II.1Transport & Storage	Covers road, rail, water and air transport and storage, whether or not related to transportation.
II.2Communications	Includes all communications (post and telecommunications, radio, television, print media).
II.3 Energy	Covers both the production and distribution of energy. Assistance towards the peaceful use of nuclear energy is reportable as ODA. This includes the construction and decommissioning of nuclear power reactors for civilian power supply, the development or
II.4 Banking & Financial Services	Covers assistance to finance and banking in both formal and informal sectors.
II.5 Business & Other Services	Includes business development and activities aimed at improving the business climate; privatisation.
III.PRODUCTION SECTORS	III.Total
III.1 Agriculture - Forestry - Fishing, Total	Including agricultural sector policy, agricultural development and inputs, crops and livestock production, agricultural credit, co-operatives and research.
III.1.a) Agriculture	Including agricultural sector policy, agricultural development and inputs, crops and livestock production, agricultural credit, co-operatives and research.
III.1.b) Forestry	Includes forestry policy, planning and programmes, fuelwood and charcoal projects, forestry education, research and development.
III.1.c) Fishing	Includes fisheries policy, planning and programmes as well as fisheries research and education.
III.2 Industry - Mining - Construction, Total	Covers assistance to manufacturing industries of all kinds, technological research and development, extractive industries, and construction when sector cannot be identified.
III.2.a) Industry	Industrial policy, small business and craft development; all types of manufacturing, including agro-processing, chemicals and fertilisers, gas liquefaction and petroleum refining, fuel wood production, textiles and leather.
III.2.b) Mining	Includes mining and minerals policy and programmes, geology, and extraction of metals, minerals and fuels.
III.2.c) Construction	Construction sector policy and planning; excluding construction activities within specific sectors (e.g., hospital or school construction).
III.3 Trade & Tourism	Covers trade and export promotion; hotels and other tourist facilities.
III.3.a) Trade	Trade policy and planning; domestic marketing, trade, service industries, patents and trademarks, wholesale and retail trade and export promotion.
III.3.b) Tourism	Tourism policy and administrative management.
IV. MULTISECTOR	IV.Total
IV.1 General Environment Protection	Covers activities concerned with conservation, protection or amelioration of the physical environment without sector allocation.
IV.2 Women In Development	Covers activities concerned with advancement of women in development without sector allocation.
IV.3 Other Multisector	Covers urban and rural development projects and other multisector activities

Sector Classification	Definition
V.TOTAL SECTOR ALLOCABLE (I+II+III+IV)	Sum of amounts on lines 100, 200, 300 and 400.
VI. COMMODITY AID / GENERAL PROG. ASS.	This main heading includes contributions for general development purposes without sector allocation, with or without restrictions on the specific use of the funds (and irrespective of any control by the donor of the use of counterpart funds).
VI.1 Structural Adjustment (with IBRD/IMF)	Non-sector allocable programme assistance whose provision is explicitly linked to agreed policy packages, in particular those implementing recommendations made by the World Bank and the IMF.
VI.2 Food Aid excluding Relief Food Aid	Supplies and transport of food, cash for food, and intermediate products (fertilisers, seeds etc.) provided as part of a food aid programme.
VI.3 Other General Programme & Commodity Ass.	Includes import, budget and balance-of-payments support.
VII. ACTION RELATING TO DEBT	This main heading groups all actions relating to debt (forgiveness, swaps, buy-backs, rescheduling, refinancing).
VIII. EMERGENCY ASSISTANCE	This main heading groups emergency and distress relief in cash or in kind, emergency food aid, humanitarian aid including aid to refugees, and assistance for disaster preparedness.
VIII.1 Relief Food Aid	Food aid for population groups affected by emergency situations.
VIII.2 Non-Food Emergency and Distress Relief	All emergency, distress relief and humanitarian aid except food aid.
VIII.3 Reconstruction relief	
IX. ADMINISTRATIVE COSTS OF DONORS	Administrative costs as defined in paragraphs 1.26 to 1.30.
X. SUPPORT TO NGO'S	This main heading refers to official funds paid over to national and international non-governmental organisations for use at the latters' discretion.
XI. UNALLOCATED/UNSPECIFIED	Amounts should be reported under this heading only for forms of aid which cannot be assigned to another part of the table, and also, in the case of project or sector assistance, to record contributions for which sectoral destination remains to be specified.
XII.TOTAL	

Table reproduced from OECD (2005b).

Appendix 4.C

Table 4.C.1: Bilateral Aggregate Aid Commitments as per cent of GDP – Excluding outliers

Dependent variable: Log(DAC bilateral aid commitments, per cent of GDP)

	[1']	[2']
Outliers removed:	*Log(aid/GDP)*	*Log(aid/GDP)*
Log(Population)	-1.743***	-2.773***
	[0.372]	[0.452]
Log(GDP per capita)	-0.331	-0.392
	[0.471]	[0.408]
Openness	0.208	0.213
	[0.170]	[0.162]
Democracy	0.048**	0.055***
	[0.020]	[0.018]
Human Rights	0.109	0.038
	[0.071]	[0.068]
Corruption	-0.145***	-0.156***
	[0.047]	[0.040]
Arms imports		-0.003***
		[0.001]
Friend of US		-0.004
		[0.011]
Friend of Japan		0.100***
		[0.022]
Friend of UK		-0.058
		[0.035]
Friend of France		0.003
		[0.020]
Constant	6.932**	5.071
	[3.353]	[3.681]
Observations	97	95
Countries	27	27
R^2	0.403	0.639
Hausman Test (p-value)	0.011	0.000

White heteroskedasticity corrected standard errors in parenthesis.
* significant at 10%; ** significant at 5%; *** significant at 1%
Country specific dummies included

Appendix 4.D

Relationship between estimated coefficients when the dependent variable is ln(aid per capita) and when it is ln(aid/GDP)

Consider the following equation to be estimated (for simplicity, we exclude country and time subscripts, a constant, and include only corruption as an additional regressor):

$$\ln\left[\frac{aid}{population}\right] = \beta_1 \ln[\,population\,] + \beta_2 \ln[\,GDP \text{ per capita}\,] + \beta_3 Corruption + \varepsilon$$

Using the properties of the logarithm, we obtain:

$$\ln[\,aid\,] - \ln[\,population\,] = \beta_1 \ln[\,population\,] + \beta_2 \ln[\,GDP \text{ per capita}\,] + \beta_3 Corruption + \varepsilon$$

Rearranging terms we obtain:

$$\ln[\,aid\,] = (\beta_1 + 1)\ln[\,population\,] + \beta_2 \ln[\,GDP \text{ per capita}\,] + \beta_3 Corruption + \varepsilon$$

Subtracting $\ln[\,GDP \text{ per capita} \times population\,]$ from each side, we obtain:

$$\ln[\,aid\,] - \ln[\,GDP \text{ per capita} \times population\,] = (\beta_1 + 1)\ln[\,population\,] + \beta_2 \ln[\,GDP \text{ per capita}\,] + \beta_3 Corruption - \ln[\,GDP \text{ per capita} \times population\,] + \varepsilon$$

Using the properties of the logarithm and rearranging terms, we obtain:

$$\ln\left[\frac{aid}{GDP}\right] = (\beta_1 + 1)\ln[\,population\,] + \beta_2 \ln[\,GDP \text{ per capita}\,] - \ln[\,GDP \text{ per capita}\,] - \ln[population] + \beta_3 Corruption + \varepsilon$$

Rearranging further, we obtain:

$$\ln\left[\frac{aid}{GDP}\right] = \beta_1 \ln[\,population\,] + (\beta_2 - 1)\ln[\,GDP \text{ per capita}\,] + \beta_3 Corruption + \varepsilon$$

So, estimating a model with $\ln\left[\frac{aid}{population}\right]$ as the dependent variable yields the same coefficients for all explanatory variables except $\ln[GDP \text{ per capita}]$ as estimating a model with $\ln\left[\frac{aid}{GDP}\right]$, when $\ln[population]$ and $\ln[GDP \text{ per capita}]$ are included as regressors. In addition, the estimated coefficient of $\ln[GDP \text{ per capita}]$ when $\ln\left[\frac{aid}{GDP}\right]$ is the dependent variable is equal to the estimated coefficient of when $\ln\left[\frac{aid}{population}\right]$ is the dependent variable minus 1. This holds for estimating the models using annual data.

Now consider period data (in particular, four-year periods). For period j, the variables are defined as follows:

$$\ln\left[\frac{aid}{population}\right] = \ln\left[\frac{\sum_{i=1}^{4}\frac{aid_i}{population_i}}{4}\right]$$

$$\ln\left[\frac{aid}{GDP}\right] = \ln\left[\frac{\sum_{i=1}^{4}\frac{aid_i}{GDP\text{per capita}_i \times population_i}}{4}\right]$$

$$\ln[population] = \ln\left[\frac{\sum_{i=1}^{4} population_i}{4}\right]$$

$$\ln[GDP\text{per capita}] = \ln\left[\frac{\sum_{i=1}^{4} GDP\text{per capita}_i}{4}\right]$$

Because the data is now averaged, rather than annual data, we cannot use the properties of the logarithms as before. This means that the estimated coefficients will not be the same when we estimated a model with $\ln\left[\frac{aid}{GDP}\right]$ or with $\ln\left[\frac{aid}{population}\right]$ as the dependent variable.

Appendix 4.E

Table 4.E.1: AW description of data and sources

Variable	Description	Source
Aid per capita	Official development assistance (constant $1987)	World Bank (1998b?)
Years as a colony	Number of years as a colony of any colonizer since 1900	Alesina and Dollar (2000). CIA (1996)
CORRBI	Business International (BI) corruption indicator average 1980-1993, collected by Mauro (1995): 10 (lowest corruption), 0 (highest corruption)	BI, now Economist Intelligence Unit
CORRICRG	Corruption index from ICRG, 1982-1995: 6 (lowest corruption), 0 (highest corruption)	Knack and Keefer (1995)
CORRIMD	Corruption Index from *World Competitiveness Yearbook, 1996* (original name: improper practices such as bribing and corruption): 10 (lowest corruption), 0 (highest corruption)	Institute for Management Development, IMD
CORRS&P	Losses and costs of corruption, from Standard and Poors (1997), redefined to: 10 (lowest corruption), 0 (highest corruption)	Standard and Poor's
CORRTI	Corruption index from Transparency International, survey 1997: 10 (lowest corruption), 0 (highest corruption)	Transparency International
CORRWDR1	Level of corruption index, from Survey of World Development Report 1997, plus five additional surveys: 6 (lowest corruption), 1 (highest corruption)	Brunetti et al. (1998)
CORRWDR2	Corruption as a business obstacle, from Survey of World Development Report 1997, plus five additional surveys: 6 (lowest corruption), 1 (highest corruption)	Brunetti et al. (1998)
Democracy	Political Rights, recoded as: 7 (democratic), 1 (autocratic government)	Gastil (1990)
FRDXXX	Percentage of times in which the recipient has voted in the UN as XXX	Alesina and Dollar (2000)
Income	Real GDP per capita, beginning of period	Heston and Summers (1991)
Openness	Proportion of years in which the country is open	Sachs and Warner (1995)

Chapter 5

Conclusions

We study three topics on corruption that are of particular relevance to sub-Saharan Africa. Although the three issues can be considered independently of one another, it is possible to draw some links between them. This chapter reflects on the links between the previous chapters, as well as on the limitations of those chapters. We also summarise our scholarly contributions, as well as some policy and future research implications.

Chapter 2 addresses the first question, which regards the determinant factors of corruption. In particular, we try to ascertain whether corruption in sub-Saharan Africa is "destiny" or policy driven. Guided by results from the theoretical and empirical literature, we estimate several models in order to assess the contribution of a number of factors to a country's level of perceived corruption. We include variables measuring long-predetermined historical and cultural characteristics, as well as variables measuring economic development, democracy and political stability, and variables capturing public policy stances, as well as the relative importance of aid flows. Our findings suggest that long-predetermined historical and cultural characteristics are important and it is not just policy that matters.

Chapter 3 addresses the second question, which focuses on a much less studied aspect of corruption, namely, the supply of bribes. In particular, we look at government procurement contracts and investigate whether allocative efficiency is maintained in the presence of corrupt officials. We also assume the winning firm may be audited and fined if it offered bribes. We find that, unless the government official is known with certainty to be honest, bribery will always take place. The only exceptions are when there is either a fixed fine that is sufficiently large or if a firm's expected punishment is more than proportional to its gain. In addition, as long as bribery occurs, there will generally be no welfare efficiency.

Chapter 4 addresses the final question, which is whether more corrupt countries in sub-Saharan Africa receive less aid from bilateral donors in aggregate. Although we find that countries perceived to be more corrupt tend to receive less aid, we are unable to establish a causal impact of perceived corruption on aid receipts. Motivated by the focus of the UN Millennium Development Goals on specific sectors, such as health and education, we also present some preliminary evidence on aid receipts across sectors. We find little evidence that sectoral aid is affected by levels of perceived corruption.

The brief summary above highlights that the most obvious links are between Chapters 2 and 4. Indeed, whilst Chapter 2 examines the impact of aid flows (among other factors) on a country's level of perceived corruption, Chapter 4 looks at whether countries perceived to be more corrupt receive more aid. In both cases, we are guided by the two separate literatures in choosing our set of explanatory variables. Aid and corruption are not exogenously determined, but there is a causal relationship between the two variables. In both cases, we attempt to estimate causal effects. We use instrumental variables in Chapter 2, though not in Chapter 4, as we find no instruments suitable for FE models (the potential instrument, ethno-linguistic fractionalisation, was time-invariant). So instead in Chapter 4 we use lagged values. In Chapter 2 we also check the robustness of our IV results using the approach of lagged values. In Chapter 2 we do not find a robust empirical relationship between aid receipts and a country's level of perceived corruption. In Chapter 4, although we find a correlation between a recipient country's perceived corruption and the aid it receives, we find no evidence that this is a causal effect. Although we take into account the endogeneity of aid and perceived corruption, the empirical models that we estimate in each chapter are not derived from theoretical economic models that seek to establish the underlying structural and behavioural relationship between aid and corruption.

However, there are also links between Chapters 2 and 3, and between Chapters 3 and 4. Consider the links between Chapters 2 and 3, in particular in terms of the implications for firms' behaviour of observing high levels of corruption, as measured by subjective indices. In Chapter 3, firms do not know with certainty whether the government official that will be evaluating their bids is corrupt or not – firms have beliefs regarding the corruptibility of the official. In principle, one could assume that the firms' beliefs as to the corruptibility of the government official may be proxied by indices of perceived corruption. That is, if a country is perceived to be corrupt, as measured by indices such as the ICRG corruption index that we used in Chapters 2 and 4, then we would expect these indices to reflect firms' beliefs regarding the corruption of officials. In particular, if country A is scored as more corrupt than country B, then firms could form beliefs that it is more likely for officials in country A to be more corrupt than those in country B.

However, there are two important caveats concerning how well indices of perceived corruption may serve as a proxy for firms' beliefs of officials' corruptibility. The first one is that, unless a country is scored by a subjective corruption index as being 'squeaky clean', a reliance on these indices to form beliefs about officials' corruptibility means that firms will always offer bribes.[188] Countries are not typically perceived as being completely incorrupt (or indeed, incorruptible), so that bribery would potentially almost always take place.[189] The second is that these subjective indices of corruption might not necessarily represent firms' *uncertainty* regarding whether a certain government official is corrupt. Suppose that a country is scored as being highly corrupt. In this case, you could expect that it is more probable to encounter a corrupt official, and that firms may have less uncertainty about an official's corruptibility. Conversely, firms may believe that officials are more likely to be honest in a country that is scored as not very corrupt. However, indices of corruption may not accurately reflect firms' uncertainty about officials. There may be a proportion of officials who are corrupt and others who are honest, but firms may know which is which. This might happen if firms routinely deal with the same set of government officials, and have built relationships, or even if certain officials have strong reputations of either being honest or dishonest. Only if there is high political turnover would one expect the corruption index to

[188] Note that unless the government official is known with certainty to be honest, in Chapter 3 the only exceptions for bribing to take place are when there is either a fixed fine that is sufficiently large (i.e., when the expected value of the fixed fine is greater than the payoff to the firm with the greatest capacity to bribe) or if a firm's expected punishment is more than proportional to its gain.

[189] Note that some countries are given the score of no perceived corruption – for example, in our sample South Africa is scored as having no perceived corruption from 1982 to 1986.

reflect uncertainty, particularly in countries where more senior civil servants change when there is a change in the political party in power.

Consider the links between Chapters 3 and 4. All the sub-Saharan African countries in our sample receive aid from bilateral donors in aggregate, even if all countries do not receive aid from all bilateral donors.[190] It is reasonable to assume that foreign aid will finance projects that the recipient country might not otherwise have had funds to finance.[191] So aid flows allow for the commissioning of more government projects. Suppose that foreign aid flows enable spending on an infrastructure project, say building a road. The model in Chapter 3 predicts that, unless the government official is known with certainty to be honest, firms will always offer bribes. The only exceptions for bribing to take place are when there is either a fixed fine that is sufficiently large or if a firm's expected punishment is more than proportional to its gain. If we assume that domestic firms compete for the project, then we can think that in sub-Saharan Africa it is unlikely that the political will and muscle exists to implement inspections on national firms, or that, even if firms are found to have been corrupt, that penalties will be imposed. If we assume that foreign firms compete for the project, say because aid is tied, so that procurement of goods or services is limited to the donor country, it is conceivable that those firms could face a more binding constraint in terms of being audited, and of having penalties

[190] For example, Portugal tends to give aid primarily to its former colonies, such as Angola and Mozambique. In contrast, the US gives aid to a wide variety of countries in sub-Saharan Africa.
[191] Note that it is also possible that a recipient country's government would have undertaken a donor-financed project in the absence of that financing, and that donor funds simply finance, at the margin, something else that may be undesirable (there may be a problem of fungibility). However, for our purposes, even if the switching of funds does occur, we can assume that another project will be financed, even if it is a more undesirable project (such as one which is undertaken simply because it is a project on which corrupt governments may find it easier to collect bribes.)

imposed if they were found to have offered bribes. This could be due, for example, because the donor country may be a signatory of the OECD Anti-Bribery Convention.[192,193] In either case, the fines (and monitoring) would have to be set at a level that effectively deterred bribe giving. In the absence of such fines, this would mean that, by virtue of the existence of the supply of bribes (by firms that offer bribes), not only would there be no allocative efficiency, more corrupt acts would also take place. This would occur *independently* of whether countries perceived to be more corrupt received less aid. At best, donors can only rely on indices of perceived corruption. However, these indices focus on the demand for bribes, that is, of the willingness/propensity of government officials to demand bribes. These indices may not fully capture the true extent of corruption in this scenario where officials engage in 'passive' corruption. So by taking into account the fact that it takes two to enter into a corrupt deal, and that it is extremely difficult to measure supply of bribes, we can see that the subjective indices of corruption may not be the most relevant factor in determining whether more corrupt countries receive less aid.

It is important to cast a critical eye over the work that has been carried out in this thesis. As such, it is important to highlight some limitations of the different chapters, and to consider avenues of future research.

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[192] It should be noted that surveys carried out by Transparency International (1999, 2002) present a dismal picture of firms' awareness of the OECD Anti-Bribery Convention – in 1999 (when the Convention was implemented) only 6% were familiar with the Convention, and three years on, in 2002, this had only increased to 7%. Indeed, as David Nussbaum, Chief Executive of Transparency International stated, *"It is hypocritical that OECD-based companies continue to bribe across the globe, while their governments pay lip-service to enforcing the law."*

[193] It is important to note that we are not advocating that aid should be tied. Rather, what is important is to ensure that effective monitoring and penalty mechanisms are in place.

The empirical chapters, namely 2 and 4, bring to the fore some non-negligible limitations in terms of the data available for measuring corruption. Firstly, we rely on subjective indices of perceived corruption. Although the existence of such measures in relation to a concept such as corruption that is inherently difficult to measure is a step in the right direction, it is nonetheless important to acknowledge the limitations of such measures. Important limitations are that these are measures based on *perceptions* of corruption; that they are subject to measurement errors; they do not distinguish between different types of corrupt acts; and they may reflect ideological biases of the institution compiling the scores. So caution must be exercised when interpreting results obtained when using these subjective measures, and it is important not to misuse such governance indicators.

Secondly, another related and important limitation in those chapters is that we are not able to check whether the results obtained are robust to using different measures of perceived corruption. Although other indices of perceived corruption are available, they suffer from the limitations of poor coverage of African countries within the time period we consider, and more importantly, they are not comparable over time. Therefore, we are unable to use any alternative measures of perceived corruption.

Thirdly, although the early 1990s marked the awakening of policymakers to the problems of corruption, it was not until the mid to late 1990s that awareness of corruption truly increased and became a more integral component of the policy agenda. Because the latest year included in our sample is 1997, we cannot fully capture this reversal of policy priorities. This is arguably more of a problem in Chapter 4, as having data on perceived corruption since 1997 could permit determining whether this shift in awareness by donor countries was truly translated into recipient countries' aid receipts being significantly related to their level of perceived corruption. It should be noted, however, that data on the ICRG corruption index which we used *is* available for more recent years than 1997. In fact, it is available until the current year – unfortunately, due to financial constraints, we were unable to obtain such updated data.

In terms of Chapter 2, it is also important to acknowledge the existence of some counter-intuitive results, and how these may be related to limitations with some of variables used. The most relevant example (and perhaps our most puzzling result) is that although former British colonies tend to be perceived as less corrupt, countries with a common law system are perceived as more corrupt than those with a civil law system, *ceteris paribus*. It is important to note that drawing a distinction between the highly correlated common law and British heritage variables involves considering the "divergent" cases, in which a country has just a common law system but no British heritage or in which a country has just British heritage but no common law system. We use these variations to attempt to distinguish between the effects of being a former British colony and having a common law legal system, and find that countries with both common law and British heritage probably have lower perceived corruption and that those with only a common law have higher perceived corruption. Although our results suggest that a country's political and cultural setting may significantly condition the way that institutions work, it is important to emphasize their fragility, as they depend on a small number of "divergent" cases – only three in our sample of 32 countries. This suggests that a more refined study of how certain aspects of legal practice relate to corruption in government is needed. It also suggests that, although our choice of estimating a random effects model was justified on the basis of the Hausman specification test, if we had estimated a fixed effects model then those variables that are effectively proxies for a small number of countries (for example, "Just Common Law" and "No Colonial Heritage") would have been eliminated by virtue of being time-invariant.

Our findings in Chapter 2 suggest why fighting corruption in sub-Saharan Africa has been so difficult – long-predetermined historical and cultural characteristics appear to be important, and it is not just policy that matters in determining a country's level of perceived corruption. In light of these results, a question related to whether corruption is "destiny" or policy driven arises. That is, given that governments cannot change their countries' "destiny", should we be focusing our attention towards what those governments *can* do to influence levels of corruption? Put differently, the really interesting question becomes whether countries can, through sound policies, reverse high levels of corruption, and, specifically, what policies should be pursued in order to do so. In that case, it would be appropriate to focus on changes in corruption. It would be interesting to determine empirically what factors are important in improving or deteriorating levels of perceived corruption, including potentially the speed with which such factors influence changing perceptions of corruption. The ability to empirically establish such results could have a positive impact on the policymaking arena. Such results could serve as a guide for policymakers, as they would be able to devote resources to corruption-reducing policies. Of course, it is important to bear in mind that the limitations of the corruption indicators mean that results would be indicative rather than definitive. In any case, this seems like a fruitful area for future research.

One of the limitations of Chapter 2 is that that chapter looks primarily at correlations between several factors and corruption. In particular, it studies aggregate and macro-level determinants of corruption. A focus on aggregate determinants sheds little light on the relationship between corruption and individual agents – agents facing similar institutions and policies may still exhibit different levels of corruption. So whilst informative, aggregate determinants of corruption cannot adequately explain variations of corruption within a country. It would probably be more appropriate to have a theoretical model that explicitly modelled corruption at the micro-level, in terms of officials' behaviours and incentives in engaging in corrupt activities. One drawback with this approach, however, would be the need for micro-level data in order to empirically test any predictions from the model. In any case, such a theoretical framework would allow for more robust links between different policy variables and corruption.

The most obvious limitation of Chapter 3 is that the theoretical model is not empirically tested. Unfortunately, there are no data sets that could be used to test the predictions of the model, as we require data on bribe payments by firms in order to win government contracts. In addition, we would need data not only on the incidence of bribe giving, but also on the amount of the bribes.

Although some data exist on bribe payments (Transparency International's Bribe Payers Index (for the years of 1999, 2002, 2006);[194] and the World Bank's Business Environment Survey (for 2000)), these are indicators based on perceptions of the extent to which bribing takes place. Whilst the Business Environment Survey does provide data by country in which the bribing takes place (albeit with a very low coverage of only 15 sub-Saharan African countries), the Bribe Payers Index does not – so there is no information available in terms of the country where the bribing is taking place. In any case, these indicators do not provide information on bribery in government contracts, rendering them even more inappropriate for our purposes.

In terms of limitations regarding the theoretical model, one criticism is that the model should allow for different estimates of the probability that a government official is corrupt. For example, some firms may bid for projects more frequently than others, and may, therefore, encounter the same pool of officials more often.

Another possible improvement/extension to the model would be to alter the assumption that the government official is either honest or dishonest, as this may be too restrictive. Indeed, it may be reasonable to assume instead that there are threshold effects, which take into account how bribe levels may affect the propensity of officials to be corrupt. For example, some officials may have a reservation bribe, akin to a reservation wage, so that they only engage in corrupt

[194] Note that while the Bribe Payers Indices for 1999 and 2002 are comparable, these are not comparable with the one for 2006. This is because they are based on a different methodology and different survey questions. For example, in 1999 and 2002 business executives were questioned on their propensity to offer bribes to officials in 15 emerging market economies only, whereas in 2006, business executives were questioned on the extent to which firms that did business in their country (125 countries were considered, not just emerging economies) bribed or made undocumented payments in general and not just to foreign officials.

acts at levels above their reservation bribe. In addition, officials may also have maximum bribe levels. This may occur, for example, if officials are 'semi-honest', that is, they might believe that they are entitled to receive gifts from the bidding firms, just as long as these gifts are below a certain level and cannot be considerable substantial. Another example is if the official is deterred from accepting bribes greater than a certain level due to increasing expected penalties. The existence of such threshold effects would introduce yet another source of uncertainty for the bidding firms.

A related criticism is that in the model in Chapter 3 we have abstracted from the official's decision to be corrupt. We have assumed that this is given exogenously. However, it would be interesting to ascertain how the results would change if the official's corruptibility was determined endogenously in the model, particularly in light of the possible extension described in the paragraph above.

In terms of Chapter 4, one of the limitations is that the simple theoretical model that was used to motivate the analysis was not empirically tested. This was due to the fact that the focus on the donor's price elasticity of demand for projects in the recipient country was too limited for empirical application.

Underlying the aid receipts that Chapter 4 models are aid allocations by bilateral donors. Another limitation of that chapter is that, by focusing on aggregate aid flows, we are not able to distinguish between different donors, and, therefore, potential significant differences in the behaviour of different donors cannot be uncovered. This would, therefore, entail looking at how aid is allocated.

This, in turn, highlights a related limitation. That is, that a potentially more interesting question could be how aid *should* be allocated. Should aid be allocated so that both poverty *and* corruption reduction of the recipient countries be used as the main criteria of donors? Should promoting growth and governance be the new benchmark for aid effectiveness? If the international community is serious about curbing corruption, then donors may indeed want to allocate aid not only in a 'poverty-efficient', but also in a 'corruption-efficient' way. It would be interesting to investigate whether it would be feasible, and if so, optimal to have poverty- and corruption-efficient aid allocations.

It should be highlighted, however, that there is no clear evidence of how aid flows affect corruption. Indeed, the empirical findings on the impact of aid on corruption have been ambiguous. There is evidence that aid causes perceived corruption to increase [Alesina and Weder (2002), Svensson (2000)], that aid decreases perceived corruption [Tavares (2003)], and that aid is not significantly related to perceived corruption [Knack (2001), Chapter 2]. This suggests that it would be important to examine in greater depth the mechanisms through which aid flows may affect a country's level of corruption. For example, does aid impact on corruption directly (due to a potential source of rents), or via an impact on growth?

Recent empirical evidence on aid effectiveness has also been mixed. There is evidence that aid works better in countries with good policies. For example, Burnside and Dollar (2000) and Collier and Dollar (2002) show that aid has a greater impact on growth in countries with stronger policies and institutions. Easterly, Levine and Roodman (2004) question the robustness of these results. They update and expand the data set used by Burnside and Dollar (2000) and no longer find that aid promotes greater growth in good policy environments. Hansen and Tarp (2001), using essentially the same data for the same sample as Burnside and Dollar (2000) but with different specifications and estimators, find that aid has a positive effect on growth and that this result is not conditional on policy. Overall, there seems to be more evidence to suggest that aids works in countries irrespective of the policy regime. As a comprehensive review of the literature on aid effectiveness is beyond the scope of this study, see Addison, Mavrotas and McGillvray (2005), and references therein, for a review of relevant papers on the aid effectiveness debate.

Another criticism of Chapter 4 is that we did not explore whether the type or composition of aid receipts is related to levels of perceived corruption. That is, we did not investigate the potential difference between aid loans and aid grants, and how these may be related to perceived levels of corruption. It is possible that donors may reward less corrupt countries with more grants (as these entail no future repayment burdens), even if in terms of the total of aid they may not discriminate between a recipient's level of perceived corruption.

Notwithstanding the limitations that we have identified for each chapter, we believe that we have made some important contributions to the literature.

Previous cross-national studies on the causes of corruption primarily fail to directly address critical issues of simultaneous causation. Those studies that attempt to address endogeneity issues do so through instrumental variables, but typically fail to find good instruments. Previous studies also often rely on single-year data. By doing so, those studies forego the advantages of using panel data, such as controlling for unit heterogeneity. Furthermore, most studies use measures of corruption that have a very low (and sometimes no) coverage of sub-Saharan African countries. The few studies that distinguish between levels of perceived corruption in Africa and elsewhere tend to do so using a dummy variable for the whole of Africa, ignoring the differences between North and sub-Saharan Africa, and indeed between countries in sub-Saharan Africa. In addition, previous studies fail to take into account the ordinal nature of corruption indices, and do not check whether their results obtained when treating these indices as quantitative are robust. Failure to explicitly acknowledge the nature and limitations of corruption indicators based on perceptions can only serve to weaken the rigour and credibility of studies which use these indicators. Some of the previous studies suffer from all the above shortcomings. We improve on the existing empirical literature by performing several robustness checks to our results. These include considering several specifications, tackling endogeneity issues using instrumental variables and the approach of lagged values. We also make an important contribution by verifying that our results are robust to taking into account the ordinal nature of corruption measures.

In terms of our model of the supply of bribes, we contribute towards this often ignored strand of the literature on corruption. We make an important contribution in terms of assessing allocative efficiency in the presence of corruption. Previous studies have assumed that firms competing for government contracts are either able to carry out the project at the same quality, or that the lowest cost firm is always the highest quality one. In these cases, bribing entails no loss of efficiency, and bribes merely represent a redistribution of wealth from the firms to the government official. As we assume that quality is increasing in cost, the optimal firm is not the one with the lowest cost. We find that, as long as bribery occurs, there will generally be no welfare efficiency. This is particularly relevant for sub-Saharan African countries, where infrastructures are badly underdeveloped and where a lack of resources for adequate maintenance means quality makes a difference.

We also make an important contribution in terms of the penalties that might be effective in deterring firms from offering bribes in government procurement contracts. In addition, we are able to link some of the predictions of our model to specific policy implications. For example, the World Bank's initiative of blacklisting firms that offer bribes to public officials in the procurement process or contract execution in World Bank-financed projects is akin to a high value fixed fine, as the fixed fine can be interpreted as the present value of all future World Bank-financed contracts. To date, the World Bank has blacklisted over 350 firms. The names of these corrupt firms are made publicly available at the World Bank's website. This "naming and shaming" policy has been considered a very significant deterrent for corruption. As Daniel Kaufmann, Director of Global Programmes at the World Bank Institute puts it, *"After we have announced the list publicly, other organisations will not use these firms."* This contrasts sharply with other major development organisations, such as the Asian Development Bank, which do not publish their internal lists of corrupt contractors, making it more likely that these companies get new business.

We also make a contribution in terms of the different types of transparencies that are important. Our finding that firms offer higher bribes when they have information about their rivals leads to the conclusion that transparency in terms of firms' capacity to bribe does not decrease the incidence of corrupt dealings. Although this means that the corporate sector needs to protect commercially sensitive information (in our model, firms' cost structures, as these have a direct mapping onto how much firms can afford to offer as a bribe), firms should be open to other types of disclosure. For example, companies should disclose whether they have a code of conduct containing specific rules designed to combat bribery, what the contents of the code are, and evaluations of internal controls and its performance in implementing the code. Unfortunately, publishing a code is not enough. After all, Enron had a code. As voluntary codes and guidelines have the risk of non-compliance, enforced legislation is preferable. However, given the lack of legislation or weak enforcement in many countries, voluntary programmes are essential.

Another example is the "Publish What You Pay" campaign launched in June 2002 by the international financier and philanthropist George Soros and a number of non-governmental organisations.[195] "Publish What You Pay" calls for full transparency from foreign oil companies in terms of payments they make to governments, including royalty, sign-on bonus and tax payments. Although "Publish What You Pay" had an initial positive response from BP,

[195] For more details, see http://www.publishwhatyoupay.org.

other oil companies have resisted disclosing information. Moreover, BP has yet to publish the information about the taxes and levies it pays to the Angolan government.

We also show that in order to completely deter one of the parties of a corrupt deal (i.e., the bribe-giver), there needs to be an effective way of enforcing penalties to firms that offer bribes to win public contracts. The starting point is to have a sufficiently high (and credible) probability of an external inspection to the winning firm. In many cases, there is still a heavy reliance on whistle-blowing, and this in itself is not sufficient.[196] In addition, there needs to be a credible commitment for imposing the fine. As John Githongo, from TI-Kenya, puts it: *"Until people are brought before the courts, the OECD Convention will not make a difference to the developing world"* [Transparency International (2002)]. As it currently stands, most signatories' legislation has such serious loopholes and their governments such weak monitoring and enforcement plans, that it is still highly unlikely that businesses will be punished for corruption.

The few studies that look at the empirical relationship between corruption and aid fail to find any evidence that countries perceived to be less corrupt receive more aid. However, no attempt is made to provide a plausible explanation of why this might be the case. By applying standard concepts in demand theory, we provide a simple framework that seeks to explain how

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[196] For example, the World Bank's Department of Institutional Integrity encourages the reporting of allegations of fraud and corruption in Bank-financed projects via its website or a free phone number. Unfortunately, there is still a lack of effective whistle-blower protection. Often whistle-blowers' disclosures are seen, at best, as disloyalty to the employer and colleagues and, at worst, as an attack upon them. Many suffer disciplinary action or dismissal.

corruption might affect aid flows. We interpret corruption as a tax, which increases the price of a project, say, building a school, in the recipient country. Aid is, therefore, defined as the expenditure on projects in the recipient country, and the effect of corruption on aid is given by whether demand is elastic. Although this framework is extremely simple, and has limitations which prevent it from being empirically tested, we believe it provides a starting point for explaining how corruption may impact on aid flows. We improve on the existing empirical literature by tackling endogeneity issues using the approach of lagged values. We also make an important contribution by verifying that our results are robust to taking into account the ordinal nature of the corruption measure we use.

Corruption is not an African disease, as many countries, both developing and developed, suffer from problems of corruption and few countries have escaped unscathed from scandals of kickbacks, payoffs and bribery. However, sub-Saharan Africa is riddled with many other problems, from extreme poverty, through alarming health conditions, to weak institutions and disrespect of human rights. All these factors contribute to making the task of taming corruption a particularly large and urgent one in sub-Saharan Africa. Unfortunately, there is no magic bullet to cure corruption. The fight against corruption requires a long-term commitment. We believe we have made a contribution to a better understanding of some of the problems of corruption in sub-Saharan Africa.

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