Essays on Corruption and Economic Development

Sebastian Freille, BA.

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To my parents, Maria Cristina and Jose.

Abstract

This thesis addresses two central questions in the field of corruption: the relationship between corruption and some of its main determinants and the effect that these relationships have on economic development. The research presented in this thesis extends the literature on corruption in several directions.

The third chapter studies the empirical relationship between press freedom and bureaucratic corruption. As one of the main democratic checks and balances, press freedom is thought to impose a curb on corruption. We investigate two related aspects. The first considers whether there exists a robust empirical relationship between press freedom and corruption. The second investigates the detail, by exploring which types of restrictions to press freedom are robustly related to corruption. Using robust regression techniques on a panel of countries we conclude that restrictions to media freedom are robustly associated to higher corruption. Also we find that both political and economic restrictions to press freedom are strongly related to corruption while legal and administrative restrictions are not.

The fourth chapter studies the relationship between decentralisation, corruption and development in a dynamic macroeconomic model. We assess whether corruption is always harmful to development, whether decentralisation is always beneficial for development and the effect that corruption produces on the relationship between decentralisation and development. Our main finding from this model is that if corruption is absent, decentralisation is the best alternative for development but may not be preferable to centralisation if corruption is widespread in the economy.

The fifth chapter examines the empirical relationship between decentralisation and corruption. This chapter has two main goals. First, to reconsider the available evidence in light of some newly assembled data. The second goal is to incorporate into the analysis several dimensions of decentralisation simultaneously. We find that the inconsistencies in the empirical literature arise due to the frequent omission of multiple measures of decentralisation. Secondly, that both fiscal decentralisation and constitutional centralisation are simultaneously associated with lower corruption. Finally, we find that certain forms of political decentralisation -local elections- weaken the positive effect of constitutional centralisation -unitarism- on corruption.

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Chapter 1

Introduction

1.1 Background and motivation

Public sector corruption is an "institutional disease" that is often difficult to detect and to control. It typically involves a transaction between *three* actors: *an agent* (i.e. a public official), *a principal* (i.e. the government) and *a corrupter* (i.e. individuals, firms, unions, etc.)[1]. The configuration of the corrupt transaction may adopt several forms with different outcomes for the intervening parts. This makes corruption a complex and multifaceted concept. Although it is present in all countries in some way, corruption is most pervasive throughout the developing world. In 2006, Transparency International noted that corruption was rampant in nearly 50% of the 163 countries ranked in their widely known index [Transparency International (2006)]. The obvious relationship between corruption and the level of economic development has led to the growing belief that the extent and persistence of public corruption is the greatest obstacle to achieving steady growth in the developing world. The World Bank (2001), for instance, has identified corruption as *the* single most important obstacle to development. Recently, Paul Wolfowitz, the reigning president of the institution, showed commitment to this by holding

[1] As opposed to many other crimes which typically involve two parties, the criminal and the victim. In a corrupt exchange, there is an implicit or explicit relation of trust while this relation is generally absent in other types of criminal activity. See Varese (2000) for more details

up loans to India, Bangladesh, Kenya and Chad and by allocating additional funds to the Bank's anti-corruption unit. A host of international organizations and think tanks have also recognized the relevance and urgency of the problem for international development.

To develop policies aimed at reducing corruption, the study of this phenomenon requires an examination of its nature, effects and determinants. In this research, the main interest is to explore some of the determinants of corruption[2]. In order to analyse the causes of corruption we must first acknowledge that corruption is a broad concept and it can refer to several different things. Therefore, it is convenient to make clear at the outset what we understand as public corruption in the context of this thesis. For our purposes, public corruption is defined as *"the abuse of public office for private gain"*. This definition of corruption is generally associated with what is known as *bureaucratic corruption*. Under this definition, we leave out a large number of situations that are regarded as involving acts of moral corruption yet perfectly legal (examples of these are lobbying contributions, influence-peddling activities, some instances of legal blackmailing, etc)[3]. In addition to bureaucratic corruption, there are other types of public sector corruption that affect a society, of which *political corruption* -involving political decision-makers- is possibly the most important. To put it another way, whereas political corruption takes place mainly at the decisional level, bureaucratic corruption surfaces at the implementation level [Amundsen (1999)]. It is, perhaps, these two types of corruption that have received the most attention by academic researchers and international organizations in recent decades. Although we will occasionally refer to political corruption, the present research is primarily concerned with bureaucratic corruption.

Bureaucratic corruption is generally thought to generate negative effects on eco-

[2]Analyzing the nature of corruption goes beyond the scope of this research and in any case is a complex issue that spans across several disciplines. In relation to the literature regarding the consequences of corruption, there is a growing body of knowledge from which the main and almost uncontested premise is that corruption is bad for development.

[3]Some authors suggest that these less evident forms of corruption may be more prevalent than more outright forms of corruption such as bribery and embezzlement. See Kaufmann and Vicente (2005) for a more detailed discussion.

nomic, political and social outcomes. Despite some optimistic theories about efficiency-inducing corruption -efficient grease theory or *speed money*- originated in the 60's [Leff (1964), Nye (1967), and Huntington (1968)], there is overwhelming evidence that this type of corruption impacts negatively on economic development. A number of factors underlie this negative impact, including the damaging impact on local and foreign investment, taxation, foreign aid and also the mix of economic activities. It has also been suggested that these detrimental effects are worsened if corruption is disorganized and uncoordinated [Shleifer and Vishny (1993), Prud'homme (1994) and Bardhan and Mookherjee (2000)]. In other terms, if everybody knows who to bribe and by how much in order to be granted a public service, then the level of aggregate corruption may be lower than if otherwise the case.

The political consequences of corruption are dependent on the extent and organisation of corruption but involve distortions to the decisions that politicians make. In general terms, corruption weakens the government institutions and therefore reduces political legitimacy. There are two related characteristics that influence the way corruption affects the polities of a country. The first is the position of the ruling government relative to the other actors (rival parties, interest groups, unions, etc.). Strong states are thought to be better able to control bureaucratic and political corruption compared to weak states since they have the power to set the social norms. The second characteristic is the form of government. Democracies are in general better equipped to reduce the level of corruption due to existence of several checks and balances. In authoritarian regimes, corruption takes place at the will of the ruler and there are no institutional safeguards against it. Corruption may also affect a society through a reduction in trust, the deterioration of moral standards and the rise of social and group tensions in heterogeneous societies.

Having recognised the detrimental effects of corruption on economic development, understanding the causes of corruption becomes of critical importance to elaborate policies to detect and to deter corruption. As it stands however, while the literature is large, it is often at odds regarding its findings and implications. Although

this is not entirely surprising due to the complexity of the problem at hand, it suggests that any contribution to the literature should carefully explore the robustness of the conclusions drawn and recognise that heterogeneity or multiple equilibria might exist. This represents one of the key motivations for this thesis.

Fortunately, the data and methods used for this kind of research are becoming richer and more suited to this task. In all, over the last 15 or 20 years a large number of causes have been identified and proposed as causing corruption to differ across countries ranging from economic variables to religious and cultural influences. For the sake of simplicity, we may group them into two broad categories, economic and non-economic determinants.

The main economic reason why countries differ in their corruption levels is the grade of economic development. Put it simply, poor countries tend to have higher corruption levels [La Porta et al. (1997), Ades and Di Tella (1999), Treisman (2000) and Serra (2006)]. In later sections we also review evidence that suggest that corruption both influences and is influenced by economic development yielding two-way causation between them. Academic research has found greater difficulty however in establishing the channels and the intermediate variables - other economic variables directly affected by corruption that affect ultimately development- that are behind this negative relationship.

Of the non-economic variables, long-standing democratic institutions, Protestant majority, political stability, British colonial heritage and unitary tradition are among the most important proposed elsewhere in the relevant literature. In most cases these are associated with lower corruption levels [La Porta et al. (1997), Treisman (2000), Adsera et al. (2003), Brunetti and Weder (2003) and Serra (2006)]. Compared to these economic and non-economic determinants, the two potential determinants of corruption that are the focus of this thesis, the existence and extent of freedom of the news media and the power-sharing arrangements between different levels of government, have received in comparison less attention. The following sections discuss why this is the case, how these topics are important and

the way they are approached in this thesis.

1.1.1 Media freedom and corruption

Although it is clear that corruption affects both democracies and non-democracies, there are reasons to expect the incidence of corruption to be lower in the former. This is due to the existence of the different checks and balances in democratic systems that should, in principle, act as deterrents of corruption. A potentially important democratic control is the freedom of the press. For over two centuries, political thinkers such as Alexis de Tocqueville, Thomas Jefferson and James Madison have attributed utmost importance to the liberty of the press as a fundamental democratic right. More recently, some empirical and theoretical developments have come to support this view [Van Belle (1997), Besley and Burgess (2001), and McMillan and Zoido (2004)]. As McMillan and Zoido (2004), p.91 remark ''*The news media are the chief watchdog. The checks and balances work as a system, so an independent judiciary and genuine political competition are important. But the media can provide oversight of the government even where the other checks and balances have broken down. Safeguards for the media -ensuring they are protected from political influence and are credible to the public- may be the crucial policies for shoring up democracy*".

At the same time, the effectiveness of the media in fulfilling this role can be called into question. Graber (1986) discussing the shortcomings of the media wrote that *"when an institution whose functions seem so essential to the public interest performs these functions far less than anticipated, one ought to look at the reasons, assess the consequences, and determine the public implications. There are numerous reasons why media performance deviates from expectations"*. A number of press freedom watchdogs have alerted that the levels of media freedom have slightly worsened in recent years with the danger of a worldwide downward trend looking increasingly possible. For instance, Reporters Sans Frontiers (RSF) stated in a press release that press freedom worldwide *"has taken a beating in the western*

hemisphere in 2005 and the early months of 2006"[4]. Similarly, Freedom House reports *"Press freedom saw modest gains in a number of key countries, including Ukraine and Lebanon, which received status upgrade in 2004... ...However, these improvements were outweighed by a worsening in the overall level of press freedom worldwide as measured by the global average score, continuing a three-year trend of decline."*[5]. More recently, Besley and Burgess (2002), Hillman (2003), and Vaidya (2005) have suggested that the media's role in deterring corruption may be limited and the relation is in fact much more complex. In the presence of corruption the press may be deliberately constrained from acting in its role as a deterrent of corruption. It is these contrasts that provide the motivation of the study of press freedom and its relationship to public corruption in Chapter 3 of this thesis. We provide strong evidence of a negative relationship between press freedom and corruption. Our findings also suggest that economic and political restrictions to media freedom are significantly associated with higher corruption while other forms of restrictions -legal and administrative- are not.

1.1.2 Decentralisation and corruption

In the remainder of the thesis we concentrate on a different aspect of the socio-political structure of society and its relationship with corruption. This relates to the decentralisation of government functions. The issue of the relationship between schemes of power-sharing between different levels of government and public corruption has emerged as one of the key aspects in the successful design, elaboration and implementation of decentralisation programmes. As many authors note, in the last 20-30 years decentralisation has been a fashionable idea and for many developing countries it has been all but inevitable since reforms to the public sector and to the intergovernmental relations have been pushed by international organizations.

[4]Reporters Sans Frontieres Press Release 10th May 2006, `http://www.rsf.org/article.php3?id_article=17632`

[5]See Freedom House, Press Freedom in 2004 available at `http://www.freedomhouse.org/template.cfm?page=131&year=2005`

The benefits attributed to decentralisation -mainly of an economic nature- by the early theories of fiscal federalism have been argued to be offset by new problems and inefficiencies -mainly of a political nature- in the more recent literature. As Bardhan (2002) notes: *"The traditional theory of fiscal federalism is now being extended to a political economy setting, with the introduction of transactions costs in the political markets or political agency problems between the ruler and the ruled, between the politicians/bureaucrats and the electorate, and for reasons mentioned above these transactions and agency costs may be much more serious in the context of developing countries"* [Bardhan (2002), p. 190-191]. There has been a reinterpretation of the economic theory of federalism, and several complications were taken on board (transaction costs, imperfect information, political decision-making, etc.). Several authors have suggested that certain forms of decentralisation may introduce perverse incentives and as a consequence it may be associated with higher corruption in certain conditions. For example, local capture, over-budgeting in sub-national jurisdictions, soft-budget constraints, information asymmetries between agents of different levels, and deficient monitoring mechanisms may encourage bureaucratic corruption.

Research on these issues is relatively recent and has been addressed at both the empirical and theoretical levels resulting in novel ways of thinking about the relationship between these variables. Nevertheless, the approaches of these papers vary too often and it is difficult to compare results, models and policy implications. Motivated by this lack of a systematic approach, present both in theoretical as well as empirical research, Chapter 4 considers these issues from a theoretical perspective and Chapter 5 empirically. In relation to theoretical research on decentralisation and corruption, there is a noticeable bias in favour of microeconomic approaches to this question. In order to understand the effect of corruption and decentralisation on economic development we propose a macroeconomic approach. Using an *over-lapping generations* endogenous growth model with corruption and the presence of multiple equilibria and development traps [Ehrlich and Lui (1999), Mauro (2004) and Blackburn et al. (2006)], we derive some results regarding the re-

lationship between decentralisation, corruption and economic development. Our model suggests that the effect of decentralisation on development depends crucially on the extent of corruption and on the interaction of efficiency (economic) and informational (political) elements.

The situation in terms of empirical research on corruption and decentralisation is similar to that of the theoretical case: there is a growing literature that yields mixed and even contrasting results. A review of the literature suggests that this may be because studies are often partial, they concentrate on only one aspect of decentralisation at a time, and do not account for the interdependencies between aspects of corruption. We agree with Manor (1999) when he writes: *"If it is to have a significant promise, decentralisation must entail a mixture of all three types: democratic, fiscal and administrative"*. The problem is, empirical research says very little about what the right mixture is. As we will later describe, the empirical literature in this area is still in its infancy and there is a growing need for more thorough and integrated approaches. Our research in Chapter 5 is a preliminary attempt to gaze critically at the available evidence and at the same time to overcome some of these shortcomings by exploring additional characteristics of this relationship.

1.1.3 Policy

We also provide an evaluative assessment of our results and attempt to draw some implications for policy. The design of policies aimed at tackling corruption should consider the diverse and varied nature of its determinants. In our research, we put emphasis on two important determinants of corruption which can be influenced directly and indirectly by policy changes. And the results of our research can provide some insights to the policy discussion. The two determinants of corruption we study are subject of much policy debate and discussion. In this sense, it has been made clear that the fight against corruption should be part of a broader agenda involving the strengthening of democratisation processes and sustained

economic growth. We will see in this research that one of the most important democratic check and balances has a significant deterrent effect on corruption. In particular, we suggest attention should be given to protect certain aspects of media freedom which are strongly associated to corruption. Even if the other democratic checks on corruption are not fully operational, there is still room for the media to act as an efficient watchdog on the government. Similarly, we will also derive some implications regarding the effects of decentralisation on corruption and try to determine the conditions and aspects that need to be considered when implementing decentralisation programmes and reforms. One of the implications of our analysis is that the effects of fiscal decentralisation on corruption are affected by the existence and extent of other dimensions of decentralisation in the economy.

1.2 Research Methodology

The literature on the determinants of corruption and development is not explicit about which particular methodology should be applied to this question. It rather comprises a combination of theoretical and empirical methods to explore several related aspects. The present research follows in this line and exploits the diversity of research techniques used in the literature.

Chapter 3 addresses the relationship between freedom of the press and corruption using an empirical methodology that explicitly explores the issue of robustness. This topic was first addressed by Leamer and Leonard (1983); Leamer (1983, 1985) in a series of papers warning about the fragility of regression estimates. The methodology derived from those papers, known as *extreme bounds analysis*, was conveniently adapted by Levine and Renelt (1992) and used in the context of cross-country growth equations. More recently, Serra (2006) implemented a similar analysis for corruption. We use sensitivity analysis in our study of the empirical relationship between press freedom and corruption and also introduce some extensions to the methodology. As we describe, the mixed evidence calls for a thorough and comprehensive approach to explore this relationship. We also

use different regression techniques in order to capture different characteristics of the data. Some of the techniques used are pooled ordinary least squares (OLS), generalized method of moments (GMM), and fixed-effects panel-data estimation.

The theoretical model of corruption, decentralisation and development uses the recent dynamic macroeconomic approaches previously applied by Blackburn et al. (2006), Ehrlich and Lui (1999) and Mauro (2004). This class of dynamic macroeconomic models are able to generate multiple equilibria, an agreed characteristic of the relationship between corruption and development and one not appropriately captured with the more common microeconomic approaches. Mauro (1995) identifies the need of a more general approach that takes into account not only the causation from corruption to development but also the reverse causation. This is precisely what the previous studies do and what we are set to do in Chapter 4.

Our next chapter addresses the relationship between decentralisation and corruption. We use an empirical approach to deal with this topic. As we will later analyse in more detail, there are several papers tackling the empirical relationship between decentralisation and corruption [Treisman (2000), Fisman and Gatti (2002a), Fisman and Gatti (2002b), Barenstein and de Mello (2001), Treisman (2002b,a), Enikolopov and Zhuravskaya (2006)]. Although these papers use similar methodologies the results and predictions they arrive at are often different and in some cases they are not comparable. Furthermore, in most cases the analysis of decentralisation is limited to a particular dimension and other aspects of decentralisation are not considered. In light of the mixed evidence and several theoretical presumptions in both the political science and economics literature, we believe that there are grounds to justify the inclusion of multiple dimensions of decentralisation in the econometric model. The theoretical literature is not explicit about the interrelations between these different aspects of decentralisation (i.e. whether fiscal decentralisation is helped or hindered by political decentralisation). Given this situation, we try to follow a sensible approach to dealing with these apparent inconsistencies in the empirical literature and to explore additional and alternative hypothesis. We explore several plausible interrelations between differ-

ent dimensions of decentralisation and analyse their relationship with bureaucratic corruption. While our aim is not in testing robustness as in the press freedom case, we try to be as exhaustive and comprehensive as possible in order to explain why the existing results diverge. Additionally, we test new and more refined hypotheses in order to understand better the empirical relationship between decentralisation and corruption.

1.3 Aims

Since our priority is to study the causes rather than the consequences of corruption, this research is aimed at making an original contribution to literature on determinants of corruption. As already suggested and explained in more detail in the next chapter, this strand of the literature is plagued by controversies. We set somewhat ambitious goals which we are able to achieve to some extent. One of these goals is to characterize the relationship between press freedom and corruption using a methodology that allows us to obtain robust results and conclusions.

Another goal is to contribute to the literature of decentralisation and corruption. Our purpose regarding the relation between decentralisation and corruption is three-fold. First, we aim to introduce multiple dimensions of decentralisation into both the theoretical and empirical analysis. Second, we endeavor to explain why the controversies in the empirical literature arise and suggest ways that contribute to increase our understanding of the subject. Finally, we aim to fill an evident gap in the literature by modelling the relationship between corruption, decentralisation and development in a macroeconomic setting. The next section summarises the organisation of the thesis and the contents of each chapter.

1.4 Structure

In the next section we review the scholarly literature on determinants of corruption placing emphasis on the main themes of this thesis. We review a number of studies dealing with the causes of corruption and provide an assessment of the main contributions and shortcomings in the literature. This chapter extends and reinforces some of the points made in this Introduction. In addition to this general literature review, we also provide a brief survey of the literature in each of the corresponding chapters. Chapter 3 introduces our first empirical investigation related to the relationship between press freedom and corruption. We provide a brief survey of the literature, explain the econometric methodology, and describe the results drawing some policy implications. The next chapter, Chapter 4, introduces a theoretical model of corruption, decentralisation and growth where we explain why corruption is endogenous to the economy, the effect of corruption on alternative decentralisation regimes and the implications these have on economic development. Chapter 5 presents our second empirical exploration into the relationship between decentralisation and corruption. We provide a reassessment of the empirical literature, present our hypothesis and carry out the econometric analysis. We analyse the results and provide some discussion. Finally, Chapter 6 presents the main conclusions of each chapter, an overall assessment of the contribution of this thesis and a discussion of some avenues for future research.

Chapter 2

A survey of the literature

2.1 Background

As Wesson (1968) notes, opportunities for corruption have existed ever since the first manifestations of the huge, elaborate and self-serving apparatus of the state sprung into life as far back as the Egyptian Old Kingdom. Widespread bureaucratic and political corruption are often considered to have triggered the demise of great civilizations of the past, eroding the main institutions of the *res publica* and dilapidating resources, ultimately tainting the ethical and moral roots of the society. Many autocratic and tyrannic regimes in the past kept the possibility of corruption latent by resorting to a host of ill-advised practices and activities. In more recent times, corruption still ranks as a major concern among national governments, international agencies and academics. This phenomenon has been the subject of observation and study during many centuries and it still receives much attention. Despite this long period of study and countless attempts to eradicate or at least control some of its effects, corruption has managed to survive and perpetuate itself. Although its forms, extent and manifestations have changed through the centuries, its present incidence and persistence is its defining feature.

In this chapter our aim is to place the research topics of this thesis in a broader context, stressing the relationship to different strands of the literature. We intend

to review these branches of the literature in order to highlight potential sensitivities of our main variables of interest. In fact, there are several studies which utilise some of the variables discussed here. To the extent that there are different conclusions and implications regarding the relationship between these variables and corruption, it is important to review and acknowledge them and to describe how we deal with these mixed predictions. Finally, we also endeavour to examine the literature in order to justify the choice of our conditioning variables. As we see later in this chapter, of the many variables proposed as determinants of corruption, only a small subset of these have been consistently found to have a significant and robust association to corruption.

Although economists and political scientists have always been concerned with corruption, there has been a recent surge in academic interest on the topic and particularly in the study of its relationship to development. There are several reasons that help explain this renewed enthusiasm on the topic. Firstly, the significant growth experienced in the political economics literature has triggered an increase in the number of studies in the economics of corruption. Secondly, the recent experiences of many developing countries which have found corruption to be not only an obstacle to economic development, but also a cause of political and social distress. Thirdly, the involvement of international organizations in the fight against bad governance and corruption has also promoted new research in this area. Fourthly, the use of new approaches and recent analytical and empirical techniques has also contributed to improve the quality of both theoretical and empirical research. Last but not least, the growing availability and reliability of data has also been a major force behind this trend.

There is now a large number of studies that constitute this fast growing literature on corruption and development. In the last 20 years researchers have studied different aspects of corruption and development and have produced important theoretical and empirical contributions. Scholarly research has examined several microeconomic aspects of corruption. For example, the topic of corruption as an efficiency-enhancing element has been revisited using queuing and auction models

to show the role of bribes as an allocative tool [Lui (1985), Beck and Maher (1986)]. Similarly, the role of efficiency wages in determining the mix of corruption and talent has also been analysed [Acemoglu and Verdier (1998), Acemoglu and Verdier (2000)]. Other research points to agency problems and government failures as inevitably linked to bureaucratic rent-seeking and corruption [Banerjee (1997)].

Another important fertile research area is that of the industrial organisation of corruption. It has been argued that uncoordinated (competitive) bribe taking may cause the aggregate level of corruption to be higher than if bribe taking is coordinated (monopolistic) [Shleifer and Vishny (1993)] or may not cause it to be lower [Bliss and Di Tella (1997)]. Similarly, there are studies showing the role of hierarchical structures in posing additional social costs to the economy under certain conditions [Hillman and Katz (1997)] and in stimulating individual incentives to accept bribes [Carbonara (1998)].

Another area that has been of research interest is that related to the political economy of decentralisation. Under certain conditions, the existence of local elections and local interest groups may jeopardize the positive effects of greater accountability due to political decentralisation [Bardhan and Mookherjee (2000)]. Likewise, according to some, the benefits associated with federalism may crucially depend on some form of political centralisation; otherwise opportunities for rent-seeking and corruption are significant at the local level [Blanchard and Shleifer (2001)]. There are several analyses of the relation between political institutions and corruption, including those related to the electoral system [Persson et al. (2003)], the judiciary [Osborne (2002)] and media freedom [Besley and Prat (2002)]. Finally, there are a number of macroeconomic models that analyse the joint determination of corruption and development that predict the existence of several development regimes [Ehrlich and Lui (1999), Mauro (2004) and Blackburn et al. (2006)].

The availability of new data has also stimulated a flurry of empirical research. As a consequence of this, there has been a sharp increase in the number of studies dealing with particular aspects of the relationship between corruption and devel-

opment. As discussed later most of this new research has focused on the empirical analysis of the causes and consequences of corruption. Regarding the latter, almost unanimously the main finding is that bureaucratic corruption has a negative effect on economic growth [Mauro (1995), Ades and Di Tella (1999) and Treisman (2000)]. In comparison, there is greater controversy regarding the causes of corruption. In particular, the results from this large literature often vary because of the method applied, and the variables and data used. As this is one of the main research themes of the thesis, I devote a great deal of attention to this strand of the literature in this chapter.

2.2 Main strands of the literature

The study of corruption faces several problems right from the outset. One of these is related to the definition of corruption. We have already discussed this issue in the Introduction and defined corruption as *"the abuse of public office for private gain"*[1]. Another problem is related to the detection of corruption and its measurement. In general, the existence of corruption is only indirectly revealed to us via the actions of the media, whistleblowers, NGOs for instance. Admittedly, this may give rise to inaccuracies, omissions and misleading information. Similarly, it is quite difficult to obtain reliable and representative data on the different aspects of corrupt transactions. Most data on corruption come from opinions, perceptions and assessments of the level of corruption in different regions and countries. Finally, there is the problem of comparability of any such data. Apart from the subjective measures which are available as indexes or rankings, it is difficult to find comparable indicators measuring different aspects involved in these activities.

Despite these obvious limitations, there have been important developments in the

[1] Andvig and Fjelstad (2001)provide an excellent and comprehensive review of the literature on corruption and also devote a section to examining different and alternative definitions of corruption. Bardhan (1997) also has a detailed discussion with some illustrations of the several concepts of corruption.

type and quality of cross-country and time-series corruption data[2]. Examples of this are the various corruption rankings -based on perceptions and polls- available elsewhere which have become standard tools of analysis. In principle, these indexes are not able to capture the precise levels or amount of aggregate corruption, but are nevertheless useful to trace patterns, elaborate trends and compare across countries. The availability of these indexes allows one to take a closer look at the problem and to identify recent patterns and trends in world corruption. For example, the latest edition of the Global Corruption Report [TI (2006)] puts the problem in context by stating that *"the trend analysis elaborated by Lambsdorff is the first rigorous effort to establish trends in the perceptions of corruption that are based on 'real' perceptions of change, and not on methodological adjustments to the CPI itself. It finds that robust trends do emerge in nearly 30 countries, of which about half made real improvement, while the other half deteriorated over time"*. A study by the World Bank [Kaufmann et al. (2005)] using its own corruption index (WBC) shows that while there is little evidence of a global improvement in governance, there are dramatic improvements (declines) in certain countries. It is also worth mentioning that while several advanced countries exhibit better corruption ratings over time, only a few developing countries show signs of an improvement in this trend[3].

We have already acknowledged the existence of two main strands in the literature of corruption and development. One of these is related to the study of the effects and consequences that corruption pose on economic variables and more generally on development. The other strand is concerned with the analysis of the determinants of corruption and typically involves the consideration of economic and non-economic factors. Essentially, it addresses a number of related questions: what are the forces that make corruption more pervasive in Africa and Latin America than in Western Europe? Why is bureaucratic corruption or other form

[2]We discuss these in more detail further below.

[3]Taking Lambsdorff's study, the countries which show an improving trend in their corruption ratings are: Australia, Bulgaria, Colombia, Costa Rica, Estonia, Finland, Hong Kong, Iceland, Italy, Mexico, Russia, Spain and Taiwan. On the other hand, the countries which exhibit a robust downward trend are Argentina, Canada, Czech Republic, Ecuador, Indonesia, Ireland, Malaysia, Philippines, Poland, Slovenia, Turkey and Zimbabwe.

of corruption present in almost every corner of the globe? Is it likely a society will experience improvements in government performance as a result of policy changes to the factors that increase corruption? Is there anything societies can do to avoid the piercing effects on the socioeconomic system of growing and expanding corruption? Although this strand of the literature has given several answers to most of these questions, there remains many doubts regarding the direction, significance and robustness of these relationships.

Although this thesis is mainly concerned with the causes of corruption, it is convenient to make a brief summary of the literature related to the consequences of bureaucratic corruption. Within this strand, it is possible to identify three different theoretical positions. First, there are the theories developed by both economists and political scientists in the 1960's whose central idea was that bureaucratic corruption may have a positive effect on development. If the economy is plagued by cumbersome and pervasive regulations then corruption may well be the grease required to ease the activities of a rigid administration. These views, held by Leff (1964), Nye (1967), and Huntington (1968) among others, relied on certain assumptions regarding pre-existing distortions, perfectly competitive markets and full information. These theoretical ideas were later adopted and formalized with the introduction of strategic considerations and imperfect information in the context of auction bidding [Beck and Maher (1986)], queuing models [Lui (1985)] and the informal economy [Sarte (2000)]. However, Bardhan (1997) argues the theoretical views of efficiency-enhancing corruption and its positive impact on development have several problems[4]. Furthermore, the available empirical evidence has consistently found that corruption has a strong negative effect on development[5].

[4]These theories assume that the distortions corruption is supposed to correct are exogenous but may in fact be endogenous and inherent to the system. Also, these models do not take into consideration the effect that failure to commit to the corrupt contract has on both efficiency and development. Finally, these theories do not explicitly consider the role of institutional checks and balances on the existence and incidence of corruption.

[5]Most notably, a study by Kaufmann and Wei (1999) using firm-level data find that firms paying high bribes tend to spend more time negotiating regulations than firms paying low bribes. This finding would seem to support Myrdal's argumentation that bureaucrats may end up delaying procedures purposefully rather than speeding them up.

Another view is that corruption affects key economic variables and ultimately has a negative effect on economic development. Several authors, using both theoretical and empirical approaches, have contributed to this strand. Murphy et al. (1991, 1993) have suggested that the allocation of resources (talent) to rent-seeking activities cause slower growth. Romer (1994) has also suggested that corruption viewed as a tax on ex-post profits may obstruct certain forms of investment. These theoretical ideas have been statistically confirmed by cross-country empirical work. For instance, Knack and Keefer (1995, 1997) and particularly Mauro (1995) endeavor to assess the effect of bureaucratic corruption on investment and economic growth[6]. The results support the theoretical view that corruption is detrimental to economic development. The main channel of influence is through the negative effect that corruption produces on investment. Other references in the same line and yielding rather similar results are Brunetti (1997), Hines (1995), Kaufmann et al. (1999), Davoodi and Tanzi (1997) and Wei (1997).

In recent years, several authors have proposed that corruption not only affects development but that also the level of development may have an effect on corruption. While an extension of the previous strand, this view has characterized the relationship between corruption and development as essentially bi-directional and endeavors to explain the incidence and persistence of corruption using dynamic macroeconomic models. For example, Ehrlich and Lui (1999) argue that the effect of corruption on development is to be viewed as an endogenous interaction of socially unproductive and growth-enhancing activities. Mauro (2004) introduces a model with strategic complementarities leading to good and bad equilibria. Blackburn et al. (2006) analyse the joint determination of corruption and development and show that the level of corruption not only affects but is also affected by the level of development. Aidt et al. (2005) predict the existence of multiple equilibria in the relationship between corruption and development when corruption and growth are highly complementary. These theoretical predictions have been

[6]Knack and Keefer (1995, 1997) investigate the effect of institutions on investment as well as on economic growth. They focus especially on inadequate institutions of several types that can be obstacles to economic performance.

confirmed by a few empirical studies that explore heterogeneity and interaction between these variables. For example, Haque and Kneller (2004) have used threshold effects and found significant evidence of an inter-relationship between corruption, culture and development. Similar results have been obtained by Aidt et al. (2005) and Mendez and Sepulveda (2006). Our work in chapter 4 is aimed at extending this literature by focusing on the joint determination of corruption and development under regimes of centralisation and decentralisation. Using the framework introduced by some of the theoretical models described above we aim to develop a model of decentralisation, corruption and development and to derive implications regarding the effect and extent of institutional changes.

The second area where research on corruption has been significant is usually referred as the literature on the determinants of corruption. The main objective of this literature is to find which are the relevant factors that account for cross-country differences in corruption. Although there are a number of theoretical works in this area, the vast majority of the studies adopt an empirical methodology. This is probably due to several reasons. First, as we already mentioned, the growing availability of corruption data has made possible such an analysis. Second, while the empirical literature on the consequences of corruption is overwhelmingly consistent with the result that corruption is harmful to development, there are many theoretical presumptions -some complementary, some contradictory- regarding the nature and importance of different causes. Naturally, this has resulted in a large number of empirical studies yielding often contradicting results. Finally, it is also important to note that, both in research and policy circles, the emphasis has gradually shifted from the study of the consequences to the examination of the causes of corruption. This is a result of the need to provide relevant empirical evidence to act as the basis for policy-making.

Most of the empirical studies share some common features regarding the methodology and their use of indicators. A large number of these studies use cross-country data in their analysis. Using panel-data in addition to cross-section would be advantageous but there are different obstacles to the use of such data. Another

shared characteristic is that these studies produce several testable hypotheses on the basis of theoretical presumptions or general theories from different disciplines. As a result, most of the studies adopt an *ad-hoc* specification that quite often makes results difficult to compare[7]. Another common feature is the use of subjective measures of corruption in order to proxy for the level of corruption or the estimated perceived corruption. Several authors have discussed that hard-data measures are scarce and they are often misleading and unreliable [Mauro (1995), Treisman (2000)]. Although these subjective ratings may not be able to capture the overall amount of corruption, they are, however, useful to compare countries based on the perceptions of different agents[8].

It is important to stress that most well-known corruption indexes -the CPI, WBC and Political Risk Services' ICRG- are actually measuring perceptions of corruption and are not intended to capture actual or experienced corruption. While the ICRG is compiled on the basis of expert assessments, the CPI and WBC aggregate several surveys of experts and business people. As noted in Treisman (2000), the subjects covered by these surveys included: "spread and amount of corruption in public and private busines", the frequency of "irregular, additional payments connected with import and export permits, business licenses, exchange controls, tax assessments, police protection or loan application", "improper practices (such as bribing or corruption) in the public sphere", "degree of misuse of public power for private benefits" and other related subjects. While Transparency International's CPI aggregates over more than 10 different surveys and polls, the World Bank's WBC incorporates other sources in addition to those included in the compilation of the CPI[9]. Considering the way these indexes are compiled and acknowledging previous empirical studies, we believe that both the CPI and the WBC are best

[7] As we noted, there are few theoretical model exploring the causes of corruption that produce testable implications. Some exceptions to this are Ades and Di Tella (1999), Leite and Weidmann (1999), Ellis and Dincer (2004) and Emerson (2005) where they develop a simple theoretical model and test the implications empirically.

[8] We provide a detailed explanation of these ratings in Chapter 3.

[9] It should be noted that the WBC does not include the CPI as a source but rather the original sources compiled by Transparency International. Given the larger number of sources, the WBC is available for a larger sample of countries.

suited to capture perceptions of bureaucratic corruption[10]. Another strength of both the CPI and WBC is that the surveys include opinions of residents and non-residents and both assessments are highly correlated. Another advantage of using either the CPI or WBC is that they include a measure of the dispersion of different component surveys and one can take this into account when analyzing the ranking. One potential shortcoming of these indexes is that they change slowly over time and this is partly due to the methodology that the score for one year is based on data for the previous two years. This means that substantial changes in perceptions of corruption are only likely to be reflected in the index over longer periods of time.

Another reason that has been argued in favour of the use of these indexes is the fact that these rankings are highly correlated among themselves (see Table 2.1). To some extent, this is evidence that the perceptions of corruption, regardless of whether they are accurate or not, are widely shared. As has been pointed out, *"if the ratings used in this paper reflect bias, it is a bias that seems to be shared by the populations of the countries studied"* [Treisman (2000), p.412]. From the table, there is evidence of what we argued in the previous paragraph concerning the little variation across time. The correlation between different years of a given index are generally very high at 0.95 and 0.83 for the CPI and the WBC respectively and slightly smaller for the ICRG at 0.63. On the other hand, the correlations across different indexes are diverse. While the CPI seems to correlate highly with all the indexes, the correlation between the WBC and the ICRG is relatively low. Finally, the lowest correlations are those between the ICRG and BI and the other indexes. One reason behind the high correlation between the CPI and WBC may be due to the fact they are both compiled using similar methodologies and they use certain common sources. As the empirical analysis in this thesis is primarily concerned with the study of relationships using cross-sectional data, both the CPI and the WBC are suited to this purpose and will be our main corruption indexes

[10]Note that although the surveys include certain aspects that may be closer to capturing political rather than bureaucratic corruption, political corruption has different nature and implications which are not well captured by these indexes. This is one of the reasons why these indexes have been used in previous studies as representative of perceived bureaucratic corruption.

throughout.

Table 2.1: **Correlations between different corruption indexes**

Variables	**cpi96**	**cpi00**	**icrg90**	**icrg00**	**wbc96**	**wbc00**	**bi80**
cpi96	1.00						
cpi00	0.95	1.00					
	(0.00)						
icrg90	0.83	0.81	1.00				
	(0.00)	(0.00)					
icrg00	0.78	0.83	0.63	1.00			
	(0.00)	(0.00)	(0.00)				
wbc96	0.84	0.75	0.39	0.42	1.00		
	(0.00)	(0.00)	(0.00)	(0.00)			
wbc00	0.82	0.79	0.53	0.47	0.83	1.00	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
bi80	-0.86	-0.79	-0.78	-0.60	-0.57	-0.65	1.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

Note: *cpi* is the Corruption Perception Index, *icrg* is the International Country Risk Guide Corruption Index, *wbc* is the World Bank Control of Corruption Ranking and *bi* is the Business International Corruption index.

Many potential determinants of corruption have been analysed by the empirical literature. Economic development, religious affiliation, colonial history, federalism, democracy, political instability, press freedom, degree of openness, and the form of the electoral system are among these. Similarly, the scope and depth of these empirical studies are diverse, going from those emphasizing a particular relationship to those including a large set of variables. This thesis is primarily concerned with the study of specific determinants of corruption rather than with exploring which determinants of corruption are important and relevant. Knowing that previous work has recognised the important role that both press freedom and decentralisation have as determinants of corruption, the present research tackles these two determinants. Given the sensitivity of many of the variables in the current literature, this thesis focuses on the robustness of these relationships.

While there is some agreement amongst academics regarding the causes of corruption and their relative importance, there are still many open issues and unanswered questions. There are also some discrepancies in the findings of different authors.

As we will discuss later in this research, these differences arise due to a variety of reasons, including the methodology used, the variables controlled for and the choice of the corruption indicator among others. In order to understand and justify the empirical and theoretical strategies adopted in this research, it is convenient to provide a brief survey of the main determinants of corruption that have been proposed in the literature. The next section is devoted to this purpose.

2.3 Causes of corruption: The evidence

The determinants of corruption, in line with the multifaceted nature of the phenomenon, are diverse and heterogeneous. The existence and extent of corruption may be the result of a complex interaction of many different historical, cultural, economic, political and social factors. Naturally, these factors may have different incidence on corruption and they may also be responsible for its persistence. The relevant literature has addressed a large number of these determinants and come up with different results. As a result of this research, several variables have been identified as significantly correlated with corruption. We group these into three main types.

2.3.1 Economic-related variables

Many *economic variables* have been proposed as potentially related with bureaucratic corruption. Standard variables such as economic development, total public spending, openness to trade, proportion of fuel and mineral exports in total exports have been used as also have other variables such as military spending, foreign direct investment, trade distance, measures for public wages, and the amount of foreign aid. There are in principle several reasons to believe that economic variables may cause corruption. One important reason is that certain activities or markets are prone to an increase in rent-seeking behaviour. This is for example the case of natural monopolies (gas, oil, telecom, etc.) where the environment

for corruption is ripe. Another reason is that certain types of investments, expenditures and payments are likely to generate opportunities for corruption. For example, one may think of restrictions to international trade and special concessions to foreign direct investment. Another example are public tenders to award service or infrastructure contracts. Finally, it may be the case that poor societies, with low levels of infrastructure, literacy and health care, are more likely to experience high levels of corruption.

Economic development

Perhaps the most robust empirical finding is that of the strong association between economic development and corruption. Higher levels of economic development are correlated with improvements in many economic, structural and institutional aspects of a society, which are in turn correlated with lower corruption. For example, it is generally accepted that public infrastructure increases in quantity and quality with economic development. This in turn reduces the margin for corruption and illegal behaviour. According to the economic theory of institutions, economic development also involves a gradual vanishing of traditional relations between the agents and organizations. With the establishment of a new set of institutions and relations the incentives for public officials to engage in corrupt practices may be reduced.

The expected negative correlation between economic development has been documented by empirical research. Most studies on the determinants of corruption include economic development as an independent variable. Although the purpose of some studies may be to focus on determinants other than development, they typically include some proxy of economic development, most commonly GDP per capita. The results for this variable are quite consistent: Ades and Di Tella (1999), La Porta et al. (1997, 1999), Treisman (2000), Fisman and Gatti (2002a) and Persson et al. (2003) all find a strong negative correlation between corruption and development, meaning that low-income countries are associated with high cor-

ruption levels. The same result is replicated by other studies [Goldsmith (1999), Rauch and Evans (2000), Van Rijckeghem and Weder (2001), Adsera et al. (2003), Tavares (2003), Graeff and Mehlkop (2003), Brunetti and Weder (2003), Broadman and Recanatini (2002), Serra (2006)], although the size of the coefficient for economic development is significantly smaller. Only a few studies in the literature question or contradict these results [Braun and Di Tella (2004), Fréchette (2004)] arguing that income increases corruption specially when using fixed-effects models[11].

In almost all cases, the inclusion (exclusion) of economic development increases (decreases) the explanatory power of the pertinent regressions. The size of the regression coefficient varies between the studies and also due to different corruption indexes used. For example, using Transparency International (hereafter TI) index, the coefficient ranges from -0.4 to almost -4. Another characteristic of these studies is that, in general, when included as the only explanatory variable, the level of development explains from 50% to 70% of the variability in corruption across countries (depending on whether Business International or Transparency International index is used).

More difficult has been establishing the direction of causation between economic development and corruption. In order to control for potential endogeneity most authors perform some tests to limit this possibility. Using a suitable instrumental variable (distance from the Equator) to deal with the endogeneity problem, Treisman (2000) claims that higher levels of economic development result in lower levels of perceived corruption. A similar strong negative correlation between economic development and corruption is obtained by La Porta et al. (1999). Ades and Di Tella (1999) recognize the fact that the relation also flows in the opposite direction, perceiving economic performance itself as being affected by the quality of institutions. Serra (2006) and Seldadyo and de Haan (2005, 2006) introduce

[11]See Seldadyo and de Haan (2006) for a very detailed and comprehensive literature survey on the causes of corruption. The authors cite a larger number of papers than we have here. With very small differences, the qualitative results are the same and the quantitative results are very similar.

robust methodologies to control for sensitivity of the regression estimates to alterations in the information set. While Serra (2006) and Seldadyo and de Haan (2005) find strong evidence that economic development is robustly associated with lower corruption[12], Seldadyo and de Haan (2006) in contrast find that only certain proxies of economic development -primary school enrolment and illiteracy rate- are robustly correlated with corruption. Somewhat surprisingly, the sign of the coefficient on illiteracy rate suggests that this variable is counterintuitive, meaning that high illiteracy rates are associated to low corruption. Although the authors do not elaborate on this result, it contradicts the findings in the empirical literature.

Summing up this literature, it appears that low development is significantly and strongly associated with high corruption. Indeed, according to the evidence, development appears to be the single most important factor associated with bureaucratic corruption. On the other hand, the literature is less clear regarding the direction of causation. Does economic development reduce corruption levels or is it that lower corruption promotes development or both? Although research regarding this point is relatively new, the empirical side of the question has yet to provide an answer to the endogeneity problem[13].

Other economic variables

Some theoretical arguments have suggested that trade-related variables may have an effect on perceived corruption. For example, there are certain reasons to expect a negative correlation between the degree of openness of a country and its corruption rating. Exposing the country to foreign competition is generally followed by a decrease in the opportunities for rent-seeking. This is so because trade restrictions (i.e. import licenses) may foster bribe-taking and rent-seeking behaviour [Krueger (1974)]. Other sources of variability in corruption levels across countries have been suggested and include different endowments of valuable raw materials,

[12]The coefficients in her study range from -0.83 to -2.0 for all the regressions calculated.

[13]Contrarily, some recent theoretical studies propose the existence of a bi-directional relationship between corruption and development. We have already mentioned a few studies and we will return to them later in this chapter.

the distance to the main exporting centers and differences in FDI flows[14].

The results presented in Ades and Di Tella (1999) suggest that certain trade variables are significantly associated with corruption. In particular, they find that greater openness and higher import share are significantly associated with lower corruption levels. Other studies have obtained the same qualitative finding [Treisman (2000), Fréchette (2004), Persson et al. (2003) and Herzfeld and Weiss (2003)].

In comparison, little or no significant association between these variables is reported in Treisman (2000), Fisman and Gatti (2002a), Adsera et al. (2003), Broadman and Recanatini (2002), Brunetti and Weder (2003) and Serra (2006). Interestingly, Wei (2000) and Gatti (1999) find evidence (albeit rather weak) that greater openness not only causes corruption to decrease but is also a consequence of lower corruption. Similarly, countries with a high export share of raw materials such as minerals, fuels and metal, are found to have higher corruption levels [Herzfeld and Weiss (2003), Tavares (2003), Adsera et al. (2003), Fréchette (2004) and Seldadyo and de Haan (2006)] while other authors found an insignificant or very small effect [Treisman (2000), Serra (2006)]. Finally, there is mixed evidence regarding the association between foreign aid and corruption. While Tavares (2003) finds that increases in aid help to reduce corruption, Ali and Isse (2003) show the opposite result. It is important to note that in several cases the significant relationship tend to disappear when other variables are included in the regression, most notably economic development. This is mainly due to the high correlation between economic development and most of the trade variables.

Certain characteristics of the public sector may be important in the explanation of the differences in corruption across countries. After all, bureaucratic corruption may be influenced not only by bureaucratic structures but also by more general

[14] Ades and Di Tella (1999) have suggested that the larger the endowment of these materials, the greater the potential gain to public officials in charge of allocating the rights of exploitation. In relation to geographical conditions, they argue that if there is a big enough trade distance to the world leading exporters, local firms may benefit from this 'protection' in terms of transport costs. If this is the case, it is reasonable to expect more rent-seeking activities in countries enjoying this type of cost advantage.

features of the government. One obvious factor to consider is the relative size of the government. It is reasonable to think that the larger the relative size of the public sector the larger the likelihood that corruption will appear. On the other hand, it has been suggested that larger governments may have associated higher public wages which, in turn, will lower the incentive to take bribes.

The lack of consensus regarding the predicted effect of government size on corruption is also reproduced at the empirical level. While Fisman and Gatti (2002a) and Adsera et al. (2003) report a significant negative relationship (larger governments are associated to better governance), Goel and Nelson (1998) and Ali and Isse (2003) report that higher public spending is associated to higher corruption. Corruption levels may be also influenced by the structure and level of public wages. The intuition for this is straightforward: *ceteris paribus* the incentive to get involved in corrupt activities should be smaller the higher the wages paid to public servants as the opportunity cost of corruption increases [Becker and Stigler (1974), Ul Haque and Sahay (1996)].

How well has this prediction fared in empirical research? Most of the empirical studies investigating this relation have failed to find any significant association between the variables [La Porta et al. (1999), Treisman (2000), Rauch and Evans (2000), Van Rijckeghem and Weder (2001) and Serra (2006)][15]. Along similar lines, Rauch and Evans (2000) also finds that recruitment along "meritocratic principles" leads to improved bureaucratic performance. Other effects such as the presence of internal promotions and career stability have only marginal effects on corruption.

Others have focused on particular types of public spending. One such component is that related to spending on military and defense activities. Again, the hypothesis is often contradictory since some argue that certain categories of military spending

[15]While the first two papers use the ratio of average wages of central government to per capita GDP, Van Rijckeghem and Weder (2001) opt for the ratio of public sector wages to wages in the manufacturing sector. Although the coefficients have the predicted negative sign, meaning that higher wages are associated to less corruption, the poor performance in terms of statistical significance is notorious. This result has been attributed to problems of endogeneity of the independent variable. As Treisman (2000) notes, if corrupt politicians allocate themselves higher wages, then this could be blurring the expected negative relation

are highly open to corrupt practices [Hines (1995)], whereas others consider the possibility that governments are the only providers of military and defense services and this may encourage rent-seeking activities [Gupta et al. (2001)]. Additionally, one may argue that defense and military spending, unlike many other types of public spending, is often surrounded by a veil of secrecy. Gupta et al. (2001) test the hypothesis and they find a positive association between corruption and military spending. In a more general approach Mauro (1998) investigates the relation between corruption and the composition of public spending and finds no evidence of a significant relationship.

Finally, a number of different socio-economic factors have been also proposed as potential determinants of corruption. These have included human capital [Van Rijckeghem and Weder (2001) and Ahrend (2002)]; educational indicators [Persson et al. (2003), Ahrend (2002), Seldadyo and de Haan (2006)][16]; economic freedom [Goldsmith (1999) and Treisman (2000)]; and demography [Swamy et al. (2001), Tavares (2003), Fisman and Gatti (2002a), Persson et al. (2003) and Freille et al. (forthcoming)].

2.3.2 Political variables

Different political and institutional arrangements may be important when it comes to explaining the differences in corruption levels. This issue has been tackled by researchers who have produced contributions at both the theoretical and empirical level. Again we identify two main strands: democracy and decentralisation. A key point that is often stressed in both of these literatures is that many of these different political and institutional determinants observed may be the result of pre-existent corruption conditions. In other words, the analysis of the political determinants of corruption is made more difficult by the likely existence of endogeneity problems.

[16]Fréchette (2004) obtains a stark counterintuitive result for this relationship since improvements in schooling seem to be associated to improvements in corruption. We argued earlier this same counterintuitive result had been obtained by Seldadyo and de Haan (2006)

Democracy and corruption

Political institutions shape the conditions under which the economic activity takes place. A particular dimension of these arrangements is the characteristics of the political system. There are several reasons to think that countries where democratic and open political systems prevail, are likely to experience lower corruption[17]. If democracy is in practice associated with the existence of more transparency and checks and balances on the chief executive, then it is reasonable to think that these institutions may contribute to curb corruption. Likewise, thriving democratic conditions represent institutional safeguards of basic political and civil rights. Furthermore, citizens may become more involved in the political process and therefore exercise a closer monitoring and control on the government. In addition, freedom of the media and an independent judiciary may help to keep a strong check on government corruption. In systems with free and periodic elections, people may vote out corrupt incumbents and rival politicians may also be encouraged to find evidence against them [Andvig and Fjelstad (2001)]. These theoretical relationships between democratic institutions and corruption have been explored by several authors in the context of the political science literature [Mayhew (1986), Graber (1986), Friedrich (1989), Wittman (1989), Przeworski (1995), Lijphart (1999), McMillan and Zoido (2004)] and also in the more recent political economics and corruption literature [Myerson (1993), Persson and Tabellini (2000), Treisman (2000), Persson et al. (2003), Adsera et al. (2003), Kunicova and Mattes (2006)]

The description of democracy associated with lower corruption is again not a universal opinion. For example, Rivera-Batiz and Rivera-Batiz (2002) note that under certain conditions democracy may be a potential source of government misconduct and inefficiency. In particular they refer to the proliferation of interest

[17]There are also some ideas suggesting that "controlled" authoritarian systems may be associated to low corruption levels. The main intuition behind these theories is that the rulers have strict control over the politics and the economy implying a control over corruption. This is in line with the ideas suggesting that coordinated corruption is less detrimental than uncoordinated corruption.

groups and their influence in government decisions. Other authors have suggested that corruption may actually be encouraged by enhanced electoral competition through raising campaign funds, promising biased political measures, etc. [Geddes (1999), Goldsmith (1999)]. Barro (1996) has also recognised that democracies have inherent growth-retarding and rent-seeking features.

Empirical research produces a more robust result than its theoretical counterpart. Overwhelmingly, empirical studies conclude that democratic features in a country are associated with lower levels of corruption[18]. Treisman (2000) for example reports a significant negative association between exposure to democracy and corruption, implying that long-standing democratic institutions are associated with better governance. Knack and Omar Azfar (2003), Chowdhury (2004), Fréchette (2004), and Serra (2006) all find the same negative relationship and importantly that this is robust to additional tests and alternative specifications.

However, while Paldam (2002), Goldsmith (1999), Fisman and Gatti (2002a), and Adsera et al. (2003) find evidence of a negative relationship, they show the effect is quite sensitive to the inclusion of other important variables. Somewhat surprisingly, Ades and Di Tella (1999) have reported a positive correlation between the lack of political rights and good governance, although they note it may be due to the existence of several outliers[19].

Checks and balances

To some extent, researchers have tried to incorporate and control for different democratic institutions in their relationship to bureaucratic corruption. Rather

[18] One aspect that has been subject of debate is what proxies are best suited to capture the "level of democracy" or the existence and extent of democratic conditions. The literature has seen the use of many different variables such as dummies, democracy indexes and proxies for the number of years that countries have been democracies. One sensible approach is to use a country's exposure to democratic conditions. By using this variable, Treisman (2000) argues, one is able to capture better the idea that democracies produce not only short but also long-term important effects on the country.

[19] The large majority of these studies use either a democracy index or a dummy controlling for the persistence of democracy. In other cases, authors use other measures as proxies for democratic conditions such as a dummy for democratic countries.

than using an aggregate democracy indicator, these studies focus on particular features of the democratic system of government. This is important since as McMillan and Zoido (2004) correctly argue that, for a democracy to work efficiently, all the checks and balances should work. Among these, we can mention the electoral system, political competition, an independent judiciary and a free media. Accordingly, a great deal of the empirical work on political institutions and corruption is concerned with the examination of these issues.

Electoral system. One field where there has been much interest is that related to the relationship between corruption and the characteristics of the electoral system[20]. Myerson (1993) formalized the idea that in electoral systems with low barriers to entry, citizens are more able to control and make corrupt incumbents accountable. Given that barriers to entry are higher in single-member districts, these models predicted that larger electoral districts and lower thresholds for representation should be associated with lower corruption. Persson and Tabellini (2000) and Kunicova and Rose-Ackerman (2005) also introduce a distinction between plurality systems and proportional representation systems. Their analysis suggests that corruption incentives should be more significant in proportional representation (party lists) systems where an incumbent's probability of reelection is less linked to performance.

The main empirical contribution to test the relationship between characteristics of the electoral system and corruption is the paper by Persson et al. (2003). They use specific data for these electoral indicators and also include a measure of basic political rights as a proxy for the existence and extent of democracy. They find significant evidence that voting over party lists is associated with higher corruption levels. They find no significant evidence of a negative association between district magnitude and corruption. Another finding is that countries with majoritarian electoral systems are less corruption-prone than countries with proportional representation. According to their study, endogeneity should not pose a problem

[20]See Cox (1997) for an overview of the characteristics of different electoral systems.

for both party list and district magnitude, given that electoral reforms are few and far between.

Independent judiciary. Another important democratic control is the existence of an independent judiciary. Even if democracy is a long-standing institution and other checks and balances are operating, it is possible that the judiciary is controlled by the chief executive or by the legislative and in these conditions it may not fulfill one of its roles as a balance on government activity. Salzberger (1993) notes the existence of a *"view of separation of powers and portraying the judiciary as one mechanism that operates to balance and control the legislative and executive branch, and hence as an obstacle to rent-seeking activity and interest-group legislation"* [Salzberger (1993), p.350]. This issue has received relatively less attention in recent years but there are two studies that explore this relationship to some extent. La Porta et al. (2004) have analysed the judicial checks and balances in great detail. Although they have not directly analysed their relationship with corruption, they find that judicial independence is significantly and positively associated with economic and political freedom. The only paper that has explored the relationship between corruption and judicial checks and balances is Alt and Lassen (2005). Using data on American state governments, they find that lower corruption is associated with greater judicial independence, as proxied by the existence of elected, rather than appointed state supreme court judges. Additionally, they find evidence that this effect is stronger if the government cannot control itself[21]. Although these recent studies suggest that the judiciary may be an important check on government corruption, it may be advisable to remain prudent regarding this relationship[22].

[21] This is the case when the executive and legislative are controlled by the same party. When the executive and legislative are controlled by different parties, then the government can "control itself" and therefore the role of the judiciary should be less important

[22] There are several nuances that may be incorporated to this analysis blurring the predicted relationship. For example, there are different procedures to elect judges, there may be different implications concerning the retribution and pay schemes to judges and finally, there are likely to exist certain constitutional subterfuges and other provisions to bypass judicial decisions.

Political instability. Healthy democracies are generally associated with more political stability. Several authors have noted that political instability, which is often significant not only in authoritarian regimes but also in new and recent democracies, may be associated with higher corruption. This is the view of Treisman (2000) and Persson et al. (2003) who argue that bureaucrats may be more induced to engage in rent-seeking and corruption in a politically unstable environment. On the other hand, Fredriksson and Svensson (2003) have argued that the net effect of political instability on corruption depends on the overall level of corruption. The issue has been investigated empirically and the evidence seems to support the idea that political instability and corruption are positively associated[23]. Despite the theoretical insights, most authors have not found evidence of a significant positive relationship between these variables. This is the case of Treisman (2000) and Persson et al. (2003) who find an expected positive but insignificant coefficient. Only Adsera et al. (2003) find significant evidence of a positive relationship. The studies concerned with sensitivity analysis of the causes of corruption have obtained mixed evidence. While Serra (2006) concludes that corruption is higher in politically unstable countries, Seldadyo and de Haan (2005, 2006) do not find political instability to be a robust determinant. This mixed evidence may be due to the use of different proxies, to the inclusion of highly correlated democratic controls in the specifications and to the use of a different set of control variables.

Freedom of the press. In the opening paragraph to Chapter 2 of his treaty *On Liberty*, John Stuart Mill wrote that *"the time, it is to be hoped, is gone by when any defence would be necessary of the 'liberty of the press' as one of the securities against corrupt or tyrannical government"*[24]. The existence of a free press as a check against government activity is one of the centerpieces of the democratic system. The theoretical reasons for expecting a free press to be a check on misgov-

[23] One of the usual measures used to proxy for political instability is the ratio of the number of government leaders in a recent period in relation to the length of this period. Depending on different political regimes, the definition of leader varies accordingly. For instance, the prime minister is defined as such in parliamentary systems; the president is the leader in presidential systems and the head of state or ruler in non-democratic systems.

[24] Mill (1998), p. 20

ernance and corruption are straightforward. Countries where freedom of press and speech are not only enshrined in the Constitution but also effectively fulfilled are expected to exert an important control on their officials and bureaucrats. Broadly speaking, the media perform two types of activities: news reporting and investigative journalism. The media (or at least some sectors) will undertake investigations with the aim of unveiling corruption and illicit acts of public officials. Brunetti and Weder (2003) argue that a free press can be a mechanism to fight both *extortive* and *collusive* corruption[25]. Independent journalism will always be willing to investigate and expose any kind of offences[26]. More recently, a few papers have echoed the views of Graber (1986) and argued that the role of press freedom as a watchdog on government corruption may be limited or restrained under certain conditions [Besley and Burgess (2002), Besley and Prat (2002), Hillman (2003) and Vaidya (2005)]. In light of these developments, it should be clear that, although there are grounds to expect a negative relationship between press freedom and corruption, there may be particular aspects that introduce some uncertainty about the sign of the predicted association.

We provide a more detailed revision of the empirical literature in our analysis of the relationship between press freedom and corruption in Chapter 3. For the moment, we note that although most studies find an expected negative correlation between press freedom and corruption, this relationship appears to be sensitive to different specifications and indicators used in the analysis. Our study in Chapter

[25]The case for *extortive corruption* is very clear since both parties involved have different bargaining power. Governments with discretionary power can exert several types of influences on various types of agent in order to collect bribes and other special payments. The case for licenses and permits are examples of this type of corruption, where the officials can extract payments from the contractors depending on the pervasiveness and extent of the corruption networks. On the other hand, firms and contractors can threaten to reveal the affair to the press and therefore the probability of being detected increases. The existence of free and independent media could therefore act as a channel available to private contractors or firms in order to expose inappropriate behaviour. *Collusive corruption* presents different incentives, because both parties have a mutual interest in the bargaining. The incentive to investigate in this case does not stem from the abused agent but from the independent involvement of the media. The authors even suggest that "a free press is probably the most effective institution to control collusive corruption" [Brunetti and Weder (2003), p. 1805].

[26]In their paper, they rule out the possibility that all the media and independent journalists become involved in a sort of cartel that is paid by bureaucrats in order to conceal their illicit activities. For anecdotal evidence regarding the rare occurrence of this situation see McMillan and Zoido (2004).

3 is aimed at making a contribution to this field by testing this relationship for robustness focusing primarily on press freedom and by analyzing the relationship between different aspects of press freedom and corruption. We provide several strong tests for the robustness of the effect of press freedom on corruption which differ significantly from the tests found in the current literature. Moreover, we add detail, as well as information on robustness and causation to that literature.

Decentralisation and corruption

Is decentralisation associated with more or less corruption? This question has no clear answer either at the theoretical or empirical level. Decentralisation is a multifaceted concept and any analysis of the relationship between these variables should recognise the existence of different dimensions of decentralisation. In this section we provide a brief review of the theoretical background, the empirical evidence and the conflicts existing in the literature. The objective is to place our research topics within the relevant literature. We include a specific and more detailed survey of the literature in chapters 4 and 5

The theoretical underpinnings lying behind the relation between decentralisation and corruption are diverse. The early theories of Samuelson, Musgrave and Tiebout later formalized by Oates (1972) gave form to the fiscal federalism literature which predicted significant efficiency effects of decentralisation on public service delivery. These ideas were reinforced by similar views which regarded centralised power as creating opportunities for corruption to arise and thrive [Klitgaard (1988), Weingast (1995), and Goldsmith (1999)]. It was argued that inter-jurisdictional competition would curb the opportunities for corrupt behaviour. On the other hand, some authors introduced political economy considerations to the analysis and warned about the overall effects of decentralisation [Banfield (1975), Prud'homme (1994), and Shleifer and Vishny (1993)]. Some of these ideas are based on arguments of capture of local officials [Bardhan and Mookherjee (2000)], information asymmetries [Aghion and Tirole (1997), Carbonara (1998)], yardstick

competition [Besley and Case (1995), Ellis and Dincer (2004)], interjurisdictional competition [Cai and Treisman (2004)] and uncoordinated bribe-taking [Shleifer and Vishny (1993), Waller et al. (2002)][27]. Despite this large literature on the relationship between decentralisation and corruption, there is a surprising lack of macroeconomic approaches that address this relationship.

The empirical literature on this topic has been very active in recent years although there are limitations in the availability and reliability of data. One important aspect to consider here is what dimensions of decentralisation should be considered in the econometric model. As we mentioned, there are several aspects of decentralisation and they may have different effect on corruption. In general, the empirical literature has focused on fiscal decentralisation [Fisman and Gatti (2002a), Fisman and Gatti (2002b), Barenstein and de Mello (2001)]. The main finding is that fiscal decentralisation is associated to lower corruption. Other studies [Goldsmith (1999), Treisman (2000), Adsera et al. (2003), Wu (2005) and Serra (2006)] have used a federalism dummy instead[28], obtaining opposing results for the effect of federalism on corruption. More recently, there have been attempts to include and control for other aspects of decentralisation testing for the interrelations between these aspects [Barenstein and de Mello (2001), Treisman (2002b,a), and Enikolopov and Zhuravskaya (2006)]. For instance, Barenstein and de Mello (2001) find that corruption is affected by the way in which sub-national expenditures are financed. Enikolopov and Zhuravskaya (2006) find support for some long-standing theories of political centralisation.

As many authors point out, the fact that very few comprehensive empirical studies on decentralisation exist advise against drawing strong conclusions about the spe-

[27]There are several other references analyzing the relationship between decentralisation and corruption from a theoretical perspective although they do not explicitly introduce welfare or growth considerations. See for instance Besley and Case (1995), Canavese (2004), and Ellis and Dincer (2004).

[28]The defining line between federal and non-federal states has been subject to a big debate among political scientists. There is agreement, however, that federal states have some primary defining characteristics. Among these are the existence of an agreed division of power between different tiers of government and the fact that the different levels of government rule over the same citizens but have some degree of autonomy over certain and exclusive areas.

cific and overall effects of decentralisation[29]. After all, both recent cross-country evidence and case studies produce mixed evidence. However, the idea that the political and administrative dimensions of decentralisation may affect the outcome of fiscal decentralisation seems to have gained acceptance among researchers and needs to be incorporated in both theoretical and empirical modelling. In a similar fashion, the suggestion that decentralisation is associated with higher corruption should be seriously addressed considering the effect this may have on economic development. Our analysis in chapters 4 and 5 is meant to capture these ideas and contribute to this recent research literature.

2.3.3 Other determinants: cultural, geographical and historical

Researchers have also suggested the potential effect of religious traditions, geographical conditions, historical institutions and other cultural factors on bureaucratic corruption. For example, interpersonal relations and trust among citizens may be very different among countries with different colonial history. Similarly, different traditions in legal matters probably shape the way the law is created and administered. The role of different religious affiliations has also been suggested as a potential determinant of corruption. The empirical literature has addressed these issues to some extent and a large number of different cultural, geographical and historical factors have been tested as potential determinants of corruption. These have included ethnolinguistic fractionalisation [La Porta et al. (1999), Lederman et al. (2005), Persson et al. (2003), Ali and Isse (2003)]; protestant religion [La Porta et al. (1999), Treisman (2000), Adsera et al. (2003), Persson et al. (2003)]; colonial history [La Porta et al. (1999), Treisman (2000), Persson et al.

[29]Several case studies analyzing the impact of specific decentralisation programmes find evidence of a positive relation between these programmes and certain efficiency and welfare indicators. Bardhan (2002) surveys some interesting studies most of which reveal positive effects of decentralisation programmes targeting specific goals on efficiency and welfare. Fjelstad (2004) also reviews available empirical evidence and several case studies where the focus is on the effects of decentralisation on corruption. In any case, although the authors recognise the important conclusions of these studies, one should not be tempted to draw general implications.

(2003), Herzfeld and Weiss (2003)]; and legal origin [Gatti (1999), La Porta et al. (1999) and Fisman and Gatti (2002a)]. The evidence for all these variables is mixed and the effect of most of these factors on corruption is quite sensitive to the other variables included in the regression equation.

2.4 Concluding remarks

The empirical literature on the determinants of corruption is quite large and offers mixed predictions. To some extent this is a consequence of the existence a variety of ways in which the relationship between corruption and its determinants is modelled. Additionally, this may be due to the variables being very sensitive to the inclusion of other important determinants and to the possible omission of strong tests of robustness of the estimates. In the presence of model uncertainty, it becomes important to use sensible approaches to modelling the empirical relationships. One such approach proposed in the literature is known as *extreme bounds analysis* [Leamer (1983, 1985)]. This analysis is one way of addressing model uncertainty in the context of multiple regression and, as noted by Temple (2000), can be carefully presented to address the most common objections made in the past. We use this analysis in our investigation of press freedom and corruption.

It seems appropriate to provide a summary and assessment of the main findings of the empirical literature. In order to do this, we focus on the findings obtained by four comprehensive and detailed studies [Treisman (2000), Serra (2006), Seldadyo and de Haan (2005, 2006)]. While Treisman (2000) does not provide a global sensitivity analysis of the estimates (unlike the other papers), his investigation is quite relevant and introduces several important robustness tests. All these studies find that economic development is a robust determinant of corruption. Furthermore, all the papers find evidence that democracy is robustly associated with lower corruption. While Treisman (2000) and Serra (2006) find that long-standing democratic traditions is a robust determinant of corruption, it is certain democratic institutions such as political freedom and the judiciary system [Sel-

dadyo and de Haan (2005)] and political stability [Seldadyo and de Haan (2006)] that are robustly associated with lower corruption in the other papers. In relation to other important determinants, these studies obtain mixed evidence. Protestant religion is robust according to Treisman (2000) and Serra (2006) but does not pass the robustness tests in Seldadyo and de Haan (2005) and Seldadyo and de Haan (2006). A measure of freedom of information is robust only in Seldadyo and de Haan (2005). Measures of decentralisation are not rendered robust in any of these studies[30]. Finally, while both Treisman (2000) and Serra (2006) find that colonial heritage is robustly associated with corruption, this variable has not been rendered robust in Seldadyo and de Haan (2005) and Seldadyo and de Haan (2006).

In light of this evidence, it appears that only two variables have been consistently found as significant and robust determinants of corruption: economic development and democratic institutions and traditions. Our work in Chapter 3 and Chapter 5 takes these findings into account and incorporates a measure of these variables into the regression equation. We believe this is a sensible way of approaching the study of the relationship between corruption and its determinants. In each of these chapters the relationship between our main variables (press freedom and decentralisation) and corruption is modelled considering the strong evidence in favour of the inclusion of economic development and democracy as standard controls in the corruption equations.

[30]Treisman (2000) does find a positive association between federalism and corruption which has not been supported by the studies of robustness.

Chapter 3

A contribution to the empirics of press freedom and corruption

"Were it left to me to decide whether we should have a government without newspapers, or newspapers without a government, I should not hesitate a moment to prefer the latter" (Thomas Jefferson)

3.1 Introduction

The decision to participate in corruption, like any crime, depends upon a combination of the size of the payoff received, the probability of detection and the size of any punishment upon being caught. A commonly held belief is that a free and independent press can, along with other agencies, form an important part of the detection process and therefore act as a deterrent to corruption. This view has found support in a few recent papers that consider the relationship between aggregate press freedom and corruption. Ahrend (2002), Stapenhurst (2000) and Peters (2003) all discuss the essential role of the (free) press in monitoring, reporting and denouncing official abuses for example. While using regression analysis Ahrend (2002), Brunetti and Weder (2003) and Chowdhury (2004) find that low levels of

freedom of the press are associated with high levels of corruption, controlling for other important determinants of corruption.

While most accept that the press plays a role in detecting corruption, there are reasons to suggest that its effectiveness may be overstated however. Graber (1986), for example, notes that press freedom carries both benefits and costs and the common belief that the net effect is positive does not survive deeper analysis. As she writes *"close examination of several recent instances of press sleuthing with widely heralded payoffs indicates that the media often deserve less credit than previously believed for detecting public wrongdoing and fostering correction"* [Graber (1986), p. 271]. Similar concerns are described in Pharr and Putnam (2000) regarding the ephemeral nature of public reaction to reports of corruption. Or, using a game theoretic approach to allow for collusion between the press and government Vaidya (2005) finds that the potential beneficial effects of press freedom on corruption are reduced. This may be because the media may orchestrate and release false campaigns and accusations against the government if these stories are likely to capture public attention and increase sales. Or as importantly, journalists and the press may themselves be corrupted and choose not to report their evidence[1].

Alternatively it is also likely that the effect of press freedom on corruption simply picks up wealth effects and the institutional environment more generally. Rich countries can afford a free press and are likely to be liberal across a wide range of activities not just media activities. Similarly, the detection of corrupt activities is likely to be a function of monitoring spending by the government, quality of governance, greater competition, the salaries paid to bureaucrats, the quality of the legal system, and democracy, all of which are directly or indirectly related to the level of development.

Finally, there are also a great number of very different ways in which the media are controlled across countries and which may lead to very different outcomes

[1][Peters (2003), p.52] offers an accurate description of this problem when stating that " Corruption also exists within the structure of media organizations and in the way journalist carry out their reporting tasks. Many engage in a host of corrupt practices, ranging from 'chequebook journalism' to news tailored to suit advertising or commercial needs".

for corruption. Restrictive legislation, threats, physical harassment, verbal abuse, financial extortion, censorship, media concentration, intimidation, violent assaults, high entry costs and access restrictions to the media market are some of the most common restrictions to press freedom. The following story about the ordeal of a journalist from Kazakhstan illustrates some of these restrictions to media freedom:

> Irina Petrushova, founder and editor-in-chief of the Almaty-based opposition newspaper *Respublika* and winner of CPJ's 2002 International Press Freedom Award, endured a sustained campaign of harassment for her reporting on government corruption and criticism of officials. The newspaper was forced to change its printer numerous times after government officials intimidated printing companies into cutting off their services to the publication. On May 19, *Respublika* staff found a decapitated dog's corpse hanging from an office window with an attached note that read: "There won't be a next time". Three days later, assailants threw Molotov cocktails into the office, destroying much of the building and technical equipment. The courts, meanwhile, prosecuted *Respublika*, citing a number of legal technicalities. On July 4, an Almaty court handed Petrushova an 18-month suspended prison sentence for violating a rarely enforced labor code. And on July 24, another Almaty court ordered the liquidation of the firm PR-Consulting, which published the newspaper, because it continued printing the newspaper despite an April 10 court ruling suspending *Respublika* for a minor administrative infraction. Amid growing security risks, Petrushova fled Kazakhstan, but she continues to edit the newspaper from Moscow. (Source: Committee to Protect Journalists, www.cpj.org)

Yet there is nothing to suggest that the effect of these restrictions is homogeneous, or that the effect of any one restriction would be equal in all situations[2].

[2]Some notable examples can be found in *Diario La Nacion*, Online Edition, (Archive, 26th January of 1997 at `http://www.lanacion.com.ar/archivo/Nota.asp?nota_id=62655`)

In a similar vein, whilst it is generally true that these measures of economic, political and legal control over the media are reasonably highly correlated across countries there are exceptions to this. For example, a very restrictive regulatory environment exists alongside relatively mild economic and political control of the media in Indonesia and Malaysia, while the opposite is true in Colombia, Russia, and Ukraine[3]. Or in Italy the economic and political control over the media is high compared to other developed countries, but compared to this the legal and regulatory environment is less restrictive.

In this chapter we take seriously the issues raised above to provide a rigorous examination of the correlation between press freedom and corruption. Our approach has several parts. First, we consider the robustness of the effect of press freedom on corruption to changes in the conditioning set of variables using a modified form of extreme bounds analysis (EBA) [Leamer (1983, 1985), Levine and Renelt (1992)]. As highlighted above, press freedom might be highly correlated with other aspects of the institutional environment and development. The use of error bounds analysis allows us to consider whether the effect of press freedom has a robust independent effect on corruption or not. Second, in addition to testing for the relationship between the aggregate indicator of press freedom and corruption used in previous studies we use new data on the relation between different forms of restrictions to press freedom. This disaggregated measure considers economic, political and legal restrictions on the media separately. Third, in order to avoid some well-known criticisms of standard EBA being too restrictive for a potentially important variable to pass as robust [Sala-i Martin (1997)], we take into account some suggestions regarding the implementation of this methodology [Temple (2000)]. We carefully screen the regression models for potential problems of similarity, collinearity and fit that may help to explain why a variable is not robust. Fourth, out of concern with potential problems of endogeneity we use a GMM approach in combination with EBA. Finally, we consider different data on corruption to see whether the results are robust to using data from different

[3]Source: Freedom House, Freedom of the Press (2004) and other years

sources. This set of strong tests for the robustness of the effect of press freedom on corruption differs significantly from that found in the current literature and adds detail, as well as information on robustness and causation to that literature.

Our results support the theoretical view that restrictions in press freedom lead to higher corruption levels. Furthermore, we obtain that both political and economic influences on the media are strongly and robustly related to corruption, while detrimental laws and regulations influencing the media are not strongly associated with higher corruption. In all cases, there is indicative, albeit not conclusive, evidence that the direction of causation runs from a freer press to lower corruption and some suggestion that press freedom may capture aspects of the political environment more generally. The chapter is structured as follows. The next section reviews the existing literature. In section 3.3, we describe the data, econometric methodology and the proposed robustness checks. Section 3.4 shows the main set of results using the panel data evidence, while section 3.5 explores the endogeneity problem. Section 3.6 deals with the use of alternative measures and the sensitivity of the results to changes in data sources and econometric method. Section 3.7 concludes.

3.2 Literature Review

Interest from academic economists in investigating the causes of corruption has followed largely from the influential work of Mauro (1995). In that paper, the author presents evidence regarding the negative effects of corruption on economic performance. As we have already noted in Chapter 2, while the number of cross-country comparative empirical studies on the determinants of corruption has increased, there appears to be little consensus on the effect of any variable on corruption apart from economic development and democracy. To give an example: the variables that have received most attention as determinants of corruption in the literature are British colonial heritage, uninterrupted democracy, protestant religion, electoral rule, and fiscal decentralisation [see Ades and Di Tella (1999),

La Porta et al. (1997, 1999), Treisman (2000), Persson et al. (2003), and Adsera et al. (2003)]. Yet, these studies have obtained mixed findings on the same explanatory variables, possibly due to the use of different corruption indicators, different samples of countries, and perhaps most importantly the use of a diverse set of conditioning variables within their empirical specifications. Despite this sensitivity of the results there remains within the literature little systematic research on the robustness analysis of the determinants of corruption. Some recent exceptions are the global sensitivity analysis by Serra (2006) and Seldadyo and de Haan (2005, 2006). They use Extreme Bounds Analysis (EBA) as modified by Levine and Renelt (1992) and other versions [Sala-i Martin (1997)], to perform an analysis of the sensitivity of the regression estimates to changes in the pool of control variables. Our present study focuses on a variable used in those papers, press freedom, uses time series-cross section data and suggests some further modifications to EBA. We also examine the relationship between particular restrictions to press freedom and corruption.

The study of press freedom as a determinant of corruption has, compared to the prominent variables mentioned so far, been largely absent in the literature[4]. Attempts to introduce the topic have come from a group of papers whose main focus has been placed exclusively on press freedom, rather seeing this as one determinant of corruption amongst many others. Brunetti and Weder (2003) test the hypothesis that a free press should *a priori* be associated with lower corruption. The authors use a press freedom measure compiled by Freedom House (who also publishes the popular indexes of political rights and civil liberties). The index ranks countries according to a 0-100 scale, with low values meaning a high degree of press freedom. Using this and other alternative measures for both press freedom and corruption, they find that the empirical evidence suggests a strong negative relation. Their result is robust to controlling for alternative specifications and econometric methods. They conclude that in countries where the media is

[4]Adsera et al. (2003) used a proxy for the diffusion of newspapers and found a significant and large coefficient. As others and we have discussed, this proxy does not appropriately reflect the freedom that journalists and reporters enjoy.

reasonably free from any kind of restriction on their activities corruption levels are likely to be low. Although the authors acknowledge that the problem of causality may be dealt with instrumental variables and using some panel-data techniques, the choice of the instrumental variable for which they obtain their main findings is somewhat debatable[5].

Similarly, Ahrend (2002) examines the relationship between the variables from a wider perspective. His objective is to study the relationship between human capital, press freedom and corruption. He notes that a high degree of press freedom acts as a channel through which education decreases corruption. Additionally, the author finds evidence suggesting that high corruption levels are associated with low levels of press freedom. The causal direction, according to his work, runs from a freer press to lower corruption. Chowdhury (2004) presents a concise treatment of the topic. The objective is similar to Brunetti and Weder (2003) but also incorporates the effects of democracy on corruption. In his view, the media's role as an informative device and the standing of democracy as a punishing mechanism should both help towards limiting corruption. The empirical findings of the paper support this conclusion: both press freedom and democracy are powerful and significant controls on corruption and this result is robust to different settings. The author remains cautious regarding the direction of causality. Finally, Lederman et al. (2005) examine the relationship between several political institutions and corruption. They find evidence of an association between freedom of the press and corruption. However, the coefficient on press freedom becomes insignificant when they include a control for economic development in the corruption regression.

While all these studies reach the same conclusion that press freedom is bad for corruption, they use an aggregate measure of press freedom. Additionally, the variables included in the base specification are not always those suggested by the

[5]They use an index controlling for political rights. This variable, although highly correlated with press freedom, is also correlated with corruption measures as we have described earlier, which violates one of the conditions required for a variable to be a good instrument. The authors acknowledge this may be a problem but they argue that it is reasonable to assume that it is a good and valid instrument. In other section of their paper, they use different instruments and their main findings are confirmed.

empirical literature as robust predictors[6]. Finally, most of the empirical literature does not include strong tests for robustness and those which do found mixed evidence. For example, Serra (2006) and Seldadyo and de Haan (2006) have used proxies for press freedom in their studies using sensitivity analysis. They find that press freedom is not robust according to the EBA methodology, implying that the relationship between this variable and corruption is sensitive to changes in the specification.

In the present chapter, in addition to testing for the robust relationship between the aggregate press freedom and corruption, we use previously unexplored data on different forms of restrictions on press freedom and to test the robustness of their individual relationships with corruption. Further, from a broader perspective, our chapter may be seen as an extension of the literature on Extreme Bounds Analysis (EBA) that has been originally proposed by Leamer (1983, 1985) and made popular by Levine and Renelt (1992) in the context of cross-country growth regressions. In order to avoid some well-known criticisms of standard EBA being too restrictive for a potentially important variable to pass as robust [Sala-i Martin (1997)], we carefully screen the regression models for potential problems of similarity, collinearity and fit that may help to explain why a variable is not robust. We describe these modifications later in this chapter.

3.3 Data and Methodology

This section describes the data on corruption and press freedom along with the other control variables used in the empirical analysis, and explains the econometric methodology used.

[6]For example, Lederman et al. (2005) only find that the association between corruption and press freedom becomes insignificant when they include a control for GDP in the regression.

3.3.1 Corruption and press freedom indicators

We measure corruption using Transparency International's Corruption Perception Index (CPI)[7]. The CPI is available annually from 1995 for a varying sample of countries. Countries are ranked in a 0 - 10 scale where low scores represent high and pervasive (perceived) corruption and high scores indicate low levels of corruption.

We use the Press Freedom Index as the main indicator of the degree of press freedom, which is compiled by Freedom House[8]. This index is available from 1994 to 2004, although Freedom House has been assessing the degree of press freedom across countries since 1980[9]. The index ranks countries according to their degree of press freedom in a scale ranging from 0 (total freedom) to 100 (lack of freedom). To provide some assessment of various values of the index within this range Freedom House describe countries scoring from 0 to 30 as of having *free* media, while countries with scores from 31 to 60 and from 61 to 100 are regarded as *partly free* and *not free* respectively.

In order to assemble the aggregate measure, Freedom House evaluates and rates three aspects of press freedom violations[10]. These are the legal, political and economic environments. The **legal environment** subdivision encompasses *"both and examination of the laws and regulations that could influence media content as well as the government's inclination to use these laws and legal institutions in order to restrict the media's ability to operate"* [Deutsch Karlekar (2004)]. In this category, Freedom House assesses several issues such as legal and constitutional guarantees of press freedom, penalties for libel and defamation as well as penal

[7] See Transparency International website at `www.transparency.org` for an in-depth description of the source data, methodology and procedures used in the construction of the CPI

[8] The index is constructed from several different sources including press organizations, official reports on the state of the media, country-based correspondents, expert opinions and local and international news services. The complete methodology used in the compilation of the index is available at `http://www.freedomhouse.org`.

[9] The data for the early years are not available as a numerical index but instead in the form of categorical divisions

[10] From 1994 to 2001 the press index is compiled evaluating and rating over 4 separate aspects. From 2002, Freedom House only uses three categories (two of the former has been grouped into one), which we will be analyzing over the present article.

codes, the independence of the judiciary and others. This form of harassment is typical (but not exclusive) of developing countries. The situation of the media in Eastern Europe and Central Asia is a clear example of this type of restrictions[11]. In Kyrgyzstan, the media faces innumerable laws and regulations, including criminal punishment for libel and slander. The situation is rather similar in other CIS countries. Furthermore, most developing countries still preserve certain forms of restrictive laws and regulations on the media. In general, these type of influences over the media, though not as obvious and explicit as other forms, may represent a serious challenge to the operation of a free and independent press.

The **political environment** category, on the other hand, evaluates *"the degree of political control over the content of news media"* [Deutsch Karlekar (2004)]. Among the most relevant aspects examined here are the editorial independence of the media, intimidation and threats to journalists, the access to informational sources, and also repressive actions such as arrests, imprisonment, physical violence and assassinations. The infamous corrupt administration under President Fujimori in Peru stands out as a striking case of political influence over the news media. While running the government in the 1990's, Vladimiro Montesinos, president Fujimori's secret-police chief, devised and supervised a vast network of corruption and power involving politicians, bureaucrats, judges and news media. There were intimidations, threats, kidnappings and all sorts of pressures on the several actors involved. Another famous case where political influences to the media run high is Italy[12]. An industrialized country with exceptionally high levels of corruption, Italy has a highly concentrated media sector. The Italian media are known to have had close ties to political power and the fact that the media are highly concentrated increases the likelihood of the existence of political pressures and influence. It is reasonable to think that these factors may threaten editorial independence of the media and therefore that these political restrictions on the media are associated

[11] There are other regions where media legislation suffers from these characteristics and many countries in Africa and Latin America are examples of this. Cuba, for instance, is an extreme case in that any criticism of Fidel Castro's rule is catalogued as an official crime.

[12] Economic influences are high too and they are closely linked to and probably develop as a consequence of political influences; still, the main source of restrictions to the press in Italy stem from the political sphere.

to high levels of corruption.

Finally, under the **economic environment** category, the characteristics examined are related to the economic considerations that can influence the media's activities. The relevant factors to consider within this category are the existence of competitive pressures leading to biased press reports and investigations, the extent of sponsoring, subsidization and advertisement and its effect on press coverage and content, the impact of bribery by several self-interested actors on what is published and the structure and concentration of media ownership. Examples of such influences are common in African and Eastern European countries. Ethiopian local publications, for instance, are facing significant increases in printing costs and an increased level of cumbersome bureaucratic requirements. A similar situation is observed in Uganda, where new licensing fees for radio operators were implemented by the government in 2000 adding to the mounting financial burden on the companies. A slightly different situation prevails in Ukraine where the news media have become more financially dependent on the ruling elites, political parties, and relatives of government officials since 1999. This situation reflects the events in post-Soviet Russia where journalists used to supplement their low legal earnings with bribes received from local businessmen in exchange for nice complimentary articles about their firms and activities. Another practice, not always obvious, is the provision of gifts and 'freebies' to journalists and media workers. This proceeding, usually known as *cheque-book journalism*, is gradually expanding in both the developed and developing world and it can seriously threaten editorial independence and accurate coverage.

Within our index, both the *'legal'* and *'economic'* categories vary from 0 (complete freedom) to 30 (lack of freedom) while the *'political'* sub-index ranges from 0 to 40. A country's overall press freedom score is simply the sum of the scores in each of the sub-categories[13].

[13]Freedom House introduced some alterations to the weights for the different categories and to the value range of the index from 1997. In order to work with homogeneous series for the separate categories, we rescaled the original index for 1995 and 1996. These changes introduced no alterations in the orderings of the rankings but did change the scores for that year.

Although each of the sub-indexes measure different aspects of press freedom it is likely that they are correlated with each other. Table 3.1 shows the correlation matrix for the aggregate index and the sub-indexes along with their standard summary statistics. All the correlations are significant at the 5% level and it can be observed that each of the sub-indexes correlates very highly with the aggregate index. Furthermore, the different sub-indexes are also highly correlated among themselves, suggesting that in general different forms of restrictions to press freedom move together and in the same direction. The correlation between the political influences and economic influences is the highest at 0.769 and that between the laws and regulations and the economic influences the lowest at 0.637. This might be because the most common restrictive laws and regulations are libel, defamation and slander laws which are in general less related to economic-type pressures than to political influences on the media such as civil and criminal charges, prosecution and threats.

As suggested by this correlation there exist in the data a number of examples where countries score highly on one part of the press freedom index but not on the other. For example, in Russia there are strong political influences over the media

Table 3.1: **Correlation between press freedom and its components**

Variable	**Mean**	**Sd**	**Min**	**Max**	
Press Freedom	35.01	21.98	5	97	
Laws and Regulations	10.17	7.74	0	30	
Political Influences	15.36	10.73	0	40	
Economic Influences	9.47	5.67	0	27	
Correlations	**Press Freedom**	**Laws and Regulations**	**Political Influences**	**Economic Influences**	**Corruption**
Press Freedom	1				
Laws and Regulations	0.8879*	1			
Political Influences	0.9545*	0.7606*	1		
Economic Influences	0.8578*	0.6370*	0.7690	1	
Corruption	-0.7503*	-0.6391*	-0.7429*	-0.6300*	1

Note: The aggregate Press Freedom Index (from 0 to 100); the Laws and Regulations Subindex (from 0 to 30); the Political Influences Subindex (from 0 to 40); the Economic Influences Subindex (from 0 to 30). Source: Press Freedom Index (various years) available from Freedom House.

but milder economic and legal pressures. Or in Jordan and Turkey the economic environment is less restrictive over the media (economic influences are minor in Turkey and average in Jordan) yet the legal environment is highly restrictive. Finally, in Italy the economic and political influences over the media are high compared to other developed countries, but the legal and regulatory environment is similar. In order to provide a more detailed examination of the relationship between the different subindexes, we cross-tabulate the press freedom data. The results are presented in Tables 3.2, 3.3 and 3.4.

From all the tables we can observe what was hinted earlier: there is a strong positive correlation between the subindexes (this was also evident from Table 3.1). As can be seen from Table 3.2, political influences and laws and regulations influencing the media go hand in hand (i.e. criminal defamation and libel laws should be in principle associated to an increase in the harassment and prosecution of journalists). One case where this is not true is Russia where a highly oppressive political environment lives alongside mild economic and legal pressures on the media. Although there is a positive legal and regulatory environment, there are relatively high economic and particularly political restrictions on media freedom that often lead journalists to remain silent or to undertake investigative journalism at a very high cost.

Economic influences are also positively associated with legal influences as can be seen in Table 3.3 (i.e. ownership structure and entry to the media market is likely to change with new regulations and laws allowing or restricting certain types of actions and procedures). Again, a few cases are worth mentioning particularly since the relation between these two types of restrictions is weaker. On one hand, there is the case of Jordan and Turkey. The economic environment is not particularly oppressive for the media in these countries; on the contrary, economic influences are relatively minor (Turkey) or average (Jordan) yet the legal environment represents a big obstacle leading to self-censorship. Innumerable restrictions to press freedom can be found incorporated in legal codes, regulatory procedures, codes of practise and conduct and so on. It is not about taking direct actions or

Table 3.2: **Laws and regulations and political influences**

		Laws and regulations subindex [Not free=30; Free=0]				
		30-24	**24-18**	**18-12**	**12-6**	**6-0**
Political Influences Subindex [Not Free=40; Free=0]	**40-32**	China	-	-	-	-
	32-24	Cameroon Jordan	Egypt Indonesia Kenya Malaysia Turkey	Bangladesh Colombia Pakistan	*Russia*	-
	24-16	-	Ecuador Uganda Venezuela	Argentina Brazil India Mexico Philippines	-	
	16-8	-	-	Thailand	Bolivia Chile Czech Republic Greece Israel Poland South Africa South Korea	France Hungary Italy Japan Spain
	8-0	-	-	-	Austria Portugal UK	Australia Belgium Canada Denmark Finland Ireland New Zealand Norway Sweden Switzerland USA

For each subindex, the press freedom score for a country is a 10-year average of the annual measure compiled by Freedom House. The countries are divided in quintiles according to their score and those which lie by more than one quintile away from the diagonal are in bold. We list those countries included in the dataset containing the CPI index.

Table 3.3: **Laws and regulations and economic influences**

		Laws and regulations subindex [Not free=30; Free=0]				
		30-24	**24-18**	**18-12**	**12-6**	**6-0**
Economic Influences Subindex [Not Free=30; Free=0]	**30-24**	-	-	-	-	-
	24-18	Cameroon China	Egypt Nigeria	Bangladesh		
	18-12	*Jordan*	Indonesia Kenya Malaysia	Colombia Pakistan	India Mexico Philippines Russia	*Italy*
	12-6	-	Turkey	Ecuador Thailand Uganda Venezuela	Argentina Brazil Chile Czech Republic Greece South Africa South Korea UK	Australia Denmark Finland France Hungary Ireland Japan Spain USA
	6-0	-	-	-	Austria Bolivia Israel Netherlands Poland Portugal	Belgium Canada Germany New Zealand Norway Sweden Switzerland

For each subindex, the press freedom score for a country is a 10-year average of the annual measure compiled by Freedom House. The countries are divided in quintiles according to their score and those which lie by more than one quintile away from the diagonal are in bold. We list those countries included in the dataset containing the CPI index.

exerting influence through bribes; it is more of a psychological threat imposed on journalists and refreshed every time a new restrictive law is brought to life.

Another case where the relationship between the legal and economic subindexes is not as expected is Italy. As a long-standing democracy, one would expect that most of the checks and balances on the government should be operating efficiently. It is however when it comes to analysing the situation of the press in Italy that we identify several differences with its European counterparts. Italian media are widely regarded as under the influence of particular economic and political interests. According to the data, the legal and regulatory environment in Italy is mostly *"press-friendly"*, similar to other developed countries. But the economic and political influences on the Italian media are above the average for industrialized countries. While the legal and regulatory environment present almost no obstacles for journalists and influences from the political side are mainly limited to warnings, harassment and editorial independence, the structure of media ownership presents one of the biggest threats to independent journalism and unbiased coverage[14]. The media are highly concentrated and political pressures are increasing alongside the new economic conditions. In this way, the editorial independence of the Italian press as well as media plurality are severely jeopardized.

Finally, Table 3.4 shows that the correlation between the economic and political subindexes is relatively high without any significant outliers. This is not particulary surprising given the way Freedom House categorizes the types of activities included in each of these two subindexes and the similar nature of both types of restrictions. In fact, one may think that in most cases, political restrictions entail some form of economic restrictions and *viceversa*.

Figure 3.1 provides a scatter plot of press freedom and the corruption index for 45 countries. The high correlation between the aggregate index of press freedom and its sub-components means that a similar graph is valid for the relationship between the subindexes and corruption, although the corresponding correlations

[14]One famous media empire has expanded to control the three largest private television stations, one newspaper and a substantial portion of the advertising market

Table 3.4: **Political and economic influences**

		Political influences subindex [Not free=40; Free=0]				
		40-32	**32-24**	**24-16**	**16-8**	**8-0**
Economic Influences Subindex [Not Free=40; Free=0]	**30-24**	-	-	-	-	-
	24-18	China	Bangladesh Cameroon Egypt Nigeria			
	18-12	-	Colombia Indonesia Jordan Kenya Malaysia Pakistan Russia	India Mexico Philippines	Italy	
	12-6	-	*Turkey*	Argentina Brazil Ecuador Uganda Venezuela	Chile Czech Republic France Greece Hungary Japan South Africa South Korea Spain Thailand	Australia Denmark Finland Ireland UK USA
	6-0	-	-	-	Bolivia Israel Poland	Austria Belgium Canada Germany Netherlands New Zealand Norway Portugal Sweden Switzerland

For each subindex, the press freedom score for a country is a 10-year average of the annual measure compiled by Freedom House. The countries are divided in quintiles according to their score and those which lie by more than one quintile away from the diagonal are in bold. We list those countries included in the dataset containing the CPI index.

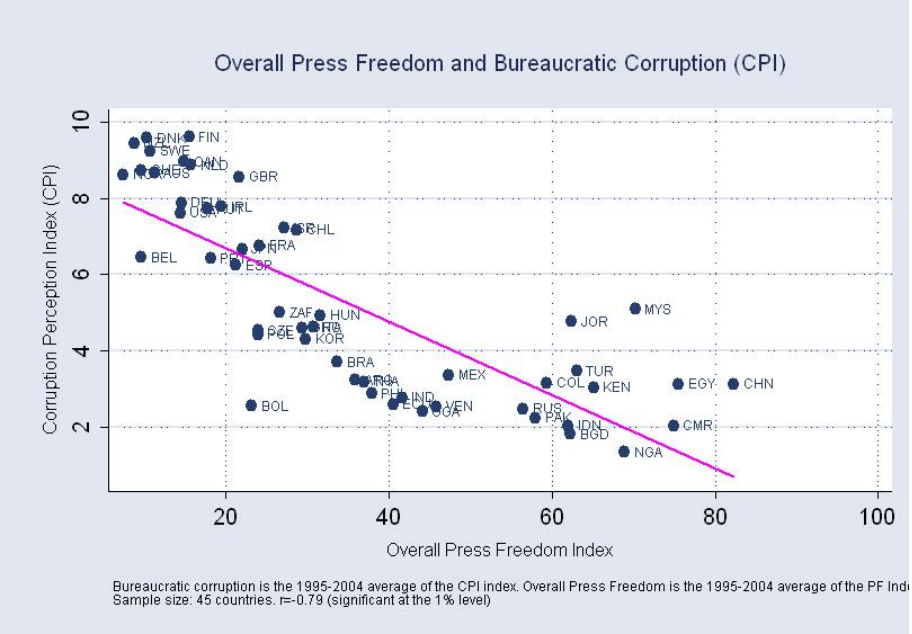

Figure 3.1: **Aggregate press freedom and bureaucratic corruption**

are lower than that for the overall index. As is made clear from this figure the correlation between the variables is strong and negative. Developed countries have both high levels of press freedom and good governance while developing countries are mostly situated on the bottom right corner of the graph with high corruption and low press freedom.

3.3.2 Control variables

In addition to our main variables described above we use a wide set of variables to serve as control variables in the regressions. Following previous empirical work we consider economic, political, cultural, institutional and historical factors among those likely to affect corruption. Due to our specific econometric technique we arrange these variables into two groups. The first is a subset of three control variables to be included in all the specifications, formed by those variables consistently found to be robustly related to corruption by previous empirical studies [Treisman (2000), Serra (2006)]. In our study, these are a measure for *economic development*,

an *index of political rights*, and a *dummy for the persistence of democracy*[15]. In the second group, we include all the other variables. A full description of the data and the description of the variables is contained in appendix A.

3.3.3 Econometric methodology

Careful model building requires that the empirical relationships on which any theoretical model is based are robust. We adopt Leamer (1983, 1985)'s *extreme bound analysis* (EBA) as modified by Levine and Renelt (1992) to provide a strict test of the robustness of the relationship between press freedom and corruption. The basic idea of this approach is to understand whether the relationship between the variable of interest and the left hand side variable is specific to certain specifications of the regression equation or holds more generally. The general specification of the EBA is given below:

$$y_t = \beta_i I + \beta_m M + \beta_z Z + u_t \tag{3.3.1}$$

where y_t is the dependent variable *(corruption)*, I is a set of (fixed) variables included in all the specifications, M is the variable of interest *(press freedom)* and Z is the subset of (changing) variables taken from a pool of additional covariates. Both the I-variables and the M-variable remain unchanged throughout the entire analysis. The EBA procedure involves changing the variables included in the subset Z in each regression (in combinations of three) until every possible combination of the pool of candidate Z variables is used. Once all the possible regressions have been performed we will have as many $\beta's$ as specifications tested. The variable M will be considered to be robust if the *extreme upper bound* and

[15]It should be noted that of the three conditioning variables economic development (*gdp*) passes the EBA test, while there are a small number of occasions when our measure of political rights (*pri*) and the existence of long-standing democratic traditions (*d50*) do not. This is particularly so when we use disaggregated data on press-freedom. While this result does not undermine the main focus of this chapter, press freedom, given the I-variables were chosen on the basis of their robustness in previous studies using EBA it is clearly worthy of further investigation. Further details on the results from this exercise are available from the authors on request.

the *extreme lower bound* estimates are statistically significant at the conventional level and have the same sign. The extreme bounds are defined as the estimated coefficients corresponding to the highest (lowest) value of β plus (minus) twice its standard error as in equation 3.3.2. The variable is considered fragile otherwise.

$$\beta_m \pm 2\sigma_{\beta_m} \tag{3.3.2}$$

Despite its potential benefits in terms of model selection, the EBA has been strongly criticized for being very difficult for any variable to pass as robust [Sala-i Martin (1997)][16]. These criticisms relate to absence of diagnostic tests when reporting the outcome, a problem of collinearity, omitted variable bias and that simply labeling a variable as *robust* or *fragile* overlooks other useful characteristics of the data. Following these criticisms we make several modifications to the general EBA approach, in the manner by which the results are reported and their discussion.

Firstly, we might be concerned that the results are driven by an omitted variable bias. To control for this we use a large number of potential covariates in the Z-matrix (we use twenty-two additional variables). Secondly, we might conclude that a variable is non-robust because it has been included with a variable that captures similar variation in the data; robustness in traditional EBA analysis is likely to be conditional on their being no collinear counterpart in the dataset. To know whether this is a problem in our dataset we use only a subset of the potential pool of Z-variables in any one regression (a set of three rotating Z-variables), identify those Z variables that are likely to measure similar aspects of corruption to press freedom and identify specifications with high variance inflation factors *(VIF)*[17]. To

[16]See Temple (2000) for a detailed review and discussion of the main critics and objections to the EBA and some recommendations to overcome them.

[17]The variance inflation factor (VIF) is an indicator designed to detect the presence of multicollinearity. To obtain the definition of VIF, we start from the expression of the variance of the estimator

$$Var(\hat{\beta}_i) = \frac{\sigma^2}{S_{ii}(1 - R_i^2)}$$

and assuming that there is no linear relation between x_i and the other explanatory variables

provide further insight we also consider carefully the regressions where insignificant coefficients on the variable of interest are found to search for potential patterns. Finally, as in Seldadyo and de Haan (2005), in order to identify variables that are highly correlated with press freedom as an initial step we analyse the pairwise correlations among all the variables. Amongst these we identified one variable that was highly correlated with press freedom, an index of democracy, where the correlation was 0.82. Given the high correlation of this variable with press freedom but also with the other measure of political rights used in the list of I-variables (pri) -the correlation here is 0.92-, the decision was made to omit this variable[18]. The correlation of this latter political rights indicator with press freedom was 0.65. To provide a cautious interpretation of the findings of this chapter we recognize that our measure of press freedom may capture aspects of the political environment more generally and we condition the conclusions on this possibility.

A third criticism of traditional EBA analysis is that robustness is measured against both well-specified and poorly specified models so that the bounds may come from flawed models. We make two adjustments. Firstly, in order to concentrate only on well-specified models we adapt the suggestion of Granger and Uhlig (1990) and reject all the specifications with adjusted R^2 lower than that of the base specification[19]. The base specification consists of only four variables, the three I-variables (always included) and the variable of interest M, press freedom. Secondly, we consider the robustness of our results to problems of endogeneity, which we discuss

in the model, then R_i^2=0 and $Var(\hat{\beta}_i) = \sigma^2/S_{ii}$. Dividing this into the above expression for $Var(\hat{\beta}_i)$, we obtain the formula for the VIF as

$$VIF(\hat{\beta}_i) = \frac{1}{1 - R_i^2}$$

The VIF can be interpreted as the ratio of the actual variance of $\hat{\beta}_i$ to the variance that would have been obtained if x_i were to be uncorrelated with the remaining $x's$. The higher the VIF the more likely the existence of severe multicollinearity. Although there is no theoretical suggestion regarding a threshold value, it is usually considered that a VIF higher than 10 indicates the existence of severe multicollinearity.

[18]We note also that the effect of this variable is likely to be already captured by the measure of persistence of democracy (labeled $d50$) included as one of the I-variables in the analysis.

[19]As noted by Granger and Uhlig (1990), the adjusted R^2 may not be an ideal measure of the quality of the model, but can still serve as a useful statistic to provide some insights about the specified model.

further below.

The regression equation actually estimated is therefore of the following form:

$$y_{it} = \beta_1 press_{it} + \beta_2 gdp_{it} + \beta_3 d50_{it} + \beta_4 pri_{it} + \beta_5 Z_{1it} + \beta_6 Z_{2it} + \beta_7 Z_{3it} + u_{it} \quad (3.3.3)$$

where y is the corruption indicator given by the Corruption Perception Index; *press* is the variable of interest, measured by the Press Freedom Index; *gdp* is the logarithm of GDP per capita; $d50$ is a dummy measuring the existence of uninterrupted democracy over the last 50 years; *pri* is an index measuring the extent of political rights in a society; and Z_1, Z_2 and Z_3 are the three additional covariates included until all combinations are exhausted. The log of GDP per capita, the measure of uninterrupted democracy and the measure of political rights are included as the I-variables (the non-rotating control variables). These have previously been found to be robustly correlated with corruption by Treisman (2000) and Serra (2006), the latter using Error Bounds Analysis. We run the regressions by pooled OLS using robust standard errors[20].

3.4 Analysis of results

We perform EBA on an unbalanced panel of 51 countries over the period 1995 to 2004. The EBA results without controlling for endogeneity are given in Table 3.5. The first column shows the EBA results for the aggregate press freedom index, while the second, third and fourth columns contain the results for each of the subcategories. The table reports the estimated values of the upper and

[20]Neither of the two main methods for analyzing panel data was considered appropriate for our analysis. It is clear that the use of fixed effects is not a valid alternative since we include both time-variant and time-invariant controls in our regressions and the inclusion of the latter rules out the fixed effects method. The use of random effects, on the other hand, was strongly rejected on the basis of the Hausman test. We do however test the robustness of the results to the use of fixed effects below.

lower bounds for press freedom as well as the base; the Z-variables included in the regressions generating these bounds, the adjusted R^2; the number of observations and the total regressions estimated and identified based on the pre-determined selection criterion.

It is worth noting to begin with that the base regression (including the three I-variables and the press freedom variable) fit the data very well, suggesting little room for important omitted variables. The regressions explain around 70 to 80 per cent of the variation in corruption across countries.

Dealing next with the final rows of the Table 3.5 we see that of the 4560 (1140*4) regressions estimated in the production of Table 3.5 some 273 are identified as failing to pass the pre-selection criterion outlined in section 3.3.3. This would appear due primarily to the ability of the additional regression to fit the data compared to the base regression, although there is some evidence of collinearity problems also. Comparing across the different measures of press freedom these problems are more severe for the components of the main index than the aggregate index itself and for the law and regulation part of this index in particular. Upon investigation it would appear that the failure to pass the *VIF* test occurs when two of the measures of openness to international trade, specifically *tra* (the ratio of exports and imports to GDP) and *imp* (the ratio of imports to GDP) are included in the Z-matrix at the same time. That is, there is a problem of collinearity amongst the Z-variables rather than being a collinearity problem with press freedom. Including these regressions in fact has no impact on the results for press freedom found in our analysis.

The failure to pass the adjusted R^2 criteria occurs when a number of variables are included, but across the four sets of regressions most commonly when the measure of fiscal decentralisation is used, *exp*. For example, of the 133 regressions excluded using the laws and regulations sub-index 81 include fiscal decentralisation. To put that in context the next most common variables are majoritarian electoral systems (*maj* appeared in 43 of the excluded regressions); exports (fue appeared in 33);

Table 3.5: **EBA results for press freedom using OLS: Aggregate index and subcategories (CPI index)**

Results of press freedom index and subcomponents on corruption (CPI) - Data: 1995-2004 - Method: Pooled OLS								
	(1) Aggregate Press Freedom		(2) Laws and Regulations		(3) Political Influences		(4) Economic Influences	
Variable of interest (M)	β	t	β	t	β	t	β	t
Upper bound	-0.0415	-6.56	-0.0053	-0.38	-0.0691	-7.71	-0.0684	-4.53
Base	-0.0609	-8.83	-0.0518	-3.28	-0.1002	-9.57	-0.0962	-5.37
Lower bound	-0.0843	-7.25	-0.1049	-4.93	-0.1303	-7.22	-0.1755	-5.82
Z-variables (upper)	*eng*, *ger*, pro_d		*fue*, pro_d, *plist*		*ffc*, *fbc*, pro_d		*soc*, *fre*, pro_d	
Z-variables (base)	–		–		–		–	
Z-variables (lower)	*interv*, *exp*, *plist*		*interv*, *exp*, *fre*		*interv*, *mag*, *exp*		*interv*, *mag*, *exp*	
Adjusted R^2 (upper)	0.8145		0.7806		0.8286		0.8002	
Adjusted R^2 (base)	0.7704		0.7266		0.7705		0.7399	
Adjusted R^2 lower	0.7943		0.7640		0.7874		0.7680	
No. observations (upper)	487		458		477		487	
No. observations (base)	487		487		487		487	
No. observations (lower)	289		299		296		296	
Total number of regressions	1140		1140		1140		1140	
Regressions dropped (R^2)	24		133		85		25	
Regressions dropped (multi)	1		3		1		1	
Remaining regressions	1115		1004		1054		1114	
No. insignificant regressions	0/1115		145/1004		0/1054		0/1114	

White-corrected standard errors. Base denotes the base specification including the M-variable and the always-included I-variables (*loggdp*, $d50$ and *pri*) and the base beta is the estimated coefficient from the base regression. Only coefficients for the M-variables are shown. The coefficients for the I-variables can be obtained from the author. The upper bound β is the estimated coefficient corresponding to the regression that generates the extreme upper bound. The lower bound β is the estimated coefficient corresponding to the regressions that generates the extreme lower bound. Z-variables are those included in the specifications that generate the bounds. "No. insignificant" denotes the number of specifications that produce a coefficient statistically insignificant at the 5% level and/or of a different sign.

Table 3.6: **EBA results for press freedom using GMM with IV: Aggregate index and subcategories (CPI index)**

RESULTS OF PRESS FREEDOM INDEX AND SUBCOMPONENTS ON CORRUPTION (CPI) - DATA: 1995-2004 - METHOD: GMM WITH IV
Instruments: Ethno-linguistic fractionalization index (elf) and Number of daily newspapers (news)

	(1) Aggregate Press Freedom		(2) Laws and Regulations		(3) Political Influences		(4) Economic Influences	
Variable of interest (M)	β	z	β	z	β	z	β	z
Upper bound$_{OLS}$	-0.0474	-6.77	-0.0176	-1.31	-0.0730	-7.49	-0.0811	-4.82
Upper bound	-0.0449	-6.32	-0.0125	-0.95	-0.0730	-7.49	-0.0748	-4.26
Base	-0.0705	-9.54	-0.0608	-3.80	-0.1132	-10.29	-0.1165	-6.11
Lower bound	-0.1008	-8.72	-0.1321	-5.15	-0.1566	-8.43	-0.2048	-6.79
Lower bound$_{OLS}$	-0.1008	-8.72	-0.1136	-5.40	-0.1532	-8.88	-0.1946	-6.31
Z-variables (upper)	*maj*, *fre*, *pro$_d$*		*fre*, *pro$_d$*, *plist*		*ffc*, *fbc*, *pro$_d$*		*parl*, *eng*, *fre*	
Z-variables (base)	–		–		–		–	
Z-variables (lower)	*interv*, *exp*, *plist*		*imp*, *exp*, *def*		*interv*, *exp*, *plist*		*exp*, *eng*, *plist*	
Adjusted R^2 (upper)	0.8148		0.7832		0.8335		0.7911	
Adjusted R^2 (base)	0.7702		0.7136		0.7676		0.7319	
Adjusted R^2 lower	0.7915		0.7149		0.7744		0.7328	
No. observations (upper)	416		429		439		429	
No. observations (base)	439		439		439		439	
No. observations (lower)	263		283		263		273	
Total number of regressions	1140		1140		1140		1140	
Regressions dropped (R^2)	30		91		39		18	
Regressions dropped (multi)	0		0		0		0	
Remaining regressions	1110		1049		1101		1122	
No. insignificant regressions	0/1110		85/1049		0/1101		0/1122	
J-test (base)	0.80 (0.37)		0.65 (0.42)		0.18 (0.67)		0.41 (0.52)	
Pagan-Hall (base)	14.40 (0.01)		30.35 (0.00)		12.13 (0.03)		22.60 (0.00)	

Base denotes the base specification including the M-variable and the always-included I-variables (*loggdp*, *d50* and *pri*) and the base β is the estimated coefficient from the base regression. Only coefficients for the M-variables are shown. The upper bound β is the estimated coefficient corresponding to the regression that generates the extreme upper bound. The lower bound β is the estimated coefficient corresponding to the regressions that generates the extreme lower bound. Z-variables are those included in the specifications that generate the bounds. "No. insignificant" denotes the number of specifications that produce a coefficient statistically insignificant at the 5% level and/or of a different sign. J-Test gives the Hansen statistic for the over-identifying restrictions. Pagan-Hall test produces the statistic to test for heterogeneity. In both cases, P-values are in parentheses.

and socialist legal system (*soc* appeared in 30).

Fiscal decentralisation plays a similarly important role for the exclusion of regressions when using the other measures of press freedom. We do not have a good explanation for this finding. Instead we considered the robustness of our conclusions to the inclusion of these regressions i.e. we consider the EBA without the removal of the regressions due to the adjusted R^2 criteria, the results are robust, and to a separate test for the robustness of fiscal decentralisation using EBA. We find from this that of the 969 regressions estimated the coefficient on *exp* is insignificant in 856 of them[21]. Overall we are satisfied that whatever the problem with the fiscal decentralisation variables it does not affect the conclusions we reach about press freedom.

According to the results presented in Table 3.5 there are no insignificant regressions for the aggregate press freedom index as well as two of its components, political and economic influences on the press. Comparisons of the upper and lower bound show that the coefficients do not pass through zero for these three measures also. In EBA terminology, aggregate press freedom and the political and economic influences on this, are therefore robust to changes in the conditioning information set. The final component of the index, that on laws and regulations, whilst the coefficient never passes through zero, is insignificant in 14 per cent of the regressions that pass the pre-selection criterion. We return to this result below.

Our results in Table 3.5 confirm that press freedom has the expected relationship with corruption. Higher levels of press freedom are associated with lower levels of corruption. Using the upper and lower bound on the coefficients as a guide then a one standard deviation increase in the overall level of press freedom is associated with a reduction in corruption of between 0.9 and 1.8 points. For countries like Brazil, Turkey and South Korea with high levels of corruption this would result in a reduction towards the mean corruption score in our data. To put this number in

[21]These results are similar if we use alternative measures of sub-national government, such as sub-national revenues in relation to GDP or sub-national revenues in relation to total government revenue)

perspective the effect of a one standard deviation increase in GDP per capita (using the coefficient from the base regression) would be roughly similar at 1.5 points. For the economic and political components of the main index the effect of a one standard deviation increase in press freedom would be associated with a decline of corruption between 0.6 to 1.7 for economic influences and 0.7 to 1.4 for political influences. Unfortunately, since the data do not include specific information on how often the media expose corruption, we are not able to explore the channels through which media freedom impacts on corruption[22]

Overall the results presented in Table 3.5 evidence a close relationship between press freedom and bureaucratic corruption, thus confirming the findings of earlier research. Moreover, we go a step further and find evidence suggesting that certain forms of restrictions to press freedom are more strongly associated to higher corruption than others. Specifically, while laws and regulations that influence the media fail to qualify as robust, both political and economic pressures on the press are robust to changes in the specification throughout the whole EBA. This might help to explain why Italy, which scores poorly on these components of the index, has high corruption levels compared to other developed countries. Similarly, this would help to understand the case of widespread corruption in Fujimori's Peru during the 1990's. As we have already mentioned, Peru was plagued by sweeping corruption involving a large number of sectors. In particular, the news media were subjected to a number of severe restrictions that involved political and economic pressures rather than legal or regulatory impediments. The fact that it was ultimately a single independent media outlet left unbribed that triggered the public scandal leading to the collapse of the administration reinforces our results[23]

This raises the question as to why is the laws and regulations index non-robust whereas the other components of press freedom manage to pass the EBA test. Un-

[22]One of the most powerful channels through which the media may help to reduce corruption is the exposure of corruption instances. This information is only indirectly captured in the press freedom indexes and this may be one of the reasons why countries whose media sector expose corruption frequently have nonetheless low press freedom levels.

[23]See McMillan and Zoido (2004) for an excellent account of the events that took place in Peru during those years.

fortunately, examination of which Z-variables leads to insignificance of the laws and regulations index yields little that is obvious in terms of providing an explanation of this finding. The Z-variables that appear most commonly in the regressions in which laws and regulations is insignificant are a dummy for Scandinavian legal system (*sca* appears on 73 occasions); a dummy for Protestantism (pro_d appears on 73 occasions); and a dummy for party lists (*plist* appears on 35 occasions). The correlation between the two dummies *sca* and pro_d is equal to one[24], which is why they appear exactly the same number of times in the insignificant regressions. Of the regressions in which laws and regulations is insignificant the Z-matrix includes neither of these variables on only 5 occasions. They would appear therefore, to be the primary reason why the laws and regulations index is insignificant. What is particular to Scandinavian countries and their control of press freedom through laws and regulations is not immediately obvious, although perhaps worthy of further investigation.

Interestingly, the inclusion of these same variables in the Z-matrix produces coefficients that are smaller than the average for the other parts of the press freedom index also, and for the economic influences sub-index they are the smallest in size. Unlike the laws and regulations index, for these other parts the press freedom remains significant however, despite the reduction in the size of the coefficient. Finally, the fragility of the laws and regulations index would also not appear to be due to the use of dummy variables to measure the extent of the Protestant following in a country rather than more detailed measures. If the proportion of Protestants, *pro* is used instead the laws and regulations subindex is even less robust: it is insignificant in some 213 out of 1004 regressions (and changes sign in some of these). Again the primary reason for the loss of significance of the laws and regulations index is the proportion of Protestants (141 occasions); the dummy for Scandinavian legal system (82 occasions); and the dummy for party list system (36 occasions).

[24]This is due to the fact that the countries with Scandinavian legal tradition (Denmark, Finland, Norway and Sweden) coincide with those having Protestantism as a majoritarian religion as defined in our study

3.5 Endogeneity

So far, our results indicate the existence of a close negative relation between press freedom and bureaucratic corruption. Can we argue that the evidence suggests that eliminating restrictions on the media and promoting a freer press is a means of reducing corruption? *A priori*, the answer is no: there are theoretical as well as empirical reasons to suspect that press freedom may be determined endogenously with corruption. Potential endogeneity could bias the estimates and lead to erroneous conclusions. In order to tackle the issue of endogeneity, we run the EBA with instrumental variable estimation performed using the *generalised method of moments* (GMM)[25]. The justification to use this method is that in the presence of arbitrary heteroskedasticity in the sample, the use of this methodology is preferable to traditional IV estimation procedure[26]. The choice of instrumental variables through GMM was also justified and supported by diagnostic tests of heteroskedasticity, particularly the Pagan-Hall test of heteroskedasticity for IV.

Our choice of instrumental variables is somewhat limited since several potential candidates are already being used as Z-variables. We therefore follow some previous studies in the selection of our instrumental variables, the *ethno-linguistic fractionalisation index* (ELF) and *the number of daily newspapers per 1000 people* (NEWS). Although some authors have proposed and used the ELF index as an instrument for corruption, the empirical literature on the determinants of corruption has rarely found evidence of a statistically important relation between ethno-linguistic fractionalisation and corruption. In the studies of robust determinants of corruption, neither Serra (2006) nor Seldadyo and de Haan (2006) find

[25] Another plausible way to check for the presence of potential endogeneity is to run a regression model where corruption and the Z-variables are the explanatory variable for press freedom. The potential danger in doing this is that the model may be mispecified if the determinants of press freedom are different than those of corruption. In order to avoid this potential problem, we only test for endogeneity using instrumental variables.

[26] An important feature of the GMM methodology is the use of lagged values and first differences of the endogenous variables as instruments. We considered the inclusion of lagged values and first differences for the press freedom variables and performed the corresponding estimation. However, due to the little year-to-year variability in the data we decided that this approach was not worth pursuing and excluded these regressions from our main analysis. For an in-depth treatment of GMM estimation and diagnostic tests see Baum et al. (2003).

that this variable is robust although the latter point to a robust relation between ethnic conflict and corruption. In relation to the number of daily newspapers per 1000 people (news), we justify its consideration as an instrument since it it highly correlated with press freedom and there is no empirical evidence of a significant association with corruption. The intuition is fairly straightforward since the larger the number of newspapers the more likely that all the views are represented and this should be associated to high press freedom levels. Table 3.6 presents the results of EBA estimated with IV using GMM. The table has the same structure as Table 3.5 although in addition we provide the coefficients resulting from running the EBA by GMM on the specifications generating the extreme bounds in the OLS case. These are denoted as $Upper\ Bound_{OLS}$ and $Lower\ Bound_{OLS}$. We also provide additional diagnostic tests for both the base regression and the bounds[27].

The explanatory power of the base regression remains high at around 0.80. The Pagan-Hall statistic rejects the null of homoskedasticity for both the upper and lower bound's regressions and for the base regression as well. Regarding the Hansen test for the over-identifying restrictions (also known as the J-Test), the null hypothesis (joint hypotheses of correct model specification and orthogonality conditions) cannot be rejected for the base and upper bound specifications and this supports the validity of the instruments chosen. It should be noted, however, that it is difficult to evaluate the validity of the instruments since we have a large number of specifications, each yielding a different value of the J-test. According to the J-test, the instruments are valid in more than half of the total number of models.

The most striking feature of the results in this table is however their similarity to those estimated using OLS. Whatever may be the explanation for the robustness or lack of the correlation between press freedom and corruption it is not driven by its reverse causation. The coefficient for press freedom is statistically significant across all the specifications for the aggregate index and the political and economic

[27]The test has been calculated for each regression of the EBA, although the statistic is only supplied for the base and extreme bounds regressions.

influences but not for laws and regulations.

3.6 Further robustness checks

In this section we carry out additional tests to see whether our results in the previous section are validated when we use other variables and techniques. In particular, we devote our attention to the use of alternative measures of corruption and to the choice of a different econometric technique.

3.6.1 Alternative measure of corruption[28]

Having checked our results for robustness to changes in specification and methodologies, we perform the same analysis but this time using an alternative measure of corruption. For this purpose, we use the corruption index elaborated by Political Risk Services (PRS) Group and included as a chapter of the International Country Risk Guide (ICRG). The index ranks more than 140 countries from 0 (high corruption) to 6 (low corruption) and is also based on perceptions of different individuals[29].

The ICRG indicator is similar to CPI in many respects although it is not a composite index. Table 3.7 replicates the IV estimation with GMM using the ICRG index and the qualitative results are very similar to those obtained before. There are some differences however. Firstly, the coefficient for the laws and regulation sub-index is not only insignificant in most of the models but also changes its sign in several specifications. Secondly, although the coefficients for both the political

[28]Originally, we also included an alternative indicator of press freedom, the index elaborated by Reporters Sans Frontieres (RFS). This data had limited time coverage and is not available as a disaggregated series and was therefore not pursued. Nevertheless, we estimated a regression using this series and the results for the overall press freedom index were very similar to those found here.

[29]Lower scores of the index indicate that "high government officials are likely to demand special payments" and that "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, police protection or loans".

Table 3.7: **EBA results for press freedom using GMM with IV: Aggregate index and subcategories (ICRG index)**

RESULTS OF PRESS FREEDOM INDEX AND SUBCOMPONENTS ON CORRUPTION (CPI) - DATA: 1995-2004 - METHOD: GMM WITH IV
Instrument: Ethno-linguistic fractionalization index (elf) and Number of daily newspapers (news)

	(1) Aggregate Press Freedom		(2) Laws and Regulations		(3) Political Influences		(4) Economic Influences	
Variable of interest (M)	β	z	β	z	β	z	β	z
Upper bound$_{OLS}$	-0.0142	-3.59	0.0041	0.46	-0.00159	-2.70	-0.0464	-3.11
Upper bound	-0.0127	-3.23	0.0049	0.59	-0.0159	-2.70	-0.0312	-2.89
Base	-0.0235	-5.81	-0.0119	-1.29	-0.0375	-5.97	-0.0457	-4.65
Lower bound	-0.0440	-6.14	-0.0593	-4.03	-0.0768	-6.33	-0.0704	-3.90
Lower bound$_{OLS}$	-0.0429	-6.25	-0.0517	-3.62	-0.0725	-6.30	-0.0577	-5.01
Z-variables (upper)	fbc, fre, pro_d		fbc, fre, pro_d		ffc, fsc, pro_d		maj, fre, mag	
Z-variables (base)	–		–		–		–	
Z-variables (lower)	$pres$, maj, exp		$pres$, maj, exp		maj, exp, $plist$		exp, eng, ger	
Adjusted R^2 (upper)	0.5466		0.5364		0.5561		0.4695	
Adjusted R^2 (base)	0.4708		0.4424		0.4696		0.4590	
Adjusted R^2 lower	0.4957		0.4507		0.4948		0.4678	
No. observations (upper)	635		635		635		607	
No. observations (base)	635		635		635		635	
No. observations (lower)	337		337		327		338	
Total number of regressions	1140		1140		1140		1140	
Regressions dropped (R^2)	107		178		111		239	
Regressions dropped (multi)	0		0		0		0	
Remaining regressions	1033		962		1029		901	
No. insignificant regressions	0/1003		718/962		0/1029		0/901	
J-test (base)	0.08 (0.78)		0.10 (0.75)		0.02 (0.88)		0.00 (0.95)	
Pagan-Hall (base)	30.75 (0.00)		29.81 (0.00)		18.26 (0.00)		48.66 (0.00)	

Base denotes the base specification including the M-variable and the always-included I-variables ($loggdp$, $d50$ and pri) and the base β is the estimated coefficient from the base regression. Only coefficients for the M-variables are shown. The upper bound β is the estimated coefficient corresponding to the regression that generates the extreme upper bound. The lower bound β is the estimated coefficient corresponding to the regressions that generates the extreme lower bound. Z-variables are those included in the specifications that generate the bounds. "No. insignificant" denotes the number of specifications that produce a coefficient statistically insignificant at the 5% level and/or of a different sign. J-Test gives the Hansen statistic for the over-identifying restrictions. Pagan-Hall test produces the statistic to test for heterogeneity. In both cases, P-values are in parentheses.

and economic influences sub-indexes have the (expected) negative sign as before, they are significantly smaller than those obtained when using the CPI index presented in Table 3.6. The z-statistics are generally lower than in the CPI case but still they are quite high for all the models estimated. The range of variation of the coefficients is sensibly smaller than with the CPI. Thirdly, the adjusted R^2 are, notably, much lower than in the CPI regressions. This might be due to the increased variability across the countries given by the increase in the sample size. Finally, the Pagan-Hall test for heteroskedasticity always rejects the null of homoskedasticity and suggests the presence of heteroskedasticity in our model. Finally, our instruments of choice fare better in this case in terms of exogeneity and relevance, since the null of validity of the instruments cannot be rejected in a larger proportion of specifications across all the indexes and sub-indexes.

3.6.2 Fixed-effects

Given the large number of time invariant control variables used as additional covariates the decision was made to perform the EBA analysis without country specific time invariant fixed effects. This has the advantage of allowing us to identify which of any economic, political and social variables included in the Z-matrix is not robustly associated with corruption. It remains possible however, that we have excluded an important country-specific variable from our analysis. To consider this we estimate the base regression as a fixed effects regression for each of the different measures of press freedom. We exclude the dummy for persistent democracy, as this is time invariant and therefore collinear with the country fixed effects.

Comparing the results in table 3.8 with those presented in tables 3.5 and 3.6, it is evident that the effects of different forms of press freedom (both aggregate and disaggregate) identified earlier remain the same even after controlling for country fixed effects, where only laws and regulations is the only insignificant variable. There are two main differences however. Firstly, although the overall press freedom

Table 3.8: **Results of press freedom index on corruption - 1995-2004**

Dependent variables: Corruption Index (CPI) **Method: Fixed-effects regressions**			
Variable of interest (M)	Beta	t-stat	se
Press Freedom (aggregate)			
pss	-0.012	-2.98***	0.004
gdp	-0.719	-1.50	0.479
pri	0.108	2.47**	0.044
c	8.229	4.28	1.921
r-squared (within)	0.0232		
No. observations	510		
F-test (all $u_i = 0$), F[50,456]	63.16 (0.00)		
Laws and Regulations			
pss_a	-0.008	-0.96	0.009
gdp	-0.234	-0.52	0.451
pri	0.631	1.52	0.042
c	6.104	3.43	1.781
r-squared (within)	0.0062		
No. observations	510		
F-test (all $u_i = 0$), F[50,456]	74.40 (0.00)		
Political Influences			
pss_b	-0.011	-1.89*	0.006
gdp	-0.555	-1.14	0.487
pri	0.075	1.81*	0.042
c	7.416	3.82	1.939
r-squared (within)	0.012		
No. observations	510		
F-test (all $u_i = 0$), F[50,456]	63.26 (0.00)		
Economic Influences			
pss_c	-0.019	-2.43**	0.008
gdp	-0.320	-0.71	0.450
pri	0.078	1.90*	0.041
c	6.501	3.66	1.774
r-squared (within)	0.017		
No. observations	510		
F-test(all $u_i = 0$), F[50,456]	70.40 (0.00)		

Only time-varying variables were considered for the econometric specification. Of the three *I* variables only *gdp* and *pri* fulfill this criterion, while *d*50 is a time-invariant dummy and therefore not included into the model. * Significant at the 10% level ** Significant at the 5% level.

index and the economic influences sub-index is significant ever after controlling for country fixed effects, the coefficient for political influences sub-index falls slightly short of significance at conventional level (the t-ratio is equal to 1.89). Secondly, the coefficients are lower than those given in tables 3.5 and 3.6 with the CPI index (the t-ratios and the adjusted R^2 are lower as well)[30] .

3.7 Concluding remarks

The motivation in this chapter was to investigate the empirical relationship between press freedom and corruption and in particular, to evaluate the impact of different types of restrictions to press freedom. We have provided empirical evidence that confirms previous findings. We also reinforce this evidence by applying a technique that allows us to incorporate not only a few but instead hundreds of alternative specifications so as to take into account the recent findings on the empirical determinants of corruption. We also noticed that restrictions to press freedom come in many guises and this may have different impacts on corruption. We cited anecdotal evidence referring to countries with similar corruption levels but different incidence of, say, political influences on the media. The econometric results suggest that not all the forms of restrictions to press freedom are strongly correlated with corruption. This is the case for example of the laws and regulations influencing the media. In contrast, economic and political restrictions are strongly associated with corruption. More specifically, it appears that it is economic pressures, which have a slightly stronger association with corruption. Our results are robust to the use of different control variables, to the inclusion of several tests and to the use of different indicators for both press freedom and corruption with a caution that our measure of press freedom may capture aspects of the political environment.

Our analysis may be seen as an addition to policy debate. In our study we found

[30]It should also be noted that the coefficient on GDP has a negative sign in all the regressions. However, this coefficient is not statistically significant in any of the models.

that certain categories of press freedom have a strong and robust association with bureaucratic corruption. The analysis allows us to know a little bit more about how different attacks on press freedom are correlated with high corruption levels. Therefore, a situation where political influences on the media are limited is likely to be associated with low levels of bureaucratic corruption. According to our study this would also be the case in countries where economic pressures are relatively unimportant. The question of whether changes in press freedom would lead to changes in corruption remains still subject to debate. Using instrumental variables to tackle the endogeneity problem, we have shed some more light on this problem. In principle, it would appear that improving the economic environment for the press sector and contributing to make it more competitive would probably help to curb corruption. This could probably be relevant for a country like Italy whose press freedom standards are worse than those of other European countries such as France, Spain and Portugal. In other words, Italy would resemble more other developed countries in terms of its corruption levels should its press freedom standards be similar to those of the countries mentioned above. Furthermore, our study has potential implications for countries where political influences on the media are much more important than other types of restrictions (Pakistan and Colombia among others). If these countries were to alleviate some of these political pressures, most notably the severe violence against journalists, they may be able to improve their corruption ratings by an amount no lower than 1 (one) point in the corruption scale. As we noted above, these arguments should be taken with caution since the evidence concerning the endogeneity problem is still limited.

In relation to the legal environment it seems that either the direct effects on corruption are much lower than those of the other categories or it may be that many effects of improving the laws and regulations are passed onto corruption through economic development. For example, there are several countries where the legal and regulatory framework is very restrictive and the other types of pressures on the media are not so strong. This is the case of Malaysia, Jordan and Cameroon. According to our results, it would be more difficult for these countries to achieve

improvements in their corruption levels by reducing the restrictions of the legal and regulatory framework. Naturally, the findings obtained in this chapter should be taken with some caution for these relationships may be based on subjective measures and the causality issue is not fully resolved. But, we remain confident that our work is a serious effort in exploring the robustness of the relationship between press freedom and corruption while also shedding some more light regarding particular aspects of this relation previously unexplored.

Chapter 4

Decentralisation, corruption and development

4.1 Background and motivation

Our motivation in this chapter stems from the need to address the relationship between decentralisation and corruption from a macroeconomic perspective, considering the various interdependencies between these aspects. In order to do so, we bring together three different strands of literature to present an integrated analysis that has been relatively absent in the literature. Firstly, we invoke the traditional fiscal federalism literature and its effects on efficiency. The second strand is related to the role of information asymmetries and control mechanisms in hierarchical organisations. The final topic concerns the effects of bureaucratic corruption on economic development. The novelty of this study lies in the use of a dynamic growth model to analyse the relationship between decentralisation, corruption and growth. To the best of our knowledge this is the first study using such an approach to analyse the relationship between these three variables[1]. Our main result highlights the role of corruption and information asymmetries in determining whether decentralisation is preferred to centralisation in terms of

[1]Ellis and Dincer (2004) model the relationship between decentralization and corruption but their study is based and formalized using the idea of yardstick competition.

economic development.

The traditional theory of fiscal federalism provides strong implications in terms of the efficiency of the decentralised provision of public goods and services. The theoretical literature has recognised the positive effects that decentralised public spending has on growth. Since the early contributions of Samuelson and Musgrave[2], the theory of fiscal federalism has supported the view that decentralisation increases economic welfare by *"tailoring outputs of such goods and services to the particular preferences and circumstances of their constituencies"* [Oates (1999), p. 1122-23]. The Decentralization Theorem [Oates (1972)] establishes a presumption in support of decentralised provision of public goods and services on the grounds of efficiency. As Oates (1999) argues, this presumption is likely to be more justified in the presence of information asymmetries and political constraints. Additionally, the potential gains from decentralization increase if the demand for local public goods is highly inelastic, an idea that finds support in the econometric evidence. Furthermore, the welfare gains from decentralization are enhanced by the *"voting with the feet"* and the mobile households arguments, although they are not dependent on that assumption. More recently, Brueckner (1999, 2006) has shown that federalism increases the incentive to save and ultimately leads to higher economic growth. The presumption of the existence of significant efficiency and welfare gains associated with the decentralised provision of public goods has also found support in recent empirical evidence [Yilmaz (1999), Lin and Liu (200), Akai and Sakata (2002), Thiessen (2003) and Stansel (2005)][3]. In sum, there appears to be both theoretical and empirical arguments to expect a positive effect of decentralised provision of public goods and services on efficiency and welfare[4].

[2]See Oates (2005) for a detailed review of these early contributions and their importance for the fiscal federalism literature.

[3]Earlier studies including Davoodi and Zou (1998) and Zhang and Zou (1998), Woller and Phillips (1998) found no significant association between decentralisation and growth.

[4]There are three main drawbacks of federalism and decentralised provision of public goods: the sacrifice of economies of scale in the provision of certain public goods and services, losses associated with inter-jurisdictional tax competition and the issue of public-good spillovers and inter-jurisdictional externalities. While these have been noted in the literature, their extent and significance appear to be limited to specific sets of public goods and services, taxes and infrastructure expenditures.

Another strand of the literature addresses the role of incentives, information asymmetries and monitoring in organizations. More generally, this literature is concerned with the role of asymmetric information in a principal-subordinate relationship. One of the main implications of these models is that decentralisation in the context of hierarchical organisations may lead to higher corruption. In a very influential paper, Aghion and Tirole (1997) show that if the information asymmetry between principal and subordinate is significant, *real* authority rests with the subordinate. This also tends to raise the monitoring cost for the principal. As Carbonara (1998) notes in relation to Aghion and Tirole (1997), as the delegation of formal authority lowers the principal's incentive to perform their screening and detection activities, decentralisation encourages corrupt activities. The last paper shows that decentralisation of authority may increase corruption under some conditions. Similar ideas are also presented by Bac (1996) who argues that flatter hierarchies are preferred when government monitoring is not specialized. In other words, due to the larger and wider span of control that the government has on steeper hierarchies, a more centralised organisation is more convenient. Both the bureaucracy and the government are hierarchical organizations and some of the aspects regarding its internal information and coordination relationships may be analysed and interpreted using these theories. If we agree that decentralisation involves the creation of intermediate decision layers consisting of public agents in charge of certain decisions, then these ideas of formal and real authority, information asymmetries and deficient monitoring are certainly important in the debate on the relationship between decentralisation and corruption.

Finally, the third strand of the literature we bring into our theoretical model is related to the effect of corruption on economic development. Although some time ago there were suggestions that bureaucratic corruption could foster efficiency and development, the view in recent decades is that corruption has a negative effect on economic development. This effect operates through different channels among which the diversion of resources away from productive activities is one of the most important. This has been suggested both in theoretical studies [Murphy

et al. (1991, 1993), Romer (1994)] and empirical studies [Mauro (1995), Brunetti (1997), Hines (1995) and Kaufmann et al. (1999)]. At the same time, there is a growing literature that acknowledges the existence of a bi-directional relationship between corruption and development. The main proposition of these studies is that bureaucratic corruption and development are jointly determined where equilibrium behaviour is dependent on the decisions of other agents. Multiple equilibria are typical in these models which predict a two-way negative relationship between corruption and development. This literature also explains the existence and persistence of corruption as a permanent feature of the economy [Ehrlich and Lui (1999), Mauro (2004), Aidt et al. (2005) and Blackburn et al. (2006)]. These theoretical presumptions have received some support in a few empirical studies [Haque and Kneller (2004), Aidt et al. (2005) and Mendez and Sepulveda (2006)] who have found a non-monotonic relationship between corruption and development.

Having already established the motivation of our research, it is important to note the relevance of the topic analysed in this chapter. The relationship between decentralisation and development has received an increasing share of research effort over recent decades. This is in part a consequence of a global trend towards devolution and decentralisation[5], most notably in developing and transition economies. A large number of countries have implemented programmes and strategies to redesign the relationship between different levels of government [Manor (1999), UNFPA (2000), Rodriguez-Pose and Gill (2003)]. Industrialized countries have voluntarily taken steps to decentralize the provision of certain public services and adopted more decentralised schemes of power sharing. In these countries, the main objective has been to improve the delivery of public services and to adapt government structures to better suit the needs of the citizens. This is for example, the

[5] Although often used as equivalent, concepts such as decentralisation, deconcentration and devolution refer to slightly different and particular aspects of the relations between central and periphery governments. We will refer to decentralisation to describe any type of power shift away from the centre while we will use different concepts of decentralisation (administrative, fiscal, political, etc.) in different sections of this chapter. Manor (1999) describes the different concepts of decentralisation in the following three types: a) deconcentration or administrative decentralisation; b) fiscal decentralisation; and c) devolution or democratic (political) decentralisation. Other useful references on this are UNDP (1999) and Treisman (2002b).

case of the decentralisation of service delivery in the UK since the early 1980's. The introduction of neighbourhood offices to improve access to certain services had limited success but created the foundations for other reforms as in the case of the decentralisation of the UK health system [Leach et al. (1994)]. Similarly there have been significant transfers of powers to the National Parliaments of Scotland, Wales and Northern Ireland.

In the case of developing countries, the decision to redefine the relations between government levels was mainly driven by the recommendations from international organizations such as the World Bank and the United Nations. The main objectives behind such recommendations were those of promoting development through the rearrangement of fiscal, political and administrative relations between governments and strengthening civil and democratic institutions. Whether voluntarily adopted or externally dictated, there is little doubt that decentralisation strategies have been encouraged primarily on the grounds of the perceived benefits found in the traditional theory of fiscal federalism, i.e. efficiency in public provision and intergovernmental competition and greater matching of local needs with provision. In addition to this, decentralisation has also been supported by the view that centralised socialist regimes failed to generate conditions leading to sustained growth. The experiences of China, India and Russia are good examples of this. In any case, as Manor (1999) argues, almost every country has adopted some form of decentralisation over the last decades based on the general presumption that it would provide a solution to many different kind of problems which centralised regimes had failed to address.

It does not follow however, even if centralised regimes have little credit on empirical (or anecdotal) grounds, that the more decentralised structures are bereft of such problems. While the transition to decentralisation may address several of the efficiency issues mentioned before, it creates new problems. For example, local capture of governments and inappropriate accountability systems may stand in the way of the decentralisation process and overturn the benefits of allocative efficiency. Other sources of complications include the existence of agency prob-

lems, information asymmetries, deficient monitoring of sub-national governments and problems arising due to vertical fiscal imbalances. These and other related topics form an important part of the recent and current research on fiscal federalism and decentralisation which aims to integrate political economy considerations in the traditional approach. As noted by Bardhan (2002), these considerations are specially relevant in developing countries where the political and institutional framework at the sub-national level is often very weak. Learning why and how these problems arise and develop under different governmental arrangements and the consequences they have for development is essential in order to inform the discussion on these matters. Our aim in this chapter is to contribute to the understanding of the complex interactions between decentralisation and development by focusing on a specific aspect of this relation, namely corruption.

Public sector corruption affects development in several ways, the more obvious being the allocation of resources away from productive activities and the squandering of public funds. There are however more subtle ways in which corruption may distort incentives and modify behaviour of economic agents bearing implications for development. Once recognised, it becomes clear that the analysis of the relationship between corruption and development should be approached using many different configurations of assumptions. These efforts have produced a large body of literature studying this relation at several levels[6].

Among the most debated topics in the decentralisation and development literature, an interesting idea concerns the possibility that the nature, extent and effects of bureaucratic corruption may be sensitive to the design of the relations between (and within) different levels of government. This suggestion, made by Shleifer and Vishny (1993), Prud'homme (1994), Oates (1999), and Bardhan (2002), has introduced yet another level to the debate on the benefits of decentralisation for both industrialized and developing countries. If we consider this possibility seriously, then it is important to incorporate these considerations into any analysis of the

[6]For an excellent survey on corruption and development see Bardhan (1997). Aidt (2003) surveys a number of theoretical approaches to corruption and Jain (2001) reviews some important theoretical and empirical aspects of corruption.

problems of corruption and test the robustness of results.

The potential importance of institutional features in a world of increased decentralisation noted above forms one of the main motives for this study. There are several reasons to believe that the nature and scope of bureaucratic corruption are likely to be different under centralised and decentralised government structures. Some of these reasons have been analysed in the literature of the new political economy of decentralisation in the form of information asymmetries [Bird (1994)], political accountability [Seabright (1996)], capture by elite groups [Bardhan and Mookherjee (2000)], yardstick competition [Besley and Case (1995)], conflict of interests [Blanchard and Shleifer (2001)], and structural organisation of bribery [Shleifer and Vishny (1993)]. Some of these elements may influence the decision of a bureaucrat to be corrupt and they may also affect the extent of corruption in an economy. Hence, we will study the suggestion that the effect of centralisation and decentralisation on development may depend on the nature and extent of corruption using a dynamic general equilibrium approach. We develop this framework in the next section and specify the potential implications that this may have for policy design and implementation.

Reviewing the anecdotal and case-study evidence over the last two or three decades, we find a common pattern of meagre success (if any) of decentralisation programmes among developing countries. This is the case for example of Indonesia, a highly centralised country which has implemented a decentralisation process with very unimpressive results to date[7]. Some Latin American countries, like Argentina, Chile and Colombia, experienced mixed results following the decentralisation of certain public services and in particular of education during the 80's and early 90's. On one hand, some improvements were achieved in terms of educational indicators but on the other hand, the sub-national levels found it extremely burdensome to cope with the new services and this led to overspending, mismanagement, and rising provincial and municipal debts. In all cases, the way in

[7]Some of the obstacles the decentralisation program has encountered in Indonesia are described in *Decentralize Indonesia without dismantling it*, International Herald Tribune, 23 January 2001.

which the accountability relationships were set to work determined the success or failure of the decentralisation programme. With the exception of Nicaragua and El Salvador, all the countries failed to ensure these accountability relationships and decentralisation brought along new problems[8]. These examples also extend to some African countries where problems of accountability and corruption have sprung up following decentralisation attempts.

This chapter studies the relationship between corruption and decentralisation from a macroeconomic perspective. Given that the effects of any decentralisation programme are ultimately spread to the aggregate variables, this has some value. Providing a macroeconomic analysis may also help to understand better the links and channels between corruption and economic development. We put the emphasis on the relation between the existence of corruption, the power-sharing arrangements between the governments and economic development. The analysis presented in this model is unique in that it provides an explicit formulation of the relationship between corruption, decentralisation and economic development. We bring together the theoretical and empirical predictions of both the traditional and modern fiscal federalism theories and find that the effect of decentralisation on development depends crucially on the existence and extent of corruption. Without corruption, decentralisation is unambiguously the best outcome for development. However, if corruption is pervasive, decentralisation may be associated with lower capital accumulation than centralisation. This result is more likely to be observed in developing countries with weak local political institutions and significant information asymmetries between the government and local administrations.

The remainder of this chapter is organised as follows. The next section presents the model introducing the agents and their motivations. Section 4.3 analyzes the incentive condition for agents to be corrupt and examines the presence of corruption in the model. In section 4.4 we derive the expressions for the budget equation

[8]Di Gropello (2004) provides a detailed account of several experiences of educational decentralisation in Latin American countries and their rather unimpressive results. The substantial overspending and lack of accountability of sub-national administrations following these and other decentralisation programmes has been a cause of concern ever since.

and taxes under corruption and no-corruption. Section 4.5.1 deals with the case of a centralised economy under corruption and no-corruption. Section 4.5.2 analyzes what happens when the economy is decentralised and the corresponding implications for corruption and development. Section 4.6 concludes.

4.2 The Model

We develop a dynamic macroeconomic growth model with public services [Barro (1990)], corruption, poverty traps and development [Ehrlich and Lui (1999), Mauro (2004), Blackburn et al. (2006)]. These models have certain common features, most important of which include the existence of multiple equilibria and development traps originating from the interaction between opposing forces. While Ehrlich and Lui (1999) put the emphasis on the trade-off between socially unproductive political capital and growth-enhancing human capital, Mauro (2004) and Blackburn et al. (2006) base their analysis around the incentives faced by officials to engage in corruption. Our model follows more closely the latter.

4.2.1 Environment

Time is discrete and indexed by $t = 0, 1, ..., \infty$. All agents live for two-periods only and belong to overlapping generations of dynastic families. There are two groups of agents -households and bureaucrats[9]. Total population is constant and normalised to 1, a proportion m of which are households and n are bureaucrats ($n < m$). All agents work and save during the first period and consume only in the second period. Households work for private firms in exchange for a wage while bureaucrats work for the government implementing policy. Policies are designed by politicians, who are part of the government, and it is they that are in charge of monitoring

[9]We assume away the occupational choice problem by making agents differentiated at birth. The skills required to become a bureaucrat are only possessed by a fraction of the population. Later on, when we refer to the behaviour of bureaucrats, we specify a condition by which they are induced to take public office rather than working in the private sector.

the activities of the bureaucrats[10]. Public policy consists of a package of taxes and expenditures, G, destined to provide public goods and services. Corruption arises when, under certain conditions, bureaucrats are willing and able to appropriate public funds in an unlawful manner thereby reducing the effective level of provision of public goods and services destined to productive activities. In order to avoid certain rigidities imposed by the settings of our model, we assume that, no matter how strong the incentives to engage in corruption, there will always be a core of non-corruptible (and hence non-corrupt) agents. In this way, we assume that a proportion $\nu \in (0,1)$ of all the bureaucrats are corruptible while the remaining $1-\nu$ are non-corruptible, and by definition, never corrupt[11]. On the other hand, all the other agents undertake activities in the private sector and their behaviour may be indirectly influenced by bureaucratic behaviour. Households work for private firms who, in turn, combine labour and capital to produce final output. All markets are perfectly competitive and payments to the productive factors are equal to their marginal products.

4.2.2 Households

Young households -households in the first period- are endowed with $\lambda > 1$ units of labour which they supply inelastically to firms in return for a wage w_t. Total labour supply in the economy amounts to $l_t = \lambda m$. In addition to their labour income, each young household receives a bequest b_t from the previous generation[12]. They are also liable to pay taxes out of their gross income. For simplicity we assume they pay a lump-sum tax τ_t and their net lifetime income is therefore equal to $\lambda w_t - \tau_t + b_t$. Households save their entire net income at the market interest rate

[10] For simplicity, we see the government as a benevolent policy maker. As we are only dealing with bureaucratic corruption, we do not consider the possibility of elections incentives or a corrupt government in our chapter.

[11] We should also note at this point that the identity of a bureaucrat, that is whether he is of the corruptible or non-corruptible type, is unobservable to the government.

[12] The introduction of bequests into the model is made for purely technical reasons. As we are not interested in modelling bequests motives, we therefore choose a very simple formulation and with warm-glow altruism where parents leave a part of their earnings to their offspring and derive utility from this donation as originally suggested by Yaari (1965).

to pay for private consumption and bequests left at the end of their lives in the second period[13]. Each household derives linear utility from their consumption of private goods and also from their donations to their offspring. Consequently, his lifetime income and utility are given by:

$$y_i^h = (1 + r_{t+1}) [\lambda w_t - \tau_t + b_t] \tag{4.2.1}$$

$$U_i^h = (1 + r_{t+1}) [\lambda w_t - \tau_t + b_t] - b_{t+1} + u(b_{t+1}) \tag{4.2.2}$$

where r_{t+1} is the market interest rate on household savings and $u(b_{t+1})$ is a non-decreasing and strictly concave function that reflects the "joy-of-giving" motive associated with leaving bequests. Utility is maximized by the household by setting $u_b(\cdot) = 1$ which implies a fixed-amount intergenerational bequest equal to b for all t. We should note that households earnings (and savings) are only affected by changes in wages and taxes. As we shall see in the next sections, bureaucratic behaviour will affect these and may have important implications for the level of development.

4.2.3 The Government

The government enters the model through the effect public spending has on private output. In particular, we assume as in Barro (1990) that spending in public goods and services, G, is an input to the production function. Each unit of public spending G yields an amount σG, $(\sigma \leq 1)$ units of productive service. Once the government decides on the total amount of public spending, it then delegates the implementation and arrangements to bureaucrats. It is important to note that in our model the **design** of policies is the sole responsibility of the government

[13] In our model, unlike similar papers in the literature, households savings are not directly affected by the activities of bureaucrats but rather indirectly via the effect embezzlement of government funds has on the level of taxation.

(politicians)[14]. Bureaucrats only have authority over the **implementation** of public policies[15]. Designing a policy package entails deciding the amount of public spending to be allocated to each bureaucrat g_t^i such that $\sum_{i=1}^{n} g^i = ng = G$. Politicians will then allocate the funds to the respective bureaucrats who will carry out the implementation of the policies. We also note that bureaucrats are responsible for the collection of taxes from households but we rule out the possibility of collusion between bureaucrats and households to avoid the payment[16]. As in previous analysis [Blackburn et al. (2006), Blackburn and Forgues-Puccio (2006)] we assume that the government pays each bureaucrat a wage equal to the one paid by firms in the private sector. In doing so, the government ensures complete bureaucratic participation. If a bureaucrat is discovered to be corrupt, the government fires him and strips him of his wage while recouping a fraction δ of the amount stolen.

The government finances its public expenditures by running a continuously balanced budget. Government revenues consist of taxes imposed on households plus any fines collected from bureaucrats who are found corrupt. The government knows the amount of tax revenue it should collect in the absence of corruption since it sets the tax rate and knows the number of tax-paying households[17]. If revenues fall short of this amount then the government will suspect that corruption is taking place. In this case, the government decides to investigate the activities of bureaucrats by using an imprecise costless monitoring technology[18]. In any

[14]Alesina and Tabellini (2004) consider a model where politicians and bureaucrats have different objectives and where elections have a role in the model. The objective of that paper is different to our objective here although it would be possible, in principle, to incorporate elections and politician incentives in our model.

[15]Although this may be seem as too extreme, it is in fact true that in most policy areas bureaucrats act under the supervision of politicians and have only marginal or limited authority over many decisions. See Peters (2001) for reference.

[16]This activity may generate opportunities for public abuse in the form of bribery and tax evasion. However, as all households have the same labour endowment and income, and are also subject to the same tax liability, corruption of this form does not arise in our model.

[17]We abstract from considering other problems that may affect the certainty of tax revenues such as tax evasion.

[18]For the sake of simplicity and to save on notation, we assume that government monitoring is costless. This may be reasonable if we think that ex-post monitoring is a rather negligible fraction of total government expenditures. In any case, costly monitoring could be added into the model in a straightforward way without modifying the main results. In fact, it would strengthen

case, the government is only able to detect and punish corrupt bureaucrats with a probability $p \in (0,1)$ and with probability $1-p$ the governments fails to capture the wrongdoers.

4.2.4 Bureaucrats

Following Ehrlich and Lui (1999) we assume that government intervention in the economy necessitates the existence and active participation of a bureaucratic sector[19]. As we have already mentioned, bureaucrats are appointed by the government (politicians) to implement a set of public policies. We assume that the bureaucratic sector has an informational advantage over the government and this asymmetry is also behind the inability to precisely monitor corrupt officials[20]. Although not directly accountable to the citizens they are certain to be fired by the government if found corrupt while holding office.

All bureaucrats earn a wage w_t^B for supplying inelastically their unit of labour endowment. Like households, bureaucrats save their total income during the first period for consumption in the second period. For simplicity, we assume that wages are the only source of legal income for bureaucrats and that these are equal to the wages paid in the private sector by firms. We have already noted that there are two types of bureaucrats -*corruptible* and *non-corruptible*-. By definition, a *non-corruptible* bureaucrat is never corrupt and resorts to his legal income only. Accordingly, his income is always certain and equal to $w_t^b = w_t$. The lifetime income and utility of a non-corruptible bureaucrat are therefore given by:

our results since costly monitoring of corrupt bureaucrats adds an extra loss of resources to the economy.

[19]The complexity of modern government structures makes it impossible for the government to make policy interventions without recourse to bureaucrats. As noted by Banerjee (1997) and Acemoglu and Verdier (1998), the agency problems created as a consequence of this are one of the crucial issues behind the existence of bureaucratic corruption.

[20]There are a number of treatments that examine in detail the role of public bureaus. In particular, Peters (2001) provides such an account and a detailed presentation of the nature, behaviour and motivations of modern bureaucracies. We assume that bureaucrats have no power over the design of policies, they are only able to alter its implementation.

$$y^{nc,b} = w_t^b \tag{4.2.3}$$

$$U^{nc,b} = w_t^b(1 + r_{t+1}) \tag{4.2.4}$$

A *corruptible* bureaucrat may or may not decide to engage in corruption. In particular, any such bureaucrat will evaluate the (expected) benefits of engaging in corruption against the benefits of remaining honest. If he decides against engaging in corruption, then his income and utility are given by equation 4.2.3 and 4.2.4. If a bureaucrat decides to engage in corruption he embezzles a fraction $\theta_t^i \in (0, 1)$ of his public funds allocation g. For simplicity we assume that each bureaucrat steals the same fraction out of government funds, hence $\theta_t = \theta$[21]. Therefore, the income of a corrupt bureaucrat is equal to $w_t^b(1 + r_{t+1}) + \theta_t g$ with probability $(1 - p)$ and with probability p he is caught and fired earning $(1 - \delta)\theta_t g$[22]. We can write the expected income and utility of a corrupt bureaucrat as:

$$U^{b,c} = w_t^b(1 + r_{t+1})(1 - p) + \theta g(1 - p\delta) \tag{4.2.5}$$

4.2.5 Firms

Output is produced by firms which hire labour from households and rent capital (loans) from all agents. There is a unit mass of identical output producers. The

[21] Naturally, the fraction a given bureaucrat may be able to steal depends on several factors. One of them is the probability of detection which in our model is constant for bureaucrats at the same level of administration as we later explain. Another factor is the "office power" of a bureaucrat relative to other bureaucrats. Although it is likely that there are differences in this, we assume the simplest case where all bureaucrats are alike in terms of "office power". We discuss this issue in more detail later in the chapter.

[22] To leave things simple, we rule out the possibility of investing embezzled funds in either the formal or informal sector. In this way, bureaucrats have to spend or hide their illegal income. Other possibilities have been analysed in the literature, such as spending additional resources to avoid being caught [Blackburn et al. (2006)] or by shipping the embezzled funds abroad [Blackburn and Forgues-Puccio (2006)].

representative firm maximizes profits. The production technology of the representative firm is given by:

$$y_t = A l_t^{\alpha} K_t^{\alpha} k_t^{1-\alpha} G^{\beta} \quad A > 0 \; ; \; \alpha, \beta \in (0,1) \tag{4.2.6}$$

where l_t are labour units, K_t denotes the aggregate stock of capital and G_t denotes total amount of productive services yielded by public spending[23]. Labour is hired at the competitive wage rate w_t and capital is rented at the competitive rate r_t. Profit maximization implies $w_t = \alpha A l_t^{\alpha-1} K_t^{\alpha} k_t^{1-\alpha} G_t^{\beta}$ and $r_t = (1-\alpha) A l_t^{\alpha} K_t^{\alpha} k_t^{-\alpha} G_t^{\beta}$. Since in equilibrium $l_t = l = \lambda m$ and $k_t = K_t$, we can write these as:

$$w_t = \alpha A (\lambda m)^{\alpha-1} G^{\beta} k_t \equiv w(k_t) \tag{4.2.7}$$

$$r_t = (1-\alpha) A (\lambda m)^{\alpha} G^{\beta} \equiv r \tag{4.2.8}$$

We can observe that the wage rate is proportional to the capital stock whereas the equilibrium interest rate is constant.

4.3 The incentive to be corrupt

Having presented the utilities and optimization conditions for all the agents, it should be clear by now that *corruptible* bureaucrats face a decision on whether to engage in corruption or not. In particular, they will do so if their expected benefits are no less than the benefits of remaining honest. From equation 4.2.5 and noting that $r_t = r_{t+1} = r$ we can write this condition as:

[23] We incorporate both an economy-wide capital as in Romer (1986) and the services provided by the public goods and services into the production function as in Barro (1990) as inputs enhancing the efficiency of private production.

$$w_t(1+r)(1-p) + \theta g(1-p\delta) \geq w_t(1+r) \tag{4.3.1}$$

where the left-hand side term is his expected utility of embezzling funds and the right-hand side term is his utility if he is honest. This expression can be rearranged conveniently to yield:

$$\theta g(1-p\delta) \geq p w_t(1+r) \tag{4.3.2}$$

One crucial aspect of condition 4.3.2 is that it includes the economy-wide variables w_t and r. As we will see, both variables are functions of the aggregate level of corruption in the economy. This means that the motivation for a bureaucrat to engage in corruption will be affected by the decisions adopted by other bureaucrats.

We can start exploring these motivations by analyzing two alternative and extreme scenarios, one in which all bureaucrats are honest and one in which all bureaucrats are corrupt. We should remember at this point that corrupt behaviour affects the economy through a reduction in the available amount of public productive services which are themselves an input into the production function of output by firms. In this sense, only the "final" amount of public goods and services enters the production function and is denoted by G_t in equations 4.2.7 and 4.2.8. This means that, if corruption exists, there will be a difference between the amount of public funds the government decided to provide and the amount of public funds destined for productive activities.

We start by considering the case where all corruptible bureaucrats are honest. In this case, total government expenditure equals total public services delivered yielding $G = \hat{G} = n\sigma g$ in productive services. Accordingly, the incentive condition 4.3.2 becomes:

$$\theta g(1-p\delta) \geq (1+\hat{r})p\hat{w}_t \equiv \hat{\zeta}(k_t) \tag{4.3.3}$$

where

$$\hat{r} = (1-\alpha)A(\lambda m)^{\alpha}\sigma^{\beta}(ng)^{\beta} \tag{4.3.4}$$

$$\hat{w}_t = \alpha A(\lambda m)^{\alpha-1}\sigma^{\beta}(ng)^{\beta}k_t \equiv \hat{w}(k_t) \tag{4.3.5}$$

The incentive condition given in 4.3.3 is the incentive condition for an individual bureaucrat to be corrupt given that no other bureaucrat is corrupt.

On the other hand, if all corruptible bureaucrats decide to engage in corruption and they embezzle a fraction θ out of public funds, then the total amount of public productive services delivered will be equal to $G = \tilde{G} = n\sigma g(1-\theta)$. The incentive condition in this case becomes:

$$\theta g(1-p\delta) \geq (1+\tilde{r})p\tilde{w}_t \equiv \tilde{\zeta}(k_t) \tag{4.3.6}$$

where

$$\tilde{r} = (1-\alpha)A(\lambda m)^{\alpha}\sigma^{\beta}(ng)^{\beta}(1-\theta)^{\beta} \tag{4.3.7}$$

$$\tilde{w}_t = \alpha A(\lambda m)^{\alpha-1}\sigma^{\beta}(ng)^{\beta}(1-\theta)^{\beta}k_t \equiv \tilde{w}(k_t) \tag{4.3.8}$$

Expression 4.3.6 is the condition for an individual corruptible bureaucrat to engage in corruption given that all other corruptible bureaucrats are also corrupt.

We can see that the only difference between the two set of equations for the wage rate and interest rate is the presence of the term $(1-\theta)$ as an argument of these expressions for the all-corruption case. Given that $(1-\theta)$ is between 0 and 1 (since

$0 < \theta < 1$), it is clear that for any given stock of capital the *wage rate* is lower under corruption than under no-corruption. Similarly, if we compare equations 4.3.4 and 4.3.7, we see that for any given stock of capital the *interest rate* is also lower when corruption exists. The economic explanation of this is that the total amount of public productive services under the presence of corruption is smaller ($\tilde{G} < \hat{G}$), which reduces the productivity of the other inputs in the production of private goods.

4.4 Corruption and public finances

In the previous section, we established the condition for a bureaucrat to be corrupt under two different hypothetical scenarios. We also showed how the existence of corruption affected certain economy-wide variables such as wages and interest rates. We also noted earlier that changes in households (and bureaucrats) savings were caused by changes in taxes and wages. It should be clear that wages are affected in the presence of corruption and that this affects the net earnings (and savings) of both households and bureaucrats. Now we study how are taxes affected by the existence of corruption and the effect this has on savings.

Since the government maintains a balanced budget each period it is essential to examine the budget equation under the two proposed scenarios for the level of taxes will be different in each case. First, if corruption is absent in the economy, government expenditures comprise wages paid to bureaucrats and spending on public goods and services. Revenues consist of tax receipts from all households. In this case, the budget equation looks like:

$$m\tau = ng + n\hat{w}_t \tag{4.4.1}$$

We can determine the amount of taxes levied on households when all corruptible bureaucrats are honest as the following:

$$\tau = \frac{ng + n\hat{w}_t}{m} \equiv \hat{\tau} \tag{4.4.2}$$

In comparison we consider the situation where all corruptible bureaucrats are indeed corrupt. In this case, each bureaucrat embezzles θg with probability $(1-p)$ and if caught and fired (with probability p), he retains $\theta g(1-\delta)$. Accordingly, government expenditures comprise wages paid to bureaucrats and spending on public goods and services. However, unlike the previous case, both total wages and spending are affected. This occurs in part because there is a proportion of corrupt bureaucrats who are caught and dismissed without pay, government expenditure on wages are reduced by $np\nu\tilde{w}_t$ -the salaries of corrupt bureaucrats who are fired. It also occurs because as bureaucrats steal government funds that otherwise would have constituted tax receipts, the government loses $n\nu\theta g(1-p\delta)$ in public funds to corrupt bureaucrats that get away with their malfeasance[24]. Under these conditions, the budget equation becomes:

$$m\tau = ng + n\tilde{w}_t(1-p\nu) + n\nu\theta g(1-p\delta) \tag{4.4.3}$$

and the level of taxes levied on households when all corruptible bureaucrats are corrupt is given by:

$$\tau = \frac{ng + n\tilde{w}_t(1-p\nu) + n\nu\theta g(1-p\delta)}{m} \equiv \tilde{\tau} \tag{4.4.4}$$

Comparing equations 4.4.2 and 4.4.4, we see that the level of taxes under corruption may be higher or lower than under no-corruption. This is because while corruption results in the loss of public funds (embezzled funds), it also leads to lower payments of wages to bureaucrats (given that a fraction p of bureaucrats are caught and fired without pay). In fact, taxes under corruption will be higher only if $n\tilde{w}_t(1-p\nu)+n\nu\theta g(1-p\delta) > n\hat{w}_t$. Note that we can see the total amount of em-

[24]Note that this amount is the result of the total amount of embezzled funds $nv\theta g$ minus the funds that are recovered from corrupt bureaucrats that are caught $nvp\theta g\delta$.

bezzled funds $n\nu\theta g(1-p\delta)$ as an indication of the aggregate impact of corruption. Accordingly, the incidence of corruption in the economy will be larger the higher the fraction of corruptible bureaucrats, ν, the higher the funds allocated to each bureaucrat g, the lower the probability of detection p, and the lower the fraction the government is able to recover out of funds embezzled by bureaucrats who are caught δ. We are now ready to analyse how corruption affects capital accumulation in the economy. We explore this possibility by analysing two alternative scenarios.

4.5 Regimes and development

In this section we address the issue of determining different regimes of corruption and development by focusing on the structural organisation of public service delivery. In particular, we focus on two alternative extreme cases, full centralisation and full decentralisation. In order to incorporate the fiscal federalism propositions into this model we assume that regardless of whether corruption exists or not, decentralised provision of public goods and services is more (economically) efficient than centralised provision. This assumption is meant to capture the differences -widely acknowledged and recognised in the literature- in the efficiency of public service delivery between centralisation and decentralisation[25]. To keep the analysis simple, we assume that the parameter σ, which represents the economic efficiency associated to the provision of public goods and services, is larger under decentralisation than under centralisation. In particular, we assume that $\sigma^c < 1$ and $\sigma^d = 1$. We analyse the case of centralisation first.

[25]It should be noted that this is a sensible assumption to make in the context of the fiscal federalism literature. As we have argued earlier, there is significant theoretical and empirical support for this assumption although it is particularly relevant in the presence of certain conditions such as the absence of interjurisdictional spillovers and the existence of competition among jurisdictions. One should also consider the possibility that poor countries may not reap the economic benefits of decentralisation due to the presence of weak institutions. Still, if the basic conditions proposed by the theory of fiscal federalism are present, the presumption may still be valid.

4.5.1 Centralisation and development

In this section, we consider the case of an economy where the provision of public services is carried out by central level bureaucrats only. Probably the best way to think about this situation is one where local or regional bureaucrats have limited powers or no powers at all. In such a case, top-level or central bureaucrats are responsible for the nationwide administration and delivery of public services. In such a configuration, we assume that the informational asymmetry problem between central bureaucrats and the government is limited. This idea finds support in a significant number of studies in the literature on industrial organisation. Bardhan (2002) argues that national information and monitoring systems are more efficient than those at the local and regional level. But even if the bureaucrats at this level are better informed than the government about embezzlement opportunities, the fact that these bureaucrats are "closer" to the central government (not only in geographical terms but more importantly in hierarchical terms) simplifies the monitoring tasks by the government. It is agreed that monitoring and auditing are better developed and more efficient at the national than at the local or regional level [Prud'homme (1995)]. Additionally, one may think that in this type of setting bureaucrats constitute a more or less homogeneous and cohesive group which further facilitates the monitoring tasks. The introduction of this assumption will affect θ which is labeled θ^c in this scenario.

We can now study how accumulation takes place in a corruption-free environment. In this case, both households and bureaucrats save their legal income. The sum of net savings by households and bureaucrats yields the total amount of savings in the economy as follows:

$$\hat{s}_t = m(\lambda\hat{w}_t - \hat{\tau}_t + b) + n\hat{w}_t \tag{4.5.1}$$

where $m(\lambda\hat{w}_t - \tau_t + b)$ are total household savings and $n\hat{w}_t$ are total bureaucrat savings. Using equations 4.3.5 and 4.4.1 to rewrite equation 4.5.1 it follows that

capital accumulation occurs in the following way:

$$\hat{k}^c_{t+1} = \alpha A(\lambda m)^{\alpha}(\sigma^c)^{\beta}(ng)^{\beta}k_t - ng + mb \equiv \hat{f}^c(k_t) \tag{4.5.2}$$

Now we consider the case where the economy is affected by corruption. As we know from the previous discussion, this is the case where all corruptible bureaucrats are corrupt. In this situation, total savings comprise the net total savings by households plus the savings of all bureaucrats which are different from the non-corruption case. Note also that a number $(1-\nu)n$ of bureaucrats (non-corruptible) are able to save their legal income, but the group of corruptible bureaucrats will have an expected level of savings equal to $\nu n(1-p)\tilde{w}_t$. Thus, the wage that both corruptible and non-corruptible bureaucrats receive is lower than the wage in the non-corruption case. In this way, total savings are given by:

$$\hat{s}_t = m(\lambda\tilde{w}_t - \tilde{\tau}_t + b) + (1-\nu)n\tilde{w}_t + \nu n(1-p)\tilde{w}_t \tag{4.5.3}$$

Replacing $\tilde{w}_t$ and $\tilde{\tau}_t$ by their equals in equations 4.3.8 and 4.4.4 and plugging them into 4.5.3, we can derive the capital accumulation equation for the case where all corruptible bureaucrats are corrupt as:

$$\tilde{k}^c_{t+1} = \alpha A(\lambda m)^{\alpha}(\sigma^c)^{\beta}(ng)^{\beta}(1-\theta^c)^{\beta}k_t - ng[1+\nu\theta^c(1-p\delta)] + mb \equiv \tilde{f}^c(k_t) \tag{4.5.4}$$

Working with 4.5.2 and 4.5.4, we can find the steady state levels of capital for each case as the following:

$$\hat{k}^{c,*} = \frac{mb - ng}{1 - \alpha A(\lambda m)^{\alpha}(\sigma^{c})^{\beta}(ng)^{\beta}} \tag{4.5.5}$$

$$\tilde{k}^{c,*} = \frac{mb - ng[1 + \nu\theta^{c}(1 - p\delta)]}{1 - \alpha A(\lambda m)^{\alpha}(\sigma^{c})^{\beta}(ng)^{\beta}(1 - \theta^{c})^{\beta}} \tag{4.5.6}$$

These steady state levels of capital are stationary if both $mb > ng[1 + \nu\theta(1 - p\delta)]$ and if $\alpha A(\lambda m)^{\alpha}(\sigma^{c})^{\beta}(ng)^{\beta} \in (0, 1)$ are satisfied[26].

From equations 4.5.5 and 4.5.6, it is evident that capital accumulation is lower under corruption than under no-corruption, that is $\tilde{k}^{c,*} < \hat{k}^{c,*}$[27]. The intuition behind this can be seen by remembering how corruption affects the main variables. First, as we have already noted, at every level of capital, the marginal productivity of labour is lower under corruption than no-corruption. The rationale behind this is that when bureaucrats embezzle public funds, the amount of public spending injected in the economy is lower and this reduces the productivity of labour and hence wages. Second, corruption raises the total costs of public goods causing taxes to be higher and resulting in lower private savings.

It is important to stress the result that corruption is harmful to development and that this is due to the loss of public resources and the decrease in public spending in goods and services. Furthermore, we are able to establish that corruption not only affects development but low development affects corruption. This follows from section 4.3 noting that $\hat{\zeta}(k_t) > \tilde{\zeta}(k_t)$. One can clearly observe that both conditions are increasing monotonically in k_t. It is easy to show that there exist two critical levels of capital k_1^* and k_2^* such that:

Definition $k_{1,b}$ is the unique value of k_t for which $\hat{\zeta}(k_{1,b}) = \theta g(1 - p\delta)$ such that

[26]Note that if $mb > ng[1 + \nu\theta(1 - p\delta)]$ then it is true that $mb > ng$. The same observation is valid for the other condition since if $\alpha A(\lambda m)^{\alpha}(\sigma^{c})^{\beta}(ng)^{\beta} \in (0, 1)$ then it is also true that $\alpha A(\lambda m)^{\alpha}(\sigma^{c})^{\beta}(ng)^{\beta}(1 - \theta^{c})^{\beta} \in (0, 1)$.

[27]This follows from the evidence that for any given k_t, $\tilde{f}^{c}(\cdot) < \hat{f}^{c}(\cdot)$.

$\hat{\zeta}(\cdot) < \theta g(1 - p\delta)$ for all $k_t < k_{1,b}$ and $\hat{\zeta}(\cdot) > \theta g(1 - p\delta)$ for all $k_t > k_{1,b}$.

Definition $k_{2,b}$ is the unique value of k_t for which $\tilde{\zeta}(k_{2,b}) = \theta g(1 - p\delta)$ such that $\tilde{\zeta}(\cdot) < \theta g(1 - p\delta)$ for all $k_t < k_{2,b}$ and $\tilde{\zeta}(\cdot) > \theta g(1 - p\delta)$ for all $k_t > k_{2,b}$.

It is clear that $k_{1,b} < k_{2,b}$ and that these capital levels define boundaries beyond which the incentive conditions given in section 4.3 are satisfied or not. Using these critical capital levels, we can now determine whether corruption forms part of an equilibrium or not. In particular, if $k_t < k_{1,b}$, there exists an equilibrium in which all corruptible bureaucrats are corrupt. And if $k_t > k_{2,b}$, there exists an equilibrium in which all corruptible bureaucrats are non-corrupt. Finally, if $k_{1,b} < k_t < k_{2,b}$, it results in multiple equilibria where bureaucrats are either corrupt or non-corrupt. These results validate the other side of our argument, i.e. that low levels of development are associated to high corruption and viceversa[28]. As we can infer, these results give rise to three different development regimes. The first, a low-development regime where there is a unique stable equilibrium and for which corruption is part of the economy (in fact, corruption is at a maximum in this regime). The second, a high-development regime where there is a unique stable equilibrium and for which corruption is not part of the economy (there is zero corruption). Finally, an intermediate-development regime where there are multiple equilibria which are frequency dependent, i.e. the decision of a corruptible bureaucrat to be corrupt will rely heavily on the number of other bureaucrats who are corrupt or not. These results are represented in figure 4.1.

4.5.2 Decentralisation and development

In this section we focus on the determination of capital accumulation under a regime of bureaucratic decentralisation. Unlike the previous regime where local bureaucrats had no involvement in the implementation of policies, in this case the

[28] Although these cases imply total and zero corruption, in practice there always remains still a core of non-corruptible and non-corrupt bureaucrats.

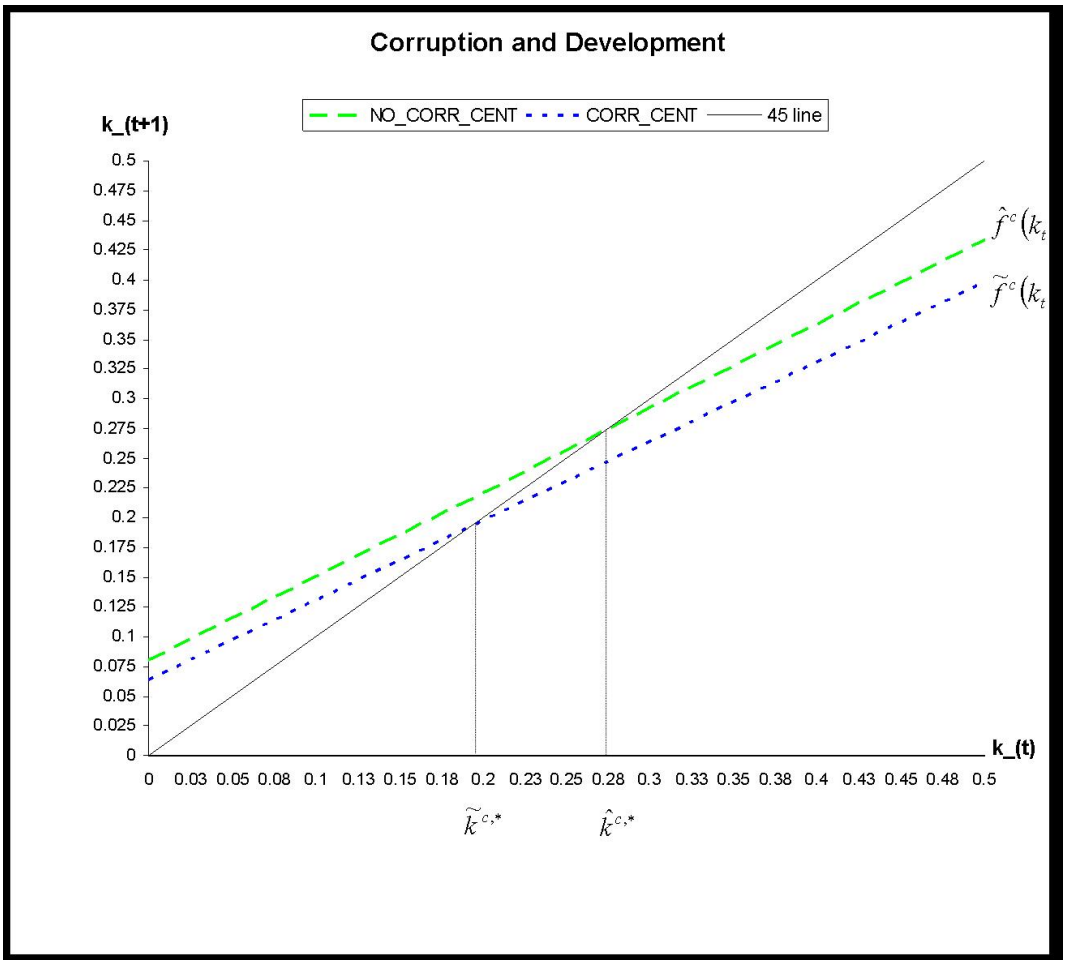

Figure 4.1: **Corruption and development**. Parameter values: $\alpha = 0.4$, $A = 3$, $\lambda > 1$, $m = 0.6$, $n = 0.2$, $g = 1.4$, $b = 0.6$, $\nu = 0.3$, $p = 0.5$, $\delta = 0.5$, $\beta = 0.2$, $\sigma^c = 0.7$, $\theta^c = 0.25$ and $\theta^d = 0.75$.

economy consists only of local level bureaucrats whose functions are to implement the provision of public goods and services decided by the national government[29]. In this configuration, the informational asymmetries between the government and the local or decentralised bureaucrats are significantly larger than in the centralised case. We have already noted the reasons why this is likely to be the case. In addition, several other reasons support this assumption. Some of these are summarized in convincingly pointed by Bardhan (2002) and include local capture, lax accountability relationships and deficient monitoring and information systems at the local levels. For the reasons mentioned, we make the assumption that the fraction each decentralised bureaucrat is able to steal is larger than in centralisation, $\theta^d > \theta^c$. This assumption is meant to capture the idea that informational asymmetries are not only more relevant in a decentralised setting but also that local bureaucrats are more loosely controlled and have greater ability to embezzle a higher proportion of public funds. This assumption can be justified for two reasons. First, the hierarchical "distance" between the government and local level bureaucrats affords decentralised bureaucrats greater latitude to embezzle funds. This is perhaps better described as representing a weak accountability relationship between the local bureaucrat and the central government. Second, local bureaucrats have usually fewer obstacles and greater incentives to be corrupt. Prud'homme (1995) notes for example that local bureaucrats are usually able to establish unethical relationships with local interest groups since they usually spend long spells in the office in the same location. Others point to the presumption that bureaucratic careers are longer and more stable at the national than at the local level. If the time-horizon for local bureaucrats is shorter, then it might be reasonable to assume that they steal higher proportions of public funds. The theories presented by Aghion and Tirole (1997), Bac (1996) and Carbonara (1998) also suggest that this is a sensible assumption to make.

[29] In order to keep the modelling simple, we consider only one level of sub-national governments, the local level, which we think as of being the lowest level. We could alternatively include a provincial or regional level but this would probably add more complexity without influencing the main results. In fact, the implicit assumption here is that the more layers in the structure the larger the information asymmetry associated to the lowest level.

First we explore the case where corruption is absent. Recall that in this case both households and bureaucrats save the same as in the centralisation regime. Remember that in this case $\sigma^c < \sigma^d = 1$. The expression of total supply of loans which equals aggregate savings is therefore equal to:

$$\hat{s}_t = m(\lambda\hat{w}_t - \hat{\tau}_t + b) + n\hat{w}_t \tag{4.5.7}$$

where $m(\lambda\hat{w}_t - \tau_t + b)$ are total household savings and $n\hat{w}_t$ are total bureaucrat savings as before. Using equations 4.3.5 and 4.4.1 to rewrite equation 4.5.7 it follows that the expression for capital accumulation in a corruption-free decentralised setting is equal to:

$$\hat{k}^d_{t+1} = \alpha A(\lambda m)^\alpha (ng)^\beta k_t - ng + mb \equiv \hat{f}^d(k_t) \tag{4.5.8}$$

since $\sigma^d = 1$. Note that for any given k_t, the corresponding level of k_{t+1} is higher in this case than in the centralisation case. This is due to the effect the greater efficiency associated to decentralisation of public service relative to the centralised case, $\sigma^d > \sigma^c$.

When all corruptible bureaucrats are corrupt households savings become $m(\lambda\tilde{w}_t - \tilde{\tau}_t + b)$ (note that both wages and taxes affect households savings) and bureaucrats savings equal $(1-\nu)n\tilde{w}_t + \nu n(1-p)\tilde{w}_t$. This level of total savings is similar to the one we obtained for the case of corruption and centralisation but in this case the efficiency of public goods and services, σ^d is equal to 1. Using the expressions for 4.3.8, and 4.4.3 we are able to obtain the expression for capital accumulation under extreme corruption and decentralisation:

$$\tilde{k}^d_{t+1} = \alpha A(\lambda m)^\alpha (ng)^\beta (1-\theta^d)^\beta k_t - ng[1 + \nu\theta^d(1-p\delta)] + mb \equiv \tilde{f}^d(k_t) \tag{4.5.9}$$

We are now ready to obtain the steady state capital levels for these two cases. Starting from equations 4.5.8 and 4.5.9 we can derive two expressions for the steady state capital level in a decentralised regime with and without corruption yielding:

$$\hat{k}^{d,*} = \frac{mb - ng}{1 - \alpha A(\lambda m)^{\alpha}(ng)^{\beta}} \tag{4.5.10}$$

$$\tilde{k}^{d,*} = \frac{mb - ng[1 + \nu\theta^{d}(1 - p\delta)]}{1 - \alpha A(\lambda m)^{\alpha}(ng)^{\beta}(1 - \theta^{d})^{\beta}} \tag{4.5.11}$$

In order to guarantee the stationarity of these equilibrium points it must be true that both $mb > ng[1 + \nu\theta^{d}(1 - p\delta)]$ and $\alpha A(\lambda m)^{\alpha}(ng)^{\beta} \in (0, 1)$ are satisfied[30]. Similarly to the centralised case, we have that capital accumulation is lower under corruption, $\tilde{k}^{d,*} < \hat{k}^{d,*}$ since $\tilde{f}^{d}(k_t) < \hat{f}^{d}(k_t)$ for any given k_t[31]. From this analysis, we can derive another important result. Note that direct comparison of equations 4.5.6 and 4.5.11 is not able to reveal whether decentralisation of public service delivery under the presence of corruption is preferred to centralisation in similar circumstances. If we look more closely at these equations we see that the numerator in 4.5.6 is larger than the numerator in 4.5.11 (this is mainly due to the extra loss in public resources generated in a decentralised setting). And from the denominator we see that there are two opposing forces, the efficiency of public spending and the proportion bureaucrats are able to steal out of public funds. Comparing these we arrive at the following condition:

$$[1 - \theta^{d}]^{\beta} < (\sigma^{c})^{\beta}[1 - \theta^{c}]^{\beta} \tag{4.5.12}$$

[30] Note that if $mb > ng[1 + \nu\theta^{d}(1 - p\delta)]$ then it will also be true that $mb > ng$. A similar observation is valid for the other condition since if $\alpha A(\lambda m)^{\alpha}(ng)^{\beta} \in (0, 1)$ then it is also verified that $\alpha A(\lambda m)^{\alpha}(ng)^{\beta}(1 - \theta^{d})^{\beta} \in (0, 1)$.

[31] This can also be derived comparing equations 4.5.10 and 4.5.11. The numerator in 4.5.10 is larger than the numerator in 4.5.11 since $ng\nu\theta^{d}(1-p\delta)$ is positive. Furthermore, the denominator in 4.5.11 is smaller due to the presence of the term $(1 - \theta^{d})^{\beta}$.

If this inequality is satisfied, then the extra losses in public resources due to the institutional conditions in the decentralised economy will outweigh the extra gains due to the better efficiency in public goods provision. Note that this condition depends crucially on the relationship between the efficiency parameter of the centralised regime, and on the different fraction bureaucrats are able to embezzle in the centralised and decentralised structures. The greater and more efficient monitoring and hierarchical control of centralised bureaucrats the more likely a decentralised economy causes further losses and harm to economic development in the presence of corruption.

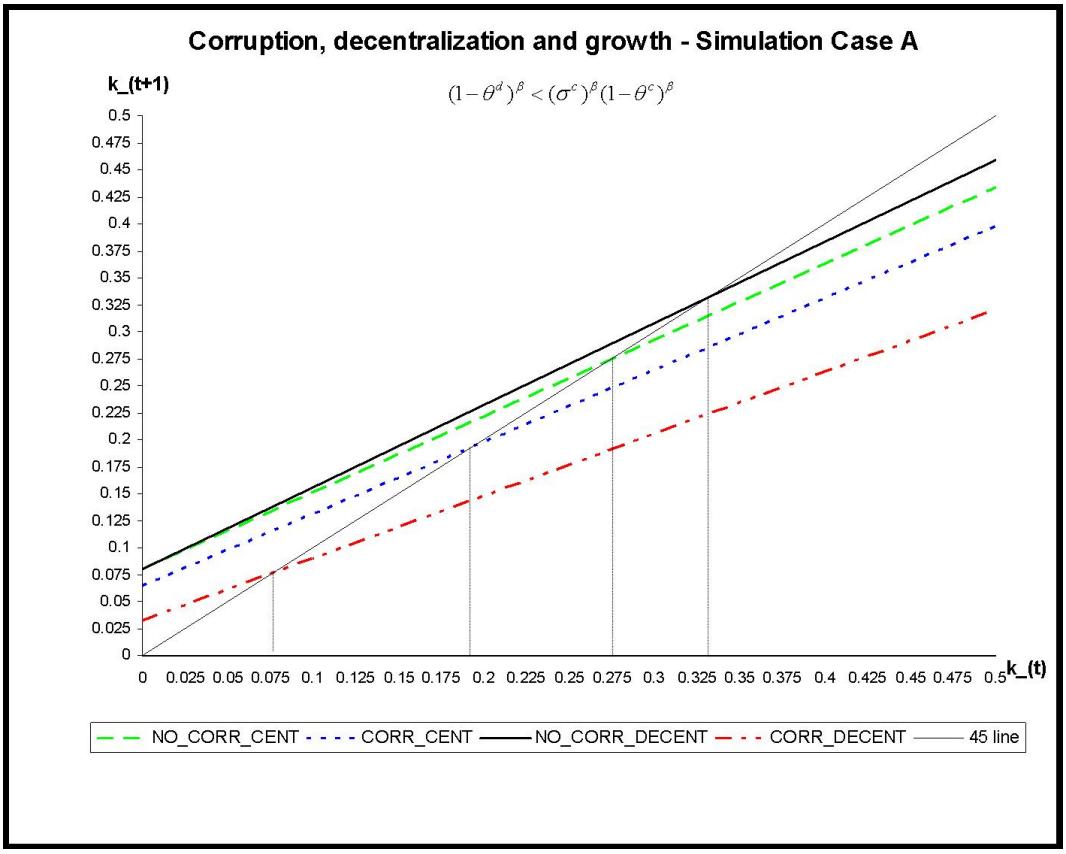

Figure 4.2: **Decentralisation, corruption and development**. Parameter values: $\alpha = 0.4$, $A = 3$, $\lambda > 1$, $m = 0.6$, $n = 0.2$, $g = 1.4$, $b = 0.6$, $\nu = 0.3$, $p = 0.5$, $\delta = 0.5$, $\beta = 0.2$, $\sigma^c = 0.7$, $\theta^c = 0.25$ and $\theta^d = 0.75$.

We present some simulation results in figures 4.2 and 4.3 as a way of illustrating the main results of the model. We considered standard values for the parameters and both simulations include the same parameters except for the economic effi-

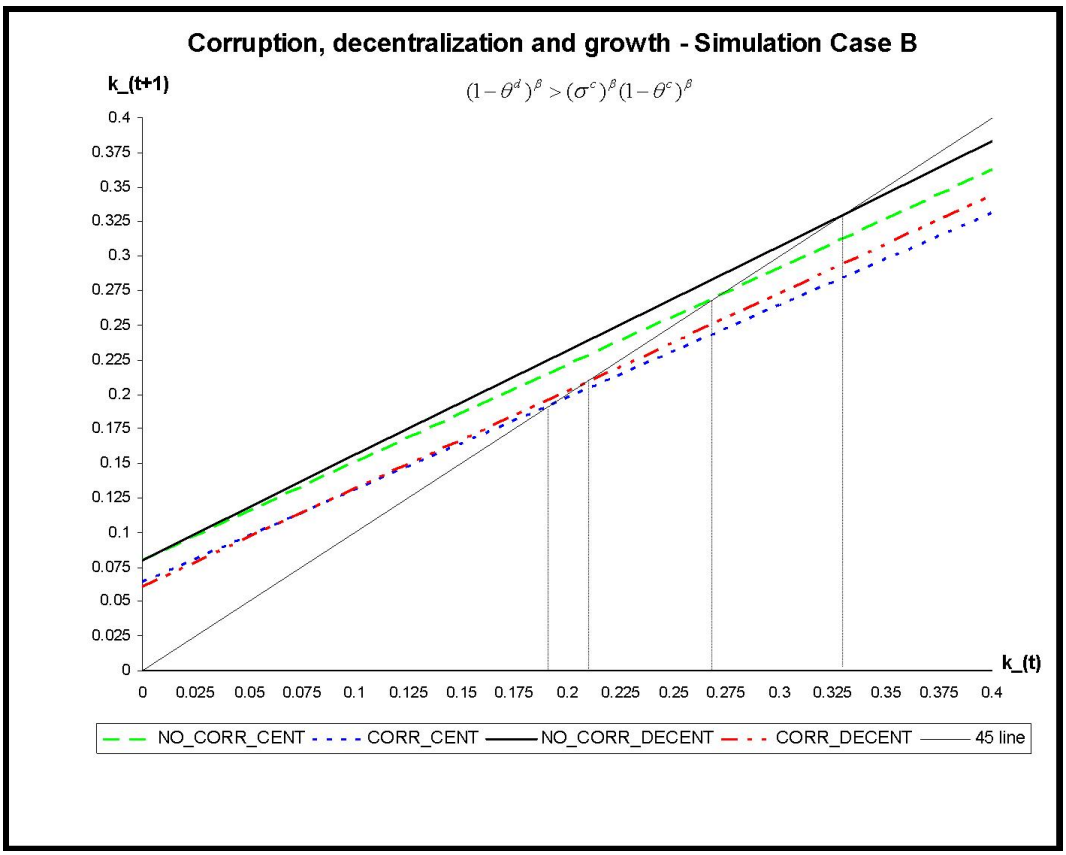

Figure 4.3: **Decentralisation, corruption and development**. Parameter values: $\alpha = 0.4$, $A = 3$, $\lambda > 1$, $m = 0.6$, $n = 0.2$, $g = 1.4$, $b = 0.6$, $\nu = 0.3$, $p = 0.5$, $\delta = 0.5$, $\beta = 0.2$, $\sigma^c = 0.7$, $\theta^c = 0.25$ and $\theta^d = 0.3$.

ciency and informational parameters. Note that regardless of the values of these, decentralisation is the best outcome in terms of development *in the absence of corruption*. However, if corruption is present in the economy, then the outcome is ambiguous. In figure 4.2, where the informational differences between centralised and decentralised structures are significant (θ^d is significantly larger than θ^c), condition 4.5.12 is satisfied and a decentralised structure is associated with very low capital levels and indeed lower than those that would be achieved in a centralised structure. If however, the informational differences between centralised and decentralised structures are not very important (θ^d is slightly larger than θ^c), then it can be seen in figure 4.3 that decentralisation is associated with higher capital levels than centralisation. In fact, while our model predicts that in the absence of corruption, decentralisation is the better outcome for development, we can no longer be certain that decentralisation is the better outcome if corruption is pervasive.

4.6 Conclusions

Decentralisation of public finance and governance has been advocated in recent decades by international organizations and national governments. Based on efficiency grounds, the idea that bringing the government closer to the people would result in a better and more efficient outcome yielding greater social welfare has been a strong motivation to decentralise. The traditional theory of fiscal federalism has been centred around this idea. The public choice literature considered the role of public agents as utility maximizers and derived slightly different implications regarding the effects of decentralisation. More recently, the modern theory of fiscal federalism is characterised by the consideration of political processes and the behaviour of public agents and the role of asymmetric information between different agents. All these theoretical considerations have introduced additional complexities to the question of whether to centralise or decentralise different government activities. In particular, it seems that the trade-off is between efficiency-enhancing considerations stemming from the traditional theory of fiscal

federalism and accountability, information and incentives stemming from the recent political economy of fiscal federalism. The issue is certainly more complex than it was originally considered and there are several interrelationships between the economic and political aspects involved.

This research has been motivated by the above considerations and the aim has been to provide a framework that enables us to capture some of these ideas. Our study is an attempt to contribute to the analysis of fiscal federalism and development in the presence of bureaucratic corruption. We elaborate a dynamic growth model where corruption is endogenously determined according to the decisions of individuals (in particular, public servants). In this context, the existence of a centralised or decentralised structure yields different implications in terms of the effects on economic development. Among the results of our analysis, in line with previous research on corruption and development, is that corruption is always adverse to economic development. This is because corruption diverts public resources away from productive activities. Furthermore, our model suggests that if corruption is absent in the economy, decentralisation is associated with greater capital accumulation than centralisation. However, if corruption occurs, then we show that decentralisation may be the worst alternative if there are weak institutions at the local level. This is the case if monitoring is significantly more efficient at the central level than at the local level and if the net efficiency gains associated with decentralisation are not significantly large. Finally, our model permits the coexistence of corruption and poverty as permanent rather than temporary features of an economy.

Our results are in line with some results in the empirical literature. There is agreement that corruption affects economic development negatively via the diversion of investible resources. Likewise, there is agreement that corruption is also affected negatively by economic development. In fact, the new directions in empirical research conform to the hypothesis of a bivariate relationship between corruption and development. Furthermore, there is mixed evidence regarding the relationship between decentralisation and corruption in the empirical literature. While there

are some studies that find that federalism is associated with more corruption in the economy, other authors have found that fiscal decentralisation is associated to lower corruption. Again, the latest empirical developments suggest that it is perhaps more convenient to adopt a more integrated approach to the study of decentralisation and corruption considering the interrelationships between different aspects or types of decentralisation. The ideas presented in this chapter accord with this if we consider that improved economic efficiency is associated with certain types of decentralisation and reduced hierarchical control and informational and monitoring problems are associated to other types of decentralisation.

We think it would be desirable to pursue certain extensions to this analysis. The decision to centralise or decentralise is rarely exogenous. It may be dependent on certain features of the socio-economic system or may be part of a larger restructuring of the public sector. In terms of our model, this would imply to postulate that the degree of decentralisation is a function of the aggregate level of corruption or development or both. Another refinement we may consider is making the probability of detection endogenous. It is likely that more efficient (costly) monitoring leads to an increase in the probability of detection. Finally, it may be important to consider the role of office-motivated politicians by incorporating national and local elections into the model. This is likely to pit the objectives of the bureaucrats against those of the politicians, with one possible effect being that local politicians may be more interested in monitoring local bureaucrats more efficiently. This would possibly reduce the ability of local bureaucrats to embezzle bureaucrats funds and alleviate local accountability problems.

Chapter 5

Federalism, decentralisation and corruption

5.1 Introduction

In the past 30 years the number of federal states has increased[1]. Decentralisation of some form has been adopted in developed and developing countries alike. In part this trend is explained by a belief that centralised governments encourage rent-seeking behaviour causing an increase in corruption levels [Bardhan and Mookherjee (2000)]. The theoretical literature on this topic would suggest however that such a simple view of the policy choice available is misplaced. The relationship between decentralisation and corruption is complex: decentralisation is multifaceted and can give rise to mixed predictions. Under some conditions centralised governments are more corrupt whereas under some other definition of decentralisation they are more corrupt[2].

Because of the reasons mentioned in the previous paragraph, it is not surpris-

[1] Among industrialized countries, Spain and Belgium have joined Australia, Canada, Germany, Switzerland and the United States (Italy agreed to a federalist turn after a Constitutional reform in 2001). Federalization processes also took place in Ethiopia and are currently being debated in a number of developing countries (Uganda, Afghanistan and Indonesia).

[2] For an excellent survey on the theoretical and empirical contributions to the literature see Fjelstad (2004).

ing to observe a number of apparent inconsistencies in the empirical literature on decentralisation and corruption. For instance, while some papers find evidence that federal countries have higher corruption ratings [Goldsmith (1999), Treisman (2000), and Wu (2005)], several other scholars have found that fiscal decentralisation is associated to lower corruption [Fisman and Gatti (2002a), Barenstein and de Mello (2001)]. In theory, federal states are not necessarily fiscally decentralised states, although it seems that there exists a positive association between them. According to Ebel and Yilmaz (2002), the average sub-national share of expenditures is 38% for federal countries and 22% for unitary countries. However, there are cases of unitary countries with a high degree of fiscal decentralisation, as the Nordic countries. At the same time, there are some federal countries with very low levels of fiscal decentralisation, as is the case of Croatia, Malaysia and Indonesia. Other studies stress the role of other aspects of decentralisation, such as political or administrative decentralisation. It has been argued that political decentralisation is important to improve accountability at the lower levels and some studies have found evidence of this. Additionally, some research has found evidence that administrative decentralisation within the public sector is associated to lower corruption [Wade (1997), Kuncoro (2004)].

In this chapter we try to bring the empirics closer to the theory by acknowledging that there are many different dimensions to decentralisation and that there may be inter-relationships between them. In so doing we build on a small recent literature that recognises this point. Treisman (2002b,a) provides a systematic treatment of the issue, carefully defining different types of decentralisation and providing measures for each of them. Recognising the importance of their joint effect on corruption he finds some direct effects but no interaction effects. This study has a closer relationship with Enikolopov and Zhuravskaya (2006) who test whether the effects of one of the aspects of decentralisation we also consider, fiscal decentralisation, on corruption depend on the existence and extent of political institutions. In particular, they analyse how the level of political centralisation modifies the effect of fiscal decentralisation on corruption. They find evidence from this approach

that strong party systems make it more likely that fiscal decentralisation reduces corruption and that political centralisation along with fiscal decentralisation improves government quality for a sample of developing countries. This evidence offers support for some long-standing political theories of decentralisation.

Our work addresses the following issues:

- Which decentralisation measures are important? - This aims to capture the rich diversity of the measures of decentralisation used in the literature.
- Are there multi-dimensional aspects?
- Are there any significant interaction effects?

We contribute to this recent literature both by recognising and measuring the existence of different dimensions of decentralisation but also examine some hypotheses in order to provide a sensible econometric model. We gather a large set of decentralisation indicators -most of which have been used alternatively by earlier research- and group them into categories in order to re-examine the relevant empirical literature in a different light. Interestingly, we find evidence of heterogeneity in the relationship between decentralisation and corruption regardless of the decentralisation measure used. Furthermore, unlike earlier research we argue and find that some types of decentralisation are simultaneously associated with corruption through both direct and indirect effects. We do not explore the co-evolution of these dimensions of decentralisation[3].

Our finding that long-standing unitary countries (constitutional centralisation) which are also fiscally decentralised have low corruption is to some extent present in earlier research. The main difference is that most articles do not model or find

[3]Unfortunately, we were not able to analyse time-varying features of the relationship between corruption and decentralisation. Although we have data on corruption and other control variables since 1975, there are almost no time-series data for decentralisation indicators. Apart from annual dummies of little use in panel-data methods, the only decentralisation measures with time-series data are *exp* and *rev*. The problem with these is that the sample of countries suffers significant variations throughout the 25-year period.

these two dimensions of decentralisation significantly associated with corruption in the same model. This result is quite robust both in terms of a variety of specifications and controls used and in terms of alternative decentralisation measures. Furthermore, we also find evidence suggesting that political decentralisation -the existence of municipal elections- is also associated with corruption but only in an indirect way through its effect on constitutional decentralisation. In particular, political decentralisation worsens the impact of constitutional centralisation on corruption. This result is similar to Enikolopov and Zhuravskaya (2006) who find a negative indirect effect of political institutions on corruption.

The remainder of the chapter is organised as follows. In the next section, we review the theoretical background on decentralisation and federalism, stressing the different dimensions and exploring the interrelations and overlaps between these dimensions. Section 5.3 details the data and the empirical strategy chosen in this research. In section 5.4, we present and discuss the main results of this chapter. We also analyse different hypothesis regarding the joint impact of different dimensions of decentralisation on corruption. Section 5.5 concludes.

5.2 Decentralisation and theory

5.2.1 Federalism defined

In order to model the relationship between federalism, decentralisation and corruption, we need first to be clear on what we mean by federalism and its opposite unitarism. As Treisman (2002b) notes there are several ways of defining federalism. We group them in two broad categories. First, there is what might be called *de jure* federalism where the status of federal or federation is enshrined in the Constitution or some other special laws. Second, there is what might label *de facto* federalism, where although not explicitly defined as federal or federations, they meet some criteria widely considered to be requirements of a federal structure.

The list of federal countries resulting from both definitions will in general be different. According to Treisman (2002b) some anomalies arise: *de facto* federations such as the US and India (and the more recently federalised Spain) would not be listed as *de jure* federations since their Constitutions do not explicitly mention this special status. Constitutionally-federal Canada would drop out from the *de facto* classification since sub-national legislatures are not given residual powers[4].

Similarly, while there are many different definitions of unitarism the most common refers to *"formal arrangements of power between national governments and regional governments, the most important of which is the existence of regional assemblies with important policymaking power"* [Gerring et al. (2005a), pp. 13]. Again, there may be countries that have unitary features without them being explicitly cited in the constitution. An important observation also made by these authors is that theoretically unitary governments are perfectly compatible with different aspects of decentralisation as are federal governments. If we accept this then we shall look at the controversies and inconsistencies in the empirical literature in a different light.

5.2.2 Theoretical literature

To motivate the empirical analysis we provide a review of the literature on decentralisation and corruption. We organise this into four sections.

Fiscal Federalism. The traditional theory of fiscal federalism has its roots in the public finance literature, with key contributions from Musgrave, Samuelson[5], and Tiebout (1956). This was then formalised by Oates (1972). He shows first that in a multi-level government situation where at least some public goods have regionally-bounded benefits, decentralised finance provides opportunities for gains in social welfare. Even with inter-jurisdictional externalities, decentralised pro-

[4] We may also add that unless we could objectively define what a 'federal' country is, a country like China where economic federalism has played an important role in promoting growth, could be even thought of as federal.

[5] See Oates (2005) for references and summary of these contributions.

vision creates a better outcome as opposed to a uniform centralised provision of public goods. Second, there is an informational asymmetry: local governments are better informed about the local preferences than the central government and this is also known as the preference-matching argument for fiscal decentralisation. Third, there is Tiebout's 'voting-with-the-feet' argument that citizens will sort themselves into homogeneous communities demanding the same local public goods. Finally, the existence of hard-budget constraints should force local and regional governments to put in effort to generate and rely on their own sources of revenues. If the local and regional governments are given transfers from the centre or face soft budget constraints then efficiency levels will likely drop. Taking these arguments together, we would expect that the scope for bureaucratic corruption is lower with fiscal federalism or fiscal decentralisation. In principle, intergovernmental competition to attract residents lowers the incentive and ability to extract rents and bribes. Moreover, the existence of hard-budget constraints reduces the scope for corruption since local governments are responsible for financing their own expenditures.

Nevertheless, there remain theoretical arguments that suggest that fiscal decentralisation (of both expenditure and revenues) may create perverse incentives and corruption. For example, because of over-budgeting and lack of accountability in the case of soft-budget constraints arising from tax evasion and unconditional intergovernmental grants. This situation may be particularly relevant in cases where there is no political decentralisation. Another possible factor that may distort incentives is the way sub-national budgets are financed. Barenstein and de Mello (2001) have suggested that the relationship of fiscal decentralisation to corruption hinged on the way sub-national expenditures are financed.

Political decentralisation. There is perhaps no better description of the difficulties in defining centralisation than Alexis de Tocqueville's comment that *"Centralisation is now a word constantly repeated but is one that, generally speaking, no one tries to define accurately"*[6]. Alongside Montesquieu and philosophers from

[6]Alexis de Tocqueville, Democracy in America, Vol. 1, Part 1, ch. 5.

the Enlightenment, de Tocqueville's ideas on federalism and decentralisation generated vigorous research effort to study the advantages and disadvantages of political decentralisation. The central idea of political decentralisation (or government decentralisation as is also called) is that citizens should be given more power in political and public decision-making. This involves the creation of a number of different institutions that support this objective. Local and regional elections, regional autonomy, local committees and civil associations, sub-national authority over taxation, spending and legislation, are all different mechanisms involved in the context of political decentralisation. This type of decentralisation often requires constitutional or statutory reforms. There are several arguments favouring political decentralisation. The most commonly cited are the greater accountability to the local and regional electorate, the development of a civic local culture by fostering democratisation and the involvement of other local actors in the decision-making process (NGO's, civil and professional associations, private sector, etc.).

Despite these theoretical arguments endorsing political decentralisation, others have highlighted the potential dangers associated with political decentralisation. Riker (1964) provided strong theoretical arguments in favour of political centralisation. The basic idea is that political centralisation may serve as a mechanism to complement and boost the outcome of fiscal decentralisation by making local politicians internalise inter-jurisdictional externalities to a greater extent. Alternatively Bardhan and Mookherjee (2000) argue that political decentralisation may not be as effective if local capture of public officials by interest groups is widespread.

Constitutional decentralisation[7]. The concept of constitutional decentralisation (or equivalently constitutional federalism) is closely associated to what we earlier defined as *de jure* federalism, representing the establishment of a federal regime by the Constitution. There is however, in addition the concept of contingent decentralisation, which refers to our current understanding of federalism as

[7] We refer to *constitutional decentralisation* as the existence of a federal regime enshrined in the Constitution. This expression was introduced by Diamond (1969) in his article about the relationship between federalism and decentralisation.

including the erosion and degradation of the constitutional decentralisation principle by jurisprudence and/or Courts rulings [Aranson (1990)]. *"Federalism as constitutional decentralisation differs from federalism as contingent decentralisation in that the authority of the states under constitutional decentralisation is guaranteed as a matter of organic, constitutional law. Neither prudential nor political judgments or decisions taken at the national level can overturn such guarantees in the face of the appropriate legal fidelity to the original constitutional arrangement"* [Aranson (1990), p. 20]. One connotation derived from this distinction is that constitutional decentralisation is a rather static status while contingent decentralisation is inherently a dynamic concept. In general, constitutional and contingent decentralisation will differ: contingent decentralisation is driven by pure utilitarist motives and this will shape the distribution of powers and federal arrangements in practice. Aranson (1990) shows the widening gap between these two concepts but in general it has happened in several other federal countries. It may be even argued that contingent decentralisation will eventually cause a country to recentralize if many judicial or consuetudinary instances[8] erode the true nature and spirit of constitutional decentralisation. At the empirical level, distinguishing between these two types of 'federalism' is not practicable and only constitutional decentralisation measures can be used.

What are the predictions of the theory for the relationship between constitutional decentralisation and corruption? Similarly to the case of political decentralisation the answer is not clear. Constitutional federalism has often been advocated as a system to accommodate ethnic and religious differences and other regional peculiarities. Federalism provides room for diversity and reduces the possibility of tensions and conflicts which may also originate opportunities for the extraction of rents. Yet on the other hand, the well-known arguments of multiplication and overlapping of layers of government causing accountability problems and the 'overgrazing' of the bribe base in federal systems suggests that the latter may also be associated to higher corruption.

[8]The term consuetudinary law is applied to cases where the rule of law is determined by long-extant customs as opposed to case law or legislative processes

Structural decentralisation. According to Treisman (2002b) structural decentralisation refers to the number of tiers of government. The greater the number of tiers the more decentralised the country. This definition gives a sense of structural decentralisation as comprising the vertical structure of country and this form of decentralisation is often refereed to as vertical decentralisation. This concept of structural decentralisation is likely to be related to other forms of decentralisation (possibly the so-called decision-making decentralisation or even fiscal decentralisation). In fact it is possible that where there are several tiers of government, each tier will have the authority over certain decisions (i.e. spending, taxing, legislation, etc.) or that each tier will be accountable for their own sources of revenues and expenditures. The definition given by Treisman refers to a tier as having a political executive in charge of certain decisions and having a territorial jurisdiction. It is clear from this that the relationship between structural and political decentralisation should be a close one. This can be confirmed in Table 5.3. Other measures such as the number of intermediate and local jurisdictions in a country will be included within this form of decentralisation, although technically they do not represent forms of structural or vertical decentralisation.

5.3 Data and sample characteristics

The empirical approach adopted in the chapter builds the relationship between decentralisation in stages. In the first stage we try to identify which measures of the different aspects of decentralisation are correlated with corruption. As a second stage we then consider the multi-faceted nature of decentralisation, and attempt to establish the robustness of the results in the first stage to other aspects of decentralisation. Finally, we allow for the possibility that there may be interaction between the various measures of decentralisation.

In this section we describe and motivate the choice of regression model that we use in stage 1 of the empirical analysis and outline the data. The baseline model we adopt in the chapter is typical of that found in the literature. It regresses a

measure of corruption against a series of control variables found to be robustly correlated with corruption [Treisman (2000); Serra (2006)] and a series of measures of decentralisation:

$$CORR_i = \beta_0 + \beta_1 DEC_i + \beta_2 \log GDP_i + \beta_3 \log POPUL_i + \beta_4 PRESS_i + \varepsilon_i \quad (5.3.1)$$

where $CORR_i$ is the corruption measure, DEC_i is our decentralisation indicator, $logGDP_i$ is the logarithm of GDP per capita (PPP), $logPOPUL_i$ is the logarithm of total population and $PRESS_i$ is the degree of press freedom[9].

We test model 1 using a dataset containing information for up to 177 countries. This data include standard decentralisation indicators used by others and some newly assembled measures. To measure corruption we use the World Bank's Control of Corruption Index[10].The decentralisation measures, definitions and coverage are given in Table 5.1 below. Some of the indicators are alternative measures for a certain type of decentralisation. More details about the source and coverage are given in the Data Appendix. Table 5.2 presents summary statistics for some of our variables.

Consistent with the theoretical literature we separate these measures into four groups: fiscal, constitutional, political and structural decentralisation. In many cases we can capture different aspects of these four main types of decentralisation. We detail the data sources for these variables in the Appendix, along with some summary statistics and the correlation between the variables.

Fiscal decentralisation. The most commonly used indicators of fiscal decen-

[9]We choose to include a measure of press freedom rather than for example a measure of democracy more typically used. This reflects the robustness of this variable using error-bounds analysis in Freille et al. (forthcoming); the high correlation between press freedom and measures of democracy; and the sensitivity of the measures of democracy to changes in specification.

[10]This choice is made to maximise the set of available observations. We have tested the robustness of this choice to the alternative measures of corruption by Transparency International's CPI and the International Country Risk Guide (ICRG) and for a common set of countries find no substantive differences. These results are available from the author on request.

Table 5.1: **Decentralisation indicators**

Variable	Description	Type	Obs	Years
exp	Sub-national expenditure (% total exp.)	Fiscal	69	1990-00**
rev	Sub-national revenue (% total revenue)	Fiscal	68	1990-00**
fis	Score for fiscal decentralisation	Fiscal	67	1996
muni	Local governments elected?	Political	127	2000
state	State/province governments elected?	Political	134	2000
stconst	Are senators' constituencies the provinces?	Political	58	2000
author	Sub-national authority in fiscal and legal	Political	61	2000
auton	Existence of autonomous regions	Political	156	2000
pol	Score for political decentralisation	Political	67	1996
*dec*2	Political decentralisation index (1)	Political	75	2000
*dec*4	Political decentralisation index (2)	Political	80	2000
federal	Federalism dummy	Constitutional	177	2000
federal(2)	Federalism dummy (broad concept)	Constitutional	177	2000
fedindex	Index of federalism	Constitutional	125	2000
unitary	Index of unitarism	Constitutional	106	2000
unitaryhis	Index of unitary history	Constitutional	106	2000
tiers	Number of elected sub-national tiers	Structural	127	1999
regj	Number of intermediate jurisdictions	Structural	61	1999
locj	Number of local jurisdictions	Structural	108	1999

* This is the number of countries with data available for each indicator (using the WBC corruption index).
** Average for the period. For sources see Appendix B

tralisation in the literature are the percentage ratio of sub-national government expenditure to total government expenditure and the percentage ratio of sub-national government revenue to total government revenue[11]. In both cases the data are an average for the period of the 1990's. Following previous studies, we decide to use the ratio of sub-national government revenue to total government revenue, *rev*, as our main indicator for fiscal decentralisation. If the vertical fiscal imbalance is not significant, it is sensible to choose this indicator as the measure that best captures the extent of fiscal decentralisation.

Constitutional decentralisation. Constitutional decentralisation refers to whether the structure of the relations between different government units are based on federal or unitary grounds according to legal bodies. In general researchers capture

[11] One problem of using these two indicators as alternative is the existence of vertical fiscal imbalances. In short, this implies that sub-national revenues fall short of sub-national expenditure and the difference should be compensated by coordination mechanisms between the different levels of government.

Table 5.2: **Summary statistics for selected variables**

Variable	Description	Mean	Std. Dev.	Min.	Max.	N
exp	Share of sub-national gov. exp.	22.9	15.6	2.02	80.53	69
rev	Share of sub-national gov. revenue	18.03	14.8	0.81	78.12	68
author	Sub-national authority in spend/tax	0.44	0.5	0	1	61
federal_alt	Dummy for federalism [Treisman]	0.1	0.3	0	1	177
tiers	Number of elected sub-national tiers	1.16	0.89	0	3	127
regj	Number of intermediate jurisdictions	26.74	24.9	2	135	61
locj	Number of local jurisdictions	4438.56	23949.3	17	237687*	108
muni	Local governments elected?	1.36	0.82	0	2	127
state	State/prov. governments elected?	0.87	0.81	0	2	134
fis	Score for fiscal decentralisation	0.41	0.22	0	1	67
pol	Score for political decentralisation	0.55	0.23	0	1	67
adm	Score for adm. decentralisation	0.54	0.28	0.01	1	67
auton	Existence of autonomous regions?	0.1	0.3	0	1	156
stconst	Are senators' constituencies the provinces?	0.5	0.5	0	1	58
dec2	Political decentralisation index 1	2.21	1.6	0	5	75
dec4	Political decentralisation index 2	2.2	1.53	0	4	80
federal	Dummy for federal countries	0.13	0.34	0	1	177
fedindex	Index of federalism	4.14	1.32	1	5	125
unitary	Index of unitarism	1.6	0.74	0	2	106
unitaryhis	Index of unitary history	36.82	31	0	101	106
federal(2)	Federal dummy (broad)	0.28	0.45	0	1	174
cpi	Corruption Perception Index (TI)	4.73	2.4	1.2	10	91
icrg	Corruption Index (ICRG)	2.96	1.22	1	6	140
wbc	Corruption Index (World Bank)	-0.02	1.03	-1.8	2.5	173
loggdp	Log of GDP per capita	3.68	0.51	2.67	4.77	160
logpopul	Log of total population	6.86	0.76	5.01	9.1	174
pss	Press freedom index	48.17	25.04	5	100	174
democindex	Index of democracy	5.13	3.98	0	10	151
demochis	Dummy for democratic history	0.26	0.44	0	1	107
polrights	Index of political rights	3.59	2.23	1	7	174
democ1	Alternative democracy index	3.65	1.98	1	7	174
bri	Dummy for former British colony	0.28	0.45	0	1	177
fre	Dummy for former French colony	0.16	0.37	0	1	177
spa	Dummy for former Spanish colony	0.11	0.32	0	1	177
por	Dummy for former Port. colony	0.03	0.17	0	1	177
ethno	Ethno-linguistic frac. index	0.35	0.3	0	1	143
eng	English legal system (dummy)	0.31	0.46	0	1	175
soc	Socialist legal system (dummy)	0.19	0.4	0	1	175
fre	French legal system (dummy)	0.43	0.5	0	1	175
ger	German legal system (dummy)	0.03	0.18	0	1	175
sca	Scandinavian legal system (dummy)	0.03	0.17	0	1	175
pro_d	Dummy for Protestant country	0.22	0.41	0	1	174

Note: Only selected variables are given in the Table. Data for year 2000, otherwise the closest available year. * Although India has a very large number of elected local jurisdictions (237687), we have included this observation in our data since it does not affect the results of our econometric analysis. As we note later, the exclusion of India in the regressions using *locj* does not change the results. For sources and data description see table B.4 in Appendix B

this as a zero-one dummy with all countries not explicitly federal being labeled as Unitarian. In our study we explore several alternative and complementary measures. Our main control for the federal structure of a country -*unitaryhis*- however is a newly assembled indicator that measures not only the current status of federal or unitary but also considers recent history. In particular, this variable gives the score of unitary history for a country during a period of 100 years. In other words, if a country has always been a federation or federal (Argentina, Canada, Malaysia and Switzerland among others), then the score assigned is 0. Countries that have been mostly unitary throughout this time period (like Denmark, Japan, and Sweden), receive high scores, whereas countries that have either changed regime or have a relatively short unitary history are ranked in between (Austria, Spain and Thailand)[12]. Although we also use dummies and indexes of federalism, we consider that the federalist or unitarist characteristics of a country are best captured using not only the present features but also the federalist or unitarist history. This reason motivates the choice of *unitaryhis* as our main measure of constitutional decentralisation.

Political Decentralisation. According to the World Bank political decentralisation is about providing the citizens of a country more power in public decision-making and is associated with institutions ranging from pluralistic politics and representative government, to local and regional democratization and greater participation in decisions. We have a number of political decentralisation indicators taken from different sources. We consider three of these to most fully capture the essence of political decentralisation: *muni*, a categorical variable indicating the existence of municipal executive and legislative elections, *state*, a similar variable for provincial or state elections and *stconst*, a dummy registering whether the provinces/states represent the constituencies of the senators. Although we consider all three indicators in our regressions, we believe the variable measuring the existence of municipal elections, *muni*, best captures the idea of political decentralisation, since it assesses the extent and depth of electoral decentralisation,

[12]See Appendix B for source and definitions

which is the most relevant aspect of political decentralisation.

Structural Decentralisation. Finally structural decentralisation concerns the vertical (number of tiers) and horizontal (number of jurisdictions within each tier) make-up of the political structure[13]. We use three indicators here: the number of elected tiers (*tiers*), the number of elected regions or jurisdictions within the upper tier (*regj*) and the number of elected localities or jurisdictions within the lower tier (*locj*). It should be noted that our variable *tiers* is the most appropriate to capture this form of decentralisation since it gives evidence on the vertical organisation of the country.

Table B.1 in the Appendix shows the correlations between different forms of decentralisation, while we reproduce the correlation for the main decentralisation variables in Table 5.3. It appears from both that the interrelations between constitutional, political and structural decentralisation are straightforward. It is the case for example that none of our main indicators for each aspect of decentralisation -*rev* for fiscal, *unitaryhis* for constitutional, *muni* for political and *tiers* for structural- in Table 5.3 are significantly correlated. Most of the correlations are intuitive; the positive correlation between *federal* and *unitaryhis*; that countries with a federal system are also likely to have local (*muni*) and regional (*state*) elections and have higher number of elected government tiers (*tiers*) for example. Other significant correlations are between *unitaryhis* and *stconst* for example.

Figure 5.1 provides a different way to look at the data. Here we arrange countries according to their fiscal and constitutional decentralisation regimes and indicate the level of corruption in those countries. According to the previous literature, we would expect countries with high fiscal decentralisation and with constitutional centralisation (*unitarism*) to show low corruption levels. This is evidenced in the figure by looking at the upper right-hand side quadrant where all countries (in bold) have low corruption levels. Similarly, countries with low fiscal decen-

[13]Treisman (2002b) introduces his definition of vertical decentralisation by measuring the number of tiers in a system. This categorization includes single-tiered systems such as Singapore and multi-tiered systems such as Argentina, the United States and China.

Table 5.3: **Pairwise correlations between selected decentralisation indicators**

VARIABLES	**unitaryhis**	**muni**	**locj**	**federal**	**state**	**stconst**	**tiers**	**regj**
unitaryhis	1.000							
	(106)							
muni	0.137	1.000						
	(85)	(127)						
locj	-0.141	0.108	1.000					
	(78)	(90)	(216)					
federal	-0.330*	0.209*	0.275*	1.000				
	(106)	(127)	(216)	(177)				
state	0.045	0.547*	0.066	0.361*	1.000			
	(84)	(110)	(96)	(134)	(134)			
stconst	-0.318*	0.314*	0.201	0.447*	0.288*	1.000		
	(48)	(45)	(41)	(58)	(49)	(58)		
tiers	0.140	0.479*	0.190*	0.437*	0.359*	0.463*	1.000	
	(81)	(104)	(108)	(127)	(107)	(42)	(127)	
regj	0.085	0.112	-0.003	-0.138	0.004	-0.150	0.005	1.000
	(47)	(55)	(60)	(61)	(53)	(31)	(61)	(61)

Notes: The number of observations is given under the corresponding correlation. * Denotes significance at the 10% level

tralisation and with constitutional decentralisation (*federalism*) should have high corruption levels. Although the evidence is not as strong as in the previous case, the lower left-hand side quadrant shows most countries as having intermediate to high corruption levels.

5.4 Empirical evidence: Fiscal decentralisation, federalism and political institutions

5.4.1 Which aspects of decentralisation matter?

Tables 5.4 and 5.5 contain the results for the baseline regression we specified above. We have considered the robustness of the results to alternative measures of corruption (the CPI and ICRG indices of corruption) and to changes in the

		FISCAL DECENTRALIZATION			
		Low Fiscal Decentralization		High Fiscal Decentralization	
CONSTITUTIONAL DECENTRALIZATION	Unitarism	**Belgium** **Botswana** **Chile** **Costa Rica** Dom. Republic **Fiji** **France** **Israel**	**Italy** **Mauritius** **New Zealand** Panama **Portugal** Thailand Trinidad & Tobago **UK** Uruguay	**Austria** **Denmark** **Finland** **Iceland** **Ireland**	**Netherlands** **Norway** **South Africa** **Sweden**
	Federalism	*Albania* Bulgaria Croatia Czech Republic **Hungary** *Indonesia* Malaysia	*Nicaragua* *Paraguay* Poland *Romania* Slovakia **Slovenia**	**Australia** *Bolivia* Brazil **Canada** **Estonia** **Germany** *India* *Latvia*	Lithuania Mexico *Moldova* *Mongolia* **Spain** **Switzerland** **USA**
Notes: We consider the mean of the variables as a criterion to subdivide the sample					
Countries in **BOLD** have *low corruption levels* (between 0.5 and 2.5)					
Countries in NORMAL have *intermediate corruption levels* (between -0.5 and 0.5)					
Countries in *ITALICS* have *high corruption levels* (between -2.5 and -0.5)					

Figure 5.1: **Fiscal and constitutional decentralisation**

observations. We reproduce the latter in table B.2 in the Appendix B where we use a common subset of countries including all the countries with data available for the three corruption indexes.

In discussing the results we begin with the *fiscal decentralisation* indicators, the sub-national government expenditure as a percentage of total government expenditure and sub-national government revenue as a percentage of total government revenue. The results for these variables are consistent with earlier research: fiscal decentralisation is associated with lower corruption ratings [Huther and Shah (1998); Fisman and Gatti (2002a); Barenstein and de Mello (2001)]. The coefficients are also similar in size to those obtained previously.

In contrast to the results for fiscal decentralisation less agreement has been found in the literature for *constitutional decentralisation*. Treisman (2000) found that federal states are perceived to be more corrupt and that this conclusion was robust to several tests, whereas for a different indicator Gerring et al. (2005a) find that unitary systems are strongly associated with good governance. Others have found

no relationship between federalism and corruption [Fisman and Gatti (2002a); Wu (2005)].

Table 5.5 confirms these mixed results. The zero-one federal dummy suggests that federalism has no relationship to corruption, a result similar to that obtained if we use the federal dummy included in Treisman (2000)[14]. Investigating the results further we find we are unable to replicate Treisman's result that federal states are more corrupt for two reasons. Firstly, the effect of the federalism dummy is sensitive to the inclusion of the logarithm of total population and to cultural and historical indicators. Second, the results for the federalism dummy are sensitive to the year chosen. Specifying the model and the data as closely as possible to Treisman, our results are similar to his paper for 1996 and 1998 (federal states are more corrupt) although the coefficients are never significant, but the coefficients become negative when we use either 2000 or 2002 (federal states are less corrupt).

Also in Table 5.4 we explore whether using more detailed measures of constitutional decentralisation help to improve the robustness of this variable. The first measures is an index of federalism (*fedindex*) ranging from 1 (most federal) to 5 (most unitary). Although the positive sign of the coefficient implies that unitary countries are associated with lower corruption levels, it is not significantly different from zero. The second measure is taken from Gerring et al. (2005a). The authors study the relative merits of federal and unitary systems and come to the conclusion that long standing unitary systems are associated with lower corruption. The unitarism index (*unitary*) takes values of 0=federal (elective regional legislatures plus constitutional recognition of sub-national authority), 1=semi-federal (where there are elective legislatures at the regional level enjoying important policymaking power but in which constitutional sovereignty is reserved to the national government), and 2=unitary [Gerring et al. (2005a)]. As can be observed in Table 5.5 the coefficient on this variable is again not significant.

[14]Our federal dummy includes a slightly larger number of countries and therefore the number of federal states differ between our study and Treisman's. He uses the classification of federal countries as given in Elazar (1995), while we use this and other sources to update the data. As a result of this, we add Bosnia and Herzegovina, Comoros, Ethiopia, Serbia and Montenegro, South Africa, and the United Arab Emirates to the list of federal countries.

The final indicator, also from Gerring et al. (2005a), is a historical unitarism index (*unitaryhis*) created on the basis of the annual unitary scores used above[15]. The estimation results (regression corresponding to *unitaryhis* in Table 5.4) show that countries with long standing unitary regimes have lower corruption. Using our simple baseline regression, we have obtained the same qualitative results as Gerring et al. (2005a), although it should be noted that they use the ICRG index of corruption. For the same index of corruption we find an insignificant effect from the unitary history variable (it is significant if we use the CPI index of corruption)[16].

In other models in Tables 5.4 and 5.5, we explore the relationship between political dimensions of decentralisation and corruption. Several forms of *political decentralisation* have been recognized in the literature including electoral decentralisation, structure of the party system, decision-making authority and residual powers [Treisman (2002b,a); Enikolopov and Zhuravskaya (2006)]. We focus however on a subset of these aspects for which we can find reliable data, namely indicators of electoral decentralisation and of authority decentralisation (also known as decision-making decentralisation).

From Table 5.4 we can see that none of the indicators of political decentralisation are significantly and consistently related with corruption. However, this is not the case if other measures of corruption are used as can be seen from Table 5.5 in Appendix B. According to this table we note that there is a positive association between corruption and *author* when we use the ICRG index. In addition, the existence of local elections at the executive and legislative levels -*muni*- is negatively associated with the CPI index; a similar negative relationship also exists when we use an aggregate indicator of political decentralisation, *dec4*, which aggregates over *muni* and *state*. The sensitivity of the political decentralisation

[15] Although the authors have used time series data we estimate the model using the index for the year 2000. We do this since there is little year-to-year variation in the index and we were unable to obtain the original data. The variable measures the unitary history of a country from 1901 to 2000. For the construction, measurement and coverage of this index see Gerring et al. (2005a).

[16] Some investigation suggests that this difference is due to the use of panel data in their study.

Table 5.4: **Baseline regressions - Cross Section (Year:2000) - Variable subset of countries**

Dependent variable: Corruption - Method: OLS																		
	cpi	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*
	EXP			REV			MUNI			STATE			AUTHOR			AUTON		
DEC	0.03**	0.02**	0.01***	0.03**	0.02*	0.01**	-0.76***	-0.04	-0.16**	-0.14	-0.08	0.00	-0.40	-0.69***	-0.11	-0.47	-0.36	-0.22
	[2.40]	[2.46]	[2.90]	[2.13]	[1.81]	[2.37]	[-3.15]	[0.27]	[-2.10]	[-0.64]	[-0.70]	[0.07]	[-0.71]	[-3.20]	[-0.70]	[-0.96]	[-1.31]	[-1.24]
GDP	3.79***	0.96***	1.82***	3.99***	0.93***	1.87***	3.89***	0.87***	1.31***	3.39***	0.88***	1.45***	3.50***	0.88**	1.21***	2.93***	0.90***	1.26***
	[6.71]	[2.98]	[11.24]	[6.81]	[2.81]	[10.92]	[8.31]	[3.48]	[6.64]	[6.69]	[3.95]	[11.23]	[4.7]	[2.44]	[4.46]	[6.27]	[4.67]	[8.38]
POPUL	-0.57**	-0.46***	-0.23***	-0.44**	-0.44***	-0.18**	-0.35*	-0.09	0.09	-0.53**	-0.15	-0.07	-0.30	0.06	0.13	0.57***	-0.14	0.00
	[-2.6]	[-3.34]	[-2.76]	[-2.06]	[-3.27]	[-2.15]	[-1.67]	[-0.67]	[1.06]	[-2.51]	[-1.16]	[-1.15]	[-0.97]	[0.32]	[1.25]	[-2.89]	[-1.17]	[-0.02]
PRESS	-0.02**	-0.03***	-0.01***	-0.02**	-0.03***	-0.01***	-0.02**	-0.02***	-0.02***	-0.02*	-0.02***	-0.01***	-0.02	-0.28***	-0.02**	-0.02**	-0.02***	-0.01***
	[-2.37]	[-4.34]	[-3.61]	[-2.33]	[-4.46]	[-3.62]	[-2.46]	[-4.51]	[-3.87]	[-1.84]	[-5.12]	[-3.54]	[-1.17]	[-4.9]	[-2.36]	[-2.08]	[-4.76]	[-3.78]
Obs	56	64	68	55	63	67	73	99	121	77	107	127	37	47	57	81	115	142
R^2	0.76	0.61	0.83	0.76	0.59	0.83	0.74	0.48	0.69	0.72	0.47	0.73	0.69	0.50	0.65	0.71	0.49	0.69
	cpi	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*
	DECENT4			FEDINDEX			UNITARYHIS			TIERS			REGJ			LOCJ		
DEC	-0.30*	-0.05	-0.05	0.05	0.11	0.07	0.01**	0.00	0.01**	-0.12	-0.21*	-0.04	0.00	0.00	0.00	0.00	0.00**	0.00
	[-1.94]	[-0.64]	[-1.13]	[0.42]	[1.56]	[1.42]	[2.17]	[0.86]	[2.44]	[-0.6]	[-1.72]	[-0.48]	[0.3]	[-0.45]	[-0.22]	[0.87]	[2.14]	[1.58]
GDP	3.82***	0.93***	1.48***	2.90***	0.94***	1.44***	2.00***	0.92***	1.10***	2.62***	0.96***	1.22***	2.67***	1.13***	1.16***	2.77***	1.08***	1.31***
	[7.58]	[3.6]	[9.18]	[6.13]	[4.36]	[9.32]	[3.28]	[3.33]	[6.47]	[6.61]	[4.57]	[9.94]	[5.99]	[4.37]	[5.98]	[7.19]	[4.54]	[10.15]
POPUL	-0.36	-0.11	-0.01	-0.52*	-0.01	0.01	-0.29	-0.11	0.03	-0.39*	-0.27*	-0.08	-0.44	-0.25	-0.12	-0.54*	-0.46**	-0.13
	[-1.62]	[-0.71]	[-0.07]	[-1.83]	[-0.05]	[0.16]	[-1.37]	[-0.77]	[0.52]	[-1.73]	[-1.76]	[-0.95]	[-1.32]	[-1.12]	[-0.85]	[-1.88]	[-2.59]	[-1.22]
PRESS	-0.02**	-0.02***	-0.01***	-0.02**	-0.02***	-0.01***	-0.05***	-0.02**	-0.02***	-0.03***	-0.03***	-0.02***	-0.04***	-0.02***	-0.02***	-0.03***	-0.02***	-0.01***
	[-2.01]	[-4.37]	[-3.18]	[-2.23]	[-3.64]	[-2.94]	[-3.28]	[-2.59]	[-4.61]	[-3.48]	[-4.97]	[-5.49]	[-3.53]	[-3.25]	[-4.59]	[-3.26]	[-3.41]	[-4.94]
Obs	67	90	106	83	113	121	65	87	103	83	107	122	51	54	60	77	97	106
R^2	0.72	0.46	0.71	0.69	0.47	0.71	0.70	0.48	0.73	0.69	0.56	0.74	0.74	0.57	0.76	0.69	0.54	0.75

White-corrected standard errors. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level. The constant term is not reported in this table. DEC is the decentralisation indicator which varies across the different columns of the table according to the measure selected. We estimate each alternative model for three different corruption indexes. Data are for 2000 except for TIERS, REGJ and LOCJ with data for 1999. GDP and POPUL are in logs.

Table 5.5: **Baseline regressions - Cross Section (Year= 2000) - Variable subset of countries - Additional Decentralisation Indicators**

Dependent variable: Corruption - Method: OLS																		
	cpi	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*
	FEDERAL			UNITARY			STCONST			FIS			POL			ADM		
DEC	0.16	-0.16	-0.03	-0.11	0.12	0.02	0.14	0.34	0.07	-0.43	0.47	0.08	0.37	0.84	0.49	-0.43	0.34	-0.11
	[0.39]	[-0.66]	[-0.16]	[-0.42]	[0.80]	[0.24]	[0.29]	[1.16]	[0.40]	[-0.36]	[0.96]	[0.20]	[0.28]	[1.65]	[1.26]	[-0.52]	[0.87]	[-0.35]
GDP	2.92***	0.89***	1.24***	2.30***	1.03**	1.25***	2.89***	0.50	1.37***	2.70***	0.82**	1.41***	2.67***	0.87**	1.42***	2.81***	0.79**	1.44***
	[6.33]	[4.64]	[8.58]	[4.05]	[3.66]	[8.25]	[3.25]	[1.13]	[6.21]	[3.18]	[2.53]	[4.73]	[3.11]	[2.66]	[5.01]	[3.27]	[2.55]	[5.32]
POPUL	-0.58**	-0.10	0.01	-0.49*	-0.07	0.02	-0.64**	-0.26	-0.08	-0.72*	-0.09	-0.06	-0.69*	-0.14	-0.07	-0.70*	-0.13	-0.05
	[-2.51]	[-0.72]	[0.12]	[-1.84]	[-0.37]	[0.25]	[-2.40]	[-1.30]	[-0.91]	[-1.81]	[-0.49]	[-0.50]	[-1.94]	[-0.65]	[-0.68]	[-2.01]	[-0.66]	[-0.45]
PRESS	-0.02**	-0.02***	-0.01***	-0.05***	-0.02***	-0.02***	-0.03**	-0.02**	-0.01***	-0.02	-0.02***	-0.01*	-0.02	-0.02***	-0.01*	-0.02	-0.02***	-0.01*
	[-2.13]	[-5.14]	[-4.14]	[-3.92]	[-2.73]	[-4.94]	[-2.29]	[-2.10]	[-2.84]	[-1.17]	[-3.07]	[-1.85]	[-1.16]	[-3.05]	[-1.97]	[-0.94]	[-3.36]	[-1.84]
Obs	88	126	157	65	87	103	39	48	55	37	43	55	37	43	55	37	43	55
R^2	0.70	0.48	0.69	0.68	0.48	0.71	0.72	0.36	0.69	0.64	0.53	0.69	0.64	0.55	0.70	0.64	0.53	0.64

White-corrected standard errors. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level. The constant term is not reported in this table. DEC is the decentralisation indicator which varies across the different columns of the table according to the measure selected. We estimate each alternative model for three different corruption indexes. Data are for 2000 except for POL, FIS, and ADM with data for 1996. GDP and POPUL are in logs.

measures as determinants of corruption matches results found elsewhere in the literature [Treisman (2002b,a)]. Enikolopov and Zhuravskaya (2006) find no direct relation of these indicators to corruption (only through their interaction with fiscal decentralisation measures)[17].

Finally in Table 5.4 we direct our attention to the *structural decentralisation* indicators. The existence of autonomous contiguous regions, the number of regional jurisdictions and the number of local jurisdictions are included here along with the number of elected sub-national tiers (vertical decentralisation according to Treisman). In no case is there any evidence of a relationship of any kind with corruption. This supports Treisman (2002a) who found that the number of subnational elected tiers is sensitive to the inclusion of a measure of GDP, one of the most robust determinants of corruption, and country size. The existence of autonomous contiguous regions may be in principle associated with lower corruption given that these regions may be seen as checks on the central authority. But the fact that most of these regions are associated with ethnic groups would probably act as a balancing act increasing corruption derived from ethnic or linguistic fragmentation. The data suggest that *auton* and corruption are not directly related.

We summarise the results of our regression models in table 5.6. For each indicator we report whether the coefficient is significant, the significance level and the sign of the coefficient across all three corruption indexes. The variable subset column refers to the regressions where we use a different subsample for each corruption index whereas the common subset column reports the results using the same subsample. It can be observed that, in general, our main measures of decentralisation -*rev*, *unitaryhis*, *muni* and *tiers*- are significant and have the expected sign. In particular, *rev* is significant in all regression models, and *unitaryhis* and *muni* are always significant except for the ICRG index. *Tiers* is reported significant only when using the ICRG index. As we have argued earlier, these indicators are those which best capture and represent the decentralisation features that we

[17]The severe limitations of the data, in its majority dummies or categorical variables suggest a careful interpretation of these findings. In any case, the available indicators do not seem to be affecting or affected by corruption in a direct way.

study. In addition, the fact that the results using a common subset of countries do not change much compared to those obtained for the variable subset of countries, suggests that our estimation results are not heavily dependent on the choice of corruption index. Since this appears to be the case, the remainder of this chapter uses the *WBC* index on the basis that it maximizes the subsample size and that it appropriately captures the presence of bureaucratic corruption.

Table 5.6: **Significance of decentralisation indicators**

Variable	**Variable Subset**				**Common Subset**			
	cpi	**icrg**	**wbc**	**sign**	**cpi**	**icrg**	**wbc**	**sign**
exp	**	**	***	positive	**	**		positive
rev	**	*	**	positive	**	*	*	positive
muni	***		**	negative	***		**	negative
state				variable		**		negative
author		***		negative		***		negative
auton				negative				negative
*decent*4	*			negative	*	**	**	negative
fedindex				positive				positive
unitaryhis	**		**	positive	**		**	positive
tiers		*		negative		**		negative
regj				positive				positive
locj		**		positive		**		positive
federal				variable				variable
unitary				variable				variable
stconst				positive	*		*	positive

*** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level. Sign: *negative*, if always negative; *positive*, if always positive; *variable*, if signs changes across corruption indexes. For sources see Appendix B

From our discussion above, it is clear that there are relatively few measures of decentralisation that directly impact on corruption and fewer that are robust across the different indices of corruption typically used in the literature. Some combinations of the significant variables uncovered are also somewhat puzzling. For example, why are federal countries more corrupt than unitary countries if fiscal decentralisation is associated with lower corruption? Is the relationship between fiscal decentralisation and corruption the same at different levels of fiscal and political decentralisation? Why is political decentralisation not related to corruption in light of all the electoral accountability and local capture theories? To what extent is territorial/structural decentralisation associated to more efficient organ-

isation and delivery of public services? Does granting decision-making authority to sub-national governments have a different impact on corruption if electoral decentralisation is in place?

5.4.2 Multi-dimensional corruption

One of our objectives in this work is to try to analyse a number of dimensions of decentralisation and their relationship to corruption. As we noticed earlier, the literature in this area is somewhat vague in describing the way in which different aspects of decentralisation may be simultaneously important. In Table 5.7 we concentrate on the main variables found to be significant in Table 5.4. Model 1 replicates the very basic model included in Table 5.4 with only the fiscal decentralisation indicator (*rev*) controlled for. In model 5 we include both fiscal and unitary history measures, in model 7 we add the political measure *muni* and in model 8 we add the structural measure *locj*[18]. Only the results for fiscal and constitutional decentralisation are robust, indeed their estimated effects increases in size and significance compared to the earlier regressions. These results do not alter when we include the structural and political measures, excluding the fiscal and federal measure. This regression also highlights a limitation of trying to control for many dimensions of decentralisation, since the number of observations drops markedly. The main drop in the number of observations from model 5 to 12 is caused by the inclusion of *muni* for which we have many missing observations. We have also tested (although they are not shown in the table) the other indicators for constitutional (*federal*), political (*state*, *stconst*) and structural (*tiers*, *regj*) in the regressions as an alternative measure of *unitaryhis*, *muni* and *locj*. In no case are the coefficients significantly different from zero.

As a final check on these models, we have included additional controls in the speci-

[18]One potential concern when using *locj* is the possibility that countries with a very large number of elected jurisdictions are driving our results. The most notable case is India. We have performed the analysis excluding this country and the results for this variable and other relevant variables remain largely unchanged. In any case, we are confident that our results in Table 5.7 are not driven by the inclusion of India in the sample.

Table 5.7: **Corruption on decentralisation and standard controls. Direct Effects**

Dependent variable: Corruption (WBC index). Method: OLS												
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
rev	0.018***				0.029***	0.017***	0.030***	0.025***	0.030***	0.029***	0.029***	0.029***
	(4.195)				(7.795)	(3.603)	(7.337)	(4.908)	(7.025)	(5.998)	(7.006)	(6.135)
loggdp	1.954***	1.169***	1.329***	1.354***	1.883***	2.154***	1.983***	2.079***	1.983***	2.022***	1.967***	1.966***
	(12.652)	(7.157)	(6.736)	(10.828)	(11.073)	(12.064)	(11.468)	(10.860)	(10.947)	(9.274)	(11.990)	(10.917)
logpopul	-0.159**	0.049	0.095	-0.074	-0.121	-0.127	-0.103	-0.136	-0.103	-0.121	-0.101	-0.095
	(-2.022)	(0.741)	(1.178)	(-0.707)	(-1.541)	(-1.305)	(-1.157)	(-1.098)	(-1.145)	(-1.161)	(-1.206)	(-1.084)
pss	-0.010***	-0.017***	-0.015***	-0.013***	-0.004	-0.010***	-0.002	-0.005	-0.002	-0.005	-0.004	-0.003
	(-3.409)	(-4.475)	(-3.806)	(-4.737)	(-0.955)	(-2.733)	(-0.545)	(-1.079)	(-0.255)	(-0.956)	(-1.047)	(-0.608)
unitaryhis		0.005**			0.009***		0.009***	0.008***	0.009***	0.008***	0.009***	0.009***
		(2.110)			(5.310)		(4.727)	(4.033)	(4.663)	(3.616)	(4.657)	(4.183)
muni			-0.158**			-0.191	-0.109	-0.079	-0.109	-0.182	-0.133	-0.106
			(-2.022)			(-1.416)	(-0.681)	(-0.455)	(-0.666)	(-1.003)	(-0.852)	(-0.645)
locj				0.000				0.000				
				(1.120)				(1.532)				
polrights									-0.002			
									(-0.022)			
ethno										0.038		
										(0.147)		
bri											0.218	
											(1.579)	
pro_d												0.072
												(0.436)
Adj R^2	0.854	0.725	0.684	0.754	0.901	0.848	0.890	0.889	0.887	0.890	0.894	0.887
N	65	101	120	104	53	55	47	41	47	39	47	47

Note: All regressions exclude Argentina and Russian Federation. Robust standard errors (only t-ratios are reported). * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. All models are estimated by OLS. For details on data sources and description see appendix B.

fication. The idea behind this procedure is to account for the possibility that there are direct and independent significant effects of different aspects of decentralisation on the level of corruption. In general, when papers examine the relationship between federalism and corruption, they either exclude any other aspect of fiscal decentralisation from the specification [Treisman (2000)] or they have failed to find any significant direct effect of federalism on corruption [Fisman and Gatti (2002a)]. Models 9 through 12 experiment using the specification given by model 7 (fiscal, political and constitutional decentralisation altogether) and adding other standard controls that have been suggested as robust determinants of corruption elsewhere [Treisman (2000), La Porta et al. (1999) and Serra (2006)]. The level of political rights, the ethno-linguistic fractionalization index, and dummies for British colonial history and protestantism as dominant religion come out insignificant without introducing any significant changes to the coefficients of our main variables of interest[19].

5.4.3 Interaction effects

Before we move on to consider the models with indirect and interaction effects we think it may be useful to examine the relationship between corruption and a few of the decentralisation indicators at different degrees of decentralisation. We split the sample according to a certain criterion and perform a rolling regression. This procedure takes several steps involving ranking the observations on the variable of interest (fiscal, political constitutional or structural decentralisation in our case) and then running an initial regression for the observations satisfying a certain criterion. For example, we may choose as our initial sub-sample the observations for which fiscal decentralisation is less than the mean value. Another alternative is to choose an arbitrary sub-sample size and define that as the initial sub-sample. We then run a regression using this sub-sample, obtain the estimates and statistics and record the values. Next we add the nearest highest-ranked observation

[19]We have also used alternative indicators for each of these controls and have also controlled for other potential determinants of corruption with the results being largely unchanged.

not included in the initial regression and we drop the lowest-ranked observation included in the initial sub-sample. We always keep the sub-sample size constant throughout this analysis, thus making sure any changes are not due to the increase/decrease in the size of the sample. We continue this procedure until the last (highest-ranked) observation is added and we record the estimates.

The only limitation to this procedure is that we can only perform it for the continuous measures of decentralisation, since using a discrete or categorical measure will result in all countries having the same rank within each category. Therefore we perform this analysis for three continuous measures of decentralisation: *exp*, *rev*, and *unitaryhis*. In the *exp* and *rev* cases we are left with 68 and 67 observations respectively and we choose a sub-sample size of 30 for each[20]. Regarding the corruption indicator we use the World Bank Control of Corruption index which has been chosen as our main corruption index[21]. The coefficients, significance and confidence intervals for each of the regressions using the three indicators can be found in Appendix B. We summarize the results of the analysis in the following graphs. Graph 5.2 shows the sensitivity of the coefficient on fiscal decentralisation as measured through sub-national expenditure (*exp*) to gradual shifts from lower to higher fiscal decentralisation. It is clear from the graph that when our sub-sample includes the lower end of the scale (fiscally centralised countries) the coefficient of fiscal decentralisation on corruption is negative (the dots in the figure) although almost never significant at the 10% level. But as we gradually include more fiscally decentralised countries in our sub-sample, the coefficients become positive and significant for a high percentage of regressions. The fact that the graph depicts a smooth transition from negative to positive coefficients when fiscal decentralisation increases is indicative of the presence of heterogeneity in the relationship between these two variables[22].

[20]Using the criterion of defining the sub-sample by the observations that fall below or above the average the size of the sub-samples is 24 in the *exp* case and 18 in the *rev* case.

[21]The same analysis has been performed for the selected decentralisation measures using alternative corruption indexes. This can be consulted in Appendix B.

[22]However we should note that number of sub-samples which yield a significant coefficient is rather limited. It is likely that the drop in the number of observations in each sub-sample is responsible (at least partly) for the drop in significance levels.

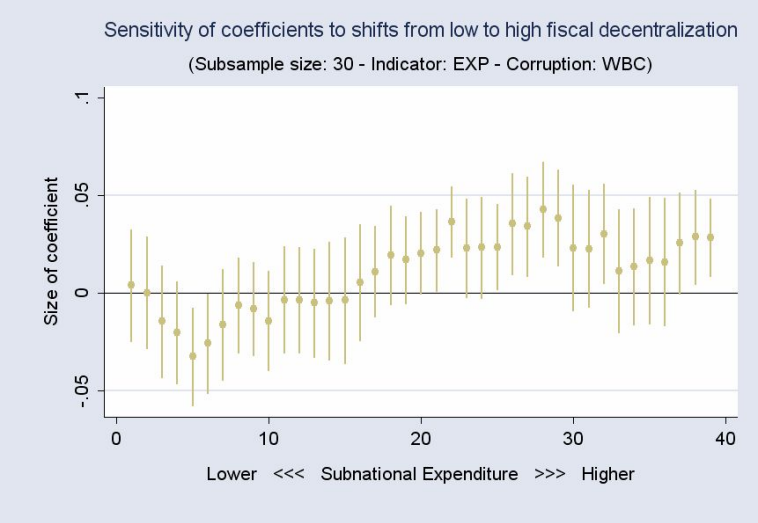

Figure 5.2: **Rolling regression for** *exp* **and** *wbc*

A similar pattern is observed in graph 5.3. The decentralisation measure is now the sub-national revenue share as a proportion of total government revenue (*rev*). The heterogeneity in the relationship between corruption and fiscal decentralisation is present regardless of the fiscal decentralisation indicator that we use. Graph 5.4 show the sensitivity of the coefficients of our measure of constitutional decentralisation (*unitaryhis*), the degree of unitary history of a country. As we mentioned earlier, this measure has been elaborated by Gerring et al. (2005a,b). It is worth noting the similarities between this graph and the previous ones. This variable does not measure the same aspects though since as we noted earlier unitary countries need not be more fiscally centralised than federal countries (although in practice this seems to be the case). In any case, this graph shows preliminary evidence suggesting that the relationship between long unitary history and corruption may not be as straightforward as it has been argued [Gerring et al. (2005a)]. More importantly it appears that the relationship between long unitary history and less corruption is being driven by the sub-sample of historically unitarist countries which have a higher GDP per capita than the rest of the countries. In fact, the average GDP per capita for the sub-sample of historically unitarist countries is almost three times that of the historically federal countries[23].

[23]We split the sample in two grouping the countries above and below the average of unitary history.

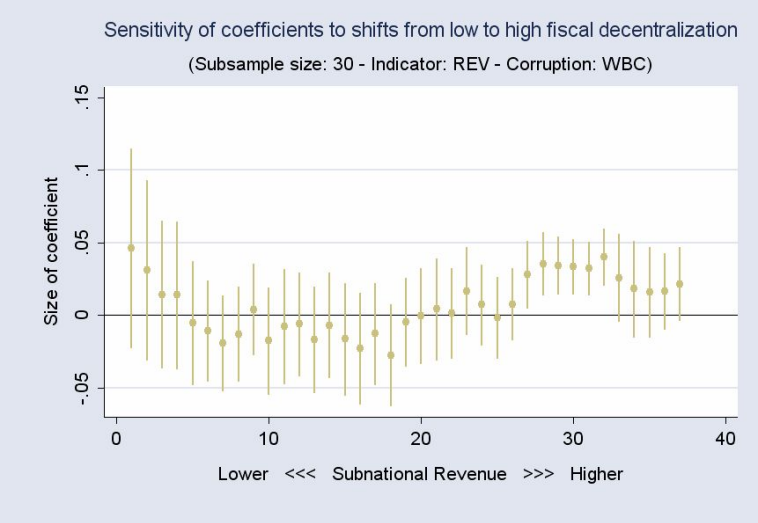

Figure 5.3: **Rolling regression for** *rev* **and** *wbc*

From the previous analysis it is evident that aspects of fiscal and constitutional decentralisation are associated to corruption. It also appears that there may be some heterogeneity in the relationship between these variables and corruption. The results yielded by the rolling regression analysis suggest this may the case. We would like to examine the form of heterogeneity existent in this relationship and in order to do this we proceed with additional econometric analysis adding interaction terms to the baseline specifications[24].

Now we want to examine the possibility that other aspects of decentralisation may affect corruption indirectly or that fiscal and constitutional decentralisation may have an indirect rather than a direct effect on corruption. We use a base specification including both controls for fiscal and constitutional decentralisation and we introduce some interaction terms. In principle we would expect that other aspects of decentralisation or of the institutional environment may affect the impact of fiscal or constitutional decentralisation on corruption. The interactions that we propose in this section are based in theoretical presumptions provided by

[24]Ideally we would like to test the presence of potential contingent effects in the relationship between decentralisation and corruption. For example, the relationship between decentralisation and corruption may be positive beyond certain thresholds of development and negative or inexistent for other thresholds. Unfortunately, this was not possible in our investigation for two reasons. First, we do not have continuous variables for all the decentralisation dimensions that we consider. Second, even for those aspects that we have suitable variables (*rev*, *unitaryhis*), the size of the sub-sample is not convenient for using threshold regression models.

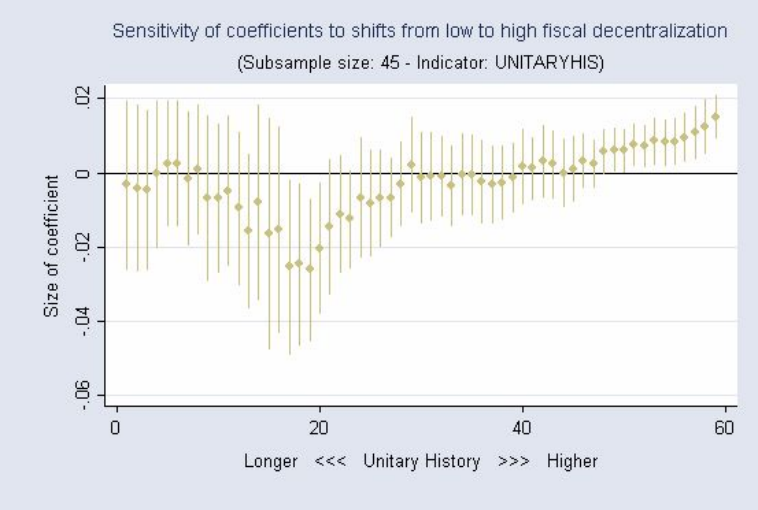

Figure 5.4: **Rolling regression for** *unitaryhis* **and** *wbc*

the relevant literature. For instance, we interact the fiscal decentralisation control (*rev*) with both GDP per capita and with the political decentralisation indicators. It is expected that as nations become more developed the marginal effect of fiscal decentralisation on corruption will be smaller since the increase in GDP per capita would improve corruption levels by a large extent. The interaction of fiscal decentralisation with political decentralisation indicators comes naturally from Riker's theory and it was previously tested by Enikolopov and Zhuravskaya (2006). Other interactions that may be of interest are the constitutional decentralisation with ethnic and linguistic fragmentation: there is a long-standing line of research arguing that federal countries are better suited than unitary system to accommodate the effects of regional and ethnic differences [see Bermeo (2002) for a recent evaluation of these ideas.].

Looking at the results presented in Table 9, one thing that we notice is that the coefficients for both fiscal (*rev*) and constitutional decentralisation (*unitaryhis*) keep the expected sign and their significance in most cases. As a first result, we can observe that the inclusion of interaction terms do not affect significantly the direct effects of the two decentralisation aspects.

Regarding the results for the interaction terms, there are three models, 1, 5 and 7 that yield significant coefficients. Model 1 produces a negative sign for interaction

Table 5.8: **Corruption on decentralisation and standard controls. Interaction Effects**

Dependent variable: Corruption (WBC index). Method: OLS								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
rev	0.037***	0.064	0.031	0.028***	0.031***	0.030***	0.040***	0.038***
	(6.866)	(1.542)	(0.856)	(5.724)	(7.776)	(7.508)	(5.341)	(6.216)
unitaryhis	0.013***	0.009***	0.009***	0.009***	0.031***	0.018	0.008***	0.032***
	(4.251)	(5.095)	(4.692)	(4.367)	(3.184)	(0.666)	(3.586)	(3.262)
loggdp	1.876***	2.064***	1.984***	1.847***	1.872***	1.949***	2.011***	1.884***
	(11.292)	(7.580)	(10.607)	(8.698)	(9.459)	(7.339)	(8.005)	(9.848)
logpopul	-0.152*	-0.131*	-0.103	-0.136	-0.135	-0.117	-0.035	-0.170*
	(-1.945)	(-1.768)	(-1.146)	(-1.424)	(-1.605)	(-1.452)	(-0.267)	(-1.981)
pss	-0.003	-0.004	-0.002	-0.006	-0.005	-0.004	-0.007	-0.003
	(-0.613)	(-0.864)	(-0.530)	(-1.051)	(-1.005)	(-0.779)	(-1.208)	(-0.613)
$INT : rev \cdot unitary$	-0.000**							-0.000*
	(-2.113)							(-1.789)
$INT : rev \cdot gdp$		-0.008						
		(-0.837)						
muni			-0.107		0.456*			0.407
			(-0.430)		(1.732)			(1.499)
$INT : rev \cdot muni$			-0.000					
			(-0.015)					
$INT : unitary \cdot ethno$				-0.004				
				(-0.831)				
$INT : unitary \cdot muni$					-0.011**			-0.010*
					(-2.236)			(-1.857)
$INT : unitaryhis \cdot gdp$						-0.002		
						(-0.331)		
regj							0.007 **	
							(2.372)	
$INT : rev \cdot regj$							-0.001**	
							(-2.582)	
Adj R^2	0.905	0.900	0.887	0.903	0.898	0.899	0.900	0.901
N	53	53	47	45	47	53	30	47

Note: All regressions exclude Argentina and Russian Federation. Robust standard errors (only t-ratios are reported). * Significant at the 10% level ** Significant at the 5% level *** Significant at the 1% level. All models are estimated by OLS. For details on data sources and description see appendix B.

between constitutional decentralisation and fiscal decentralisation. The negative sign implies that the positive effect of a unitary system on corruption is worsened when the country becomes more fiscally decentralised. As discussed earlier unitary systems need not be incompatible with other aspects of decentralisation. The sign of this interaction is somewhat surprising. One possible reason for this to happen is that when countries become more fiscally decentralized the effectiveness of a unitary structure to control and monitor the growing amount of resources allocated to the deconcentrated units decreases. In any event, even when the coefficient is negative and significant, its size is very small.

Model 5 yields a negative sign for the interaction term between political and constitutional decentralisation. Again, this means that the positive effect of constitutional decentralisation on corruption worsens when the country becomes more politically decentralised. Finally, the results for model 7 imply that the positive effect of fiscal decentralisation on corruption is worsened when the number of intermediate jurisdictions grows. We have also tried other indicators of political decentralisation interacted with fiscal and constitutional decentralisation measures but none of these other interaction terms was found significantly different from zero.

In model 8 we include both direct effects of fiscal and constitutional decentralisation and the interaction terms from models 1 and 5. The rationale for this is to test whether these interactions still hold when included within the same econometric model. Model 8 is clear in that it renders both direct effects and both interaction terms significant. The signs are the same as those obtained in the previous models. In this way, Model 8 stands both as a robustness check on the model with direct effects and also as a more comprehensive model for describing the empirical relationship between corruption and decentralisation. As it is clear from this model, our suggestions earlier in this research have been upheld by the analysis of the data.

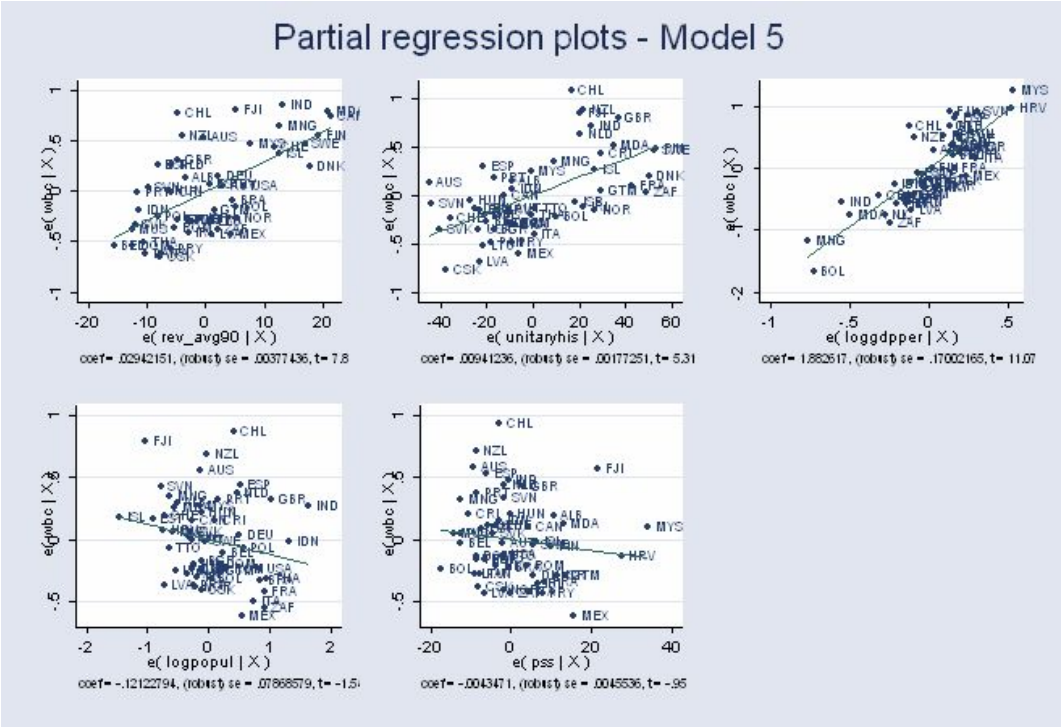

Figure 5.5: **Partial regression plots - Model 5**

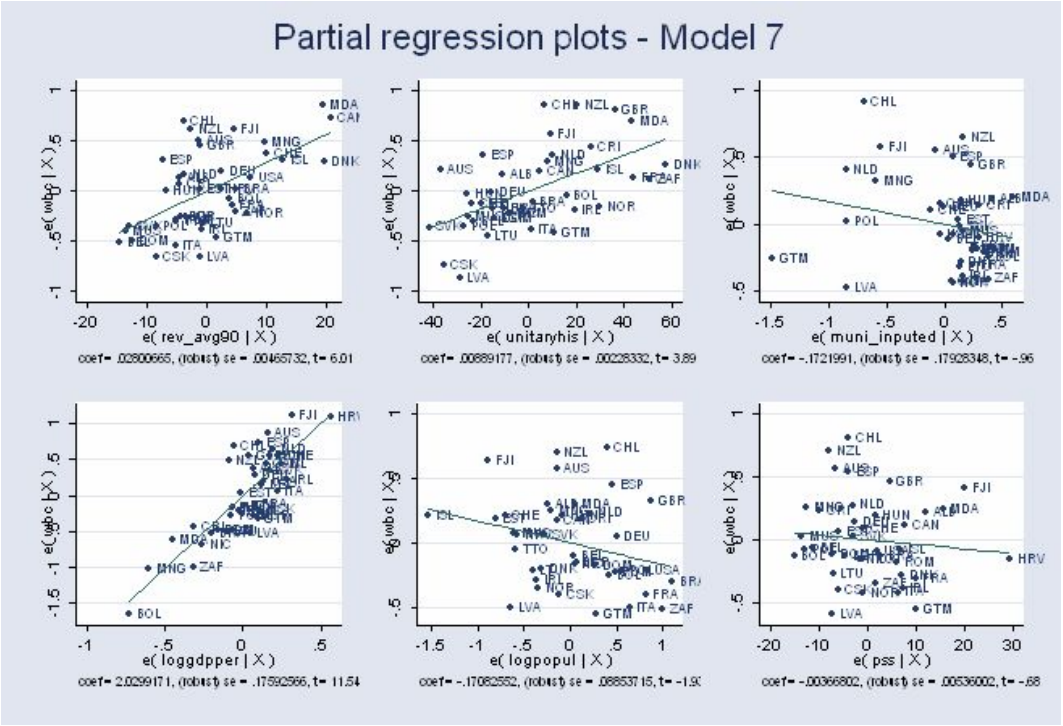

Figure 5.6: **Partial regression plots - Model 7**

5.5 Conclusions

The last 30 years have seen a large number of countries embark on some form of decentralisation. While the causes of this trend are in general precise and well-known, its consequences are much less certain and by no means definitive. Evaluating the results of decentralisation is not an easy task. Case studies provide an important source of evidence but generalisation is not straightforward. Cross-country and panel-data studies are becoming more common but suffer from two main problems. On one hand, there are data issues. On the other hand, there are modelling problems. These two elements act as limiting forces on both the quantity and quality of empirical research. Nevertheless, there seems to be a renewed scholarly commitment to take the empirics to new levels.

We need better and more thorough empirical studies. We argue that a first step towards this is to understand decentralisation as a multidimensional phenomenon that has a large variety of effects. In this sense, we should ideally aim at identifying these dimensions and postulating the likely effects and the interrelationships between them. In this sense, the theoretical literature has provided interesting insights that have been often left unexplored by the empirical literature until very recently. Our work in this chapter has shown why this approach is important, what are some of questions still unresolved in the empirical literature and how to attempt a sensible approach to tackling these issues.

Recent literature has acknowledged the presence of a number of aspects that make the study of the relationship between decentralisation and corruption less obvious. First, it has been recognized that different dimensions of decentralisation exist and that they have complex interrelations. Second, it has been argued that the extent and effects of decentralisation may depend on the existence and extent of other dimensions of decentralisation. Although these ideas are not new, they are becoming increasingly common in the empirical literature. Finally, it has also been suggested that different dimensions of decentralisation may co-evolve and their interactions over time might have a strong effect on corruption and the

institutional quality.

Our results in this chapter may provide a few insights regarding the policy debate on the effects of decentralisation. In particular, as we have seen, the positive effect of fiscal decentralisation on corruption seems to be larger when countries have a deeply rooted unitarist history. While this result seems to be not so intuitive, it is plausible that high fiscal decentralisation without changing the constitutional basis or government organisation may indeed be associated with high corruption levels. This may be particularly the case if increasing the spending or taxing authority of sub-national governments is not associated with increased accountability arising from the existence of solid local institutions. Furthermore, a growing number of unitary countries are resorting to local democratization processes via local elections or referenda voting. Our results suggest that certain forms of political decentralisation are correlated with a high incidence of bureaucratic corruption particularly if the country has a unitarist tradition and low levels of fiscal decentralisation. It should be noted, that according to our results, the existence of a long-standing unitary system is directly and indirectly associated with corruption. As these correlations have opposite signs, the overall result is uncertain and essentially an empirical matter.

While our results may suggest that some forms of decentralisation affects corruption, another plausible interpretation is that other factors may have a more direct effect on the existence and extent of bureaucratic corruption. In the empirical literature some authors have suggested the importance of factors such as fragmentation and weak local institutions. These are implicitly and indirectly present in our analysis to some extent but we are not able to assess their incidence. It would be desirable to utilise more disaggregated measures of decentralisation and political institutions in order to achieve a greater understanding of the interactions and relationships that have an association with corruption.

Finally, although we have shown that our results are consistent with a sensible specification, and robust to controlling for different variables and data, we are

rather cautious regarding the direction of the causation and concerning potential policy implications. The aim in this chapter has been to investigate the existence and extent of the relationships between multiple dimensions of decentralisation and corruption. There may be additional considerations if endogeneity of the regressors is a possibility and the study of this issue would be an interesting exercise to understand better the nature and implications of this problem.

In conclusion, the issue of whether decentralisation leads to more or less corruption is still uncertain and much more empirical research is needed. But we believe that this future empirical research should be aimed at exploring the interrelations of different aspects or dimensions of decentralisation. The study of these aspects has been suggested and carried out by Barenstein and de Mello (2001), Rodden (2002), Treisman (2002b,a) and Enikolopov and Zhuravskaya (2006). Our study contributes to this literature by both reinforcing some of the earlier findings and obtaining some new evidence.

Chapter 6

Concluding remarks

6.1 Summary of findings

This thesis has studied several aspects of the relationship between corruption and development with the aim of contributing to the empirical and theoretical literatures. The focus has been placed on the determinants of corruption and we have used various methodologies to address three key topics -the relationship between freedom of the press and corruption, the relationship between corruption, development and decentralisation and the relationship between federalism, decentralisation and corruption.

With regard to the relationship between press freedom and corruption, we have evaluated the relevant literature and identified the need for a thorough analysis of this relationship. The main motivation, discussed in chapter 3, is given by the existence of mixed evidence regarding this relationship. We have also set the goal of exploring this relationship further by considering how specific restrictions to media freedom affect bureaucratic corruption. Our empirical evidence, obtained using a global sensitivity analysis, confirms earlier results that greater media freedom is associated with lower corruption. Our estimates of the effect of press freedom on corruption however, are not only robust to different data and methods but also to changes in the conditioning information set. More specifically, we have

used the growing body of knowledge on the determinants of corruption to test the press freedom estimates for robustness to a wide range of potential determinants using the methodology known as *extreme bounds analysis*. We have also suggested and implemented certain methods and statistics to overcome the criticisms of this methodology.

In addition to confirming earlier results, we have also explored how different aspects of restrictions to press freedom matter for corruption. The econometric results suggest that not all the forms of restrictions to press freedom are strongly and robustly correlated with corruption. For example, the evidence suggests that the aspects concerning legal and administrative regulations obstructive of the media are not robustly associated to higher corruption. In contrast, economic and political restrictions are strongly associated with higher corruption and the estimates suggest a sizable effect. We also present preliminary evidence concerning the direction of the causation. Based on the tests to control for endogeneity, it would appear that improvements in press freedom lead to a lower incidence of corruption. Nevertheless, we remain cautious regarding this issue given the difficulties of finding meaningful and truly exogenous instruments.

The second central topic we study is the relationship between corruption, development and decentralisation. One of the issues that has received much attention in recent years is the bidirectional relationship between corruption and development. Among the appeal of these models is that they allow us to incorporate and analyse the impact of institutional or policy changes without affecting their essential properties. We use this type of dynamic growth model to analyse the conditions under which decentralisation is associated with higher economic development. Although much has been written on the benefits and dangers of decentralisation, the overall effect on development is subject to much debate and contention. Our purpose regarding this topic has not been to elaborate a fully comprehensive model but rather to provide a simple model considering different decentralisation regimes and the implications for corruption and development. The issue is certainly more complex than it was originally considered and there are several interrelationships

between the economic and political aspects involved.

The main implications of our model can be summarised as follows: first, corruption has a negative impact on development. Bureaucratic corruption, in our model represented as embezzlement of public funds, divert away public funds that otherwise would have been contributed to production of private services. It also increases the cost of public activity by raising monitoring costs. Second, we find that decentralisation is always preferable to centralisation if corruption is absent in the economy but may not be the preferred alternative if corruption is pervasive. Under some conditions, the economic benefits associated to decentralisation are more than offset by the political costs associated to it, and the economy may end up with a lower development level than if the country were decentralised. Finally, the model is able to explain why in the absence of institutional reform, corruption and poverty remain as permanent characteristics of the economy. This result is particularly important given the emphasis on decentralisation reforms advocated in recent decades. Although our analysis does not accurately capture the decision to decentralise or recentralise it might provide a framework of analysis that would be well suited to this task and could be extended to incorporate multiple aspects of decentralisation and eventually to endogenise the decentralisation process.

Our final central topic addresses the relationship between federalism, decentralisation and corruption. There are obvious links with the topic studied in chapter 4, although the methodology and scope are somewhat different. The aim here is to incorporate a multidimensional examination of the relationship between corruption and decentralisation. The methodology is empirical. Although it has been recognized that there are multiple dimensions of decentralisation, until very recently, the empirical literature has rarely gone beyond the analysis of a single or alternative aspects of decentralisation. Furthermore, it has been noted that there may be important interrelations and overlaps between these different aspects worth considering. In addition, there are reasons to believe in the possibility that certain forms of decentralisation work better when certain forms of centralised institutions are present. Finally, it is likely that different dimensions of decentral-

isation co-evolve over time and this co-evolution may produce a significant effect on corruption and institutional quality.

We have suggested earlier in this thesis that empirical studies on corruption and decentralisation are at a relatively early stage in their development. While there are several theories of decentralisation, the empirical literature has not generally addressed their multidimensional nature and the interrelations between different types of decentralisation. Several reasons lie behind this. First, there is a problem of data availability and concept. In order to avoid having only a partial view of the problem, one must ensure to define, group and control for the several recognized dimensions of decentralisation. Decentralisation has been often suggested as a channel through which countries are able to achieve efficiency, accountability and democratisation. Most likely, not all forms of decentralisation contribute to these objectives or at least not to the same extent.

Our study adds to the recent literature in that we not only recognize and measure the existence of different dimensions of decentralisation but also suggest hypotheses based on the theoretical literature and model their interactions. Furthermore, unlike most previous research we propose and find that some types of decentralisation are simultaneously associated with corruption through both direct and indirect effects. Our finding that long-standing unitary countries (constitutional centralisation) that are also fiscally decentralised have low corruption is to some extent present in earlier research. The main difference is that most articles do not find that these two dimensions of decentralisation are significant in the same model. Furthermore, we also find evidence suggesting that political decentralisation is also associated with corruption, but only in an indirect way through its effect on constitutional decentralisation. In particular, political decentralisation weakens the impact of constitutional centralisation on corruption. This result is similar to Enikolopov and Zhuravskaya (2006) who find a negative indirect effect of political decentralisation on corruption. Our results are robust to a range of specifications and to several alternative measures.

6.2 Policy implications

We believe the research undertaken in this study yields a number of policy implications in different directions. The two empirical studies have been centred around the relationship between corruption and two important dimensions of the socio-economic system: democratic institutions and the role and structure of the government in the economy. Our research on freedom of the media and corruption confirms the role of democracy as an important check on government corruption. Moreover, this study stresses the role of press freedom as a crucial check on corruption as has been observed in the literature [Brunetti and Weder (2003), McMillan and Zoido (2004)]. On the other hand, although the implications regarding the role and structure of the government are not as clear-cut as those concerned with press freedom, it would appear that fiscally decentralised countries which are also structured on a unitarist basis have lower levels of corruption. Furthermore, our research also supports the idea that for certain forms of decentralisation to impact on corruption (constitutional decentralisation for instance), some form of political centralisation would be beneficial.

Notably, the positive effect of fiscal decentralisation on corruption seems to be greater when countries have a long-standing history of unitarism. Furthermore, a growing number of unitary countries are resorting to local democratization processes via local elections or referenda voting. Our results suggest that a move to higher political decentralisation may have adverse effects on corruption particularly if the country has a unitary system of government and low fiscal decentralisation. The overall result of decentralisation on development will depend on different factors however. One of these concerns the political economy considerations associated with decentralisation such as the existence of local capture, deficient monitoring and the effect of political decentralisation on local accountability.

Our theoretical model in Chapter 4 also provides some insights concerning the policy discussion of the effects of decentralisation. In particular, it may be possible as we have shown that the effects of decentralisation on the economy are blurred

by the existence of pervasive corruption. A large number of developing countries immersed in poverty and corruption have undertaken institutional reforms conducing to greater decentralisation of public services and governance. The findings in our theoretical model suggest that decentralisation may not be the best policy if the countries are experiencing high corruption levels. Finally, our results suggest that if informational asymmetries in public administration and deficiencies at the local levels are significant, the positive effects of the greater economic efficiency of decentralised provision of public goods and services may be overshadowed by the negative effects associated with those problems.

6.3 Limitations and other considerations

An important topic in empirical research is related to the problem of drawing confident inferences on causality. Ideally, the way to address this problem involves not only testing for the potential endogeneity of the regressors but also introducing causality tests. Our work in this thesis has not addressed these issues for several reasons. Firstly, there are data limitations that prevent us to work with long periods of time. Second, it is difficult to use panel methods or other techniques suited to address the causality problem given the nature and characteristics of our main variables. Finally, our analysis has been concerned mainly with the identification of relationships between the variables of interest. While the focus in Chapter 3 is on robustness, Chapter 5 addresses the problem of heterogeneity in the relationship between the variables. Additionally, we have also tried to look for insights in the theoretical models and presumptions as a way to assist in drawing inferences but this has been made difficult given the lack of formal models. Given these circumstances, we believe it is important to stress that our results should be taken with caution when drawing inferences on causality and the direction of the effects. Our results indicate the existence of robust relationships between certain variables with some suggestions regarding the direction of the effects. It is necessary to have better data and to run appropriate tests in order to draw

confident inferences about causality and direction of the effects,

Another possible caveat of our research relates to the fact that we have not been able to integrate the analyses of Chapters 4 and 5. To a large extent, this has been mainly due to the intention of keeping the theoretical modeling simple. Introducing several dimensions of decentralisation into the theoretical model would have required a sacrifice in terms of simplicity and clarity. There may have also been tractability issues. One plausible way of blending the theoretical and empirical analyses would be to group the different decentralisation dimensions according to whether they have mostly economic effects or informational/political effects. This is certainly an interesting approach that may be worth pursuing in future research.

Finally, we would like to comment on the matter of choosing between different measures for the main variables of our study. In our study, the main criteria to choose a particular indicator have been the extent to which the measure represented the definition of the concept and the possibility of maximising the number of observations. In this sense, we have analysed the inclusion of several alternative indicators for press freedom, corruption and decentralisation. We have focused on the Press Freedom Index (Freedom House), CPI and WBC Corruption Indexes and three measures of decentralisation: the ratio of sub-national government revenue to total government revenue, the unitary history of a country and the presence of local elections of the executive and legislative. According to our criteria, these are the measures that best capture the essence of the phenomenons under study. While other indicators have been used in the past by previous studies, we remain confident that our choice of indicators responds to the criteria specified and therefore are the best available for the purposes of this research.

6.4 Directions for future research

There are a number of potential extensions to the topics studied here. First, it would be desirable to endogenise the decentralisation decision. In our model,

while corruption and development are endogenously determined, decentralisation is imposed exogenously. The decision to decentralise (and the decentralisation process itself) is much more complex and is likely to be affected by corruption and economic development. Another possible extension is to make the probability of detection endogenous to the model. One way to do this could be to introduce costly monitoring effort as a mechanism that allows the government to increase this probability.

A second important issue for further research concerns the role of politicians in the theoretical model. Instead of considering a benevolent government, it would be interesting to analyse the behaviour of office-motivated politicians. The introduction of elections of local and national government would provide the model with a source of additional interactions. More specifically, this would likely pit politicians against bureaucrats as their objectives go in opposite directions. The introduction of these modifications may give rise to additional effects (collusion between bureaucrats and politicians; increased monitoring; etc.) that impact on the relationship between corruption and development.

Thirdly, considering the evidence presented in this thesis regarding the association between press freedom and corruption, it would be useful to evaluate the effects that other democratic checks and balances have on the relationship between corruption and media freedom. This is especially relevant for developing and transition countries where some or all democratic institutions may be weak.

An additional area where much research is needed is that of examining the dynamic effects of institutional reforms on corruption. This type of research has been somewhat hindered due to a relative lack of time-varying indicators. However, there are some corruption and governance data which are available for relatively long periods and could be used in conjunction with indicators of institutional change.

Finally, it would be desirable to evaluate the effects of corruption on the location and production decisions of firms. The increasing availability of micro-level data

offers the opportunity to undertake research in this exciting area considering the microeconomic impact of corruption on the behaviour of individuals and firms. Although there are few empirical studies using firm-level data, more research is clearly needed in order to derive more general implications about these microeconomic effects.

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Appendix A

Appendix

Table A.1: **Summary statistics for selected variables**

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
cpi	5.25	2.59	0.4	10	510
loggdp	3.91	0.45	2.89	4.54	510
pri	2.37	1.85	1	7	510
d50	0.52	0.5	0	1	487
pss	35.01	21.98	5	97	510
pss_a	10.17	7.74	0	30	510
pss_b	15.36	10.73	0	40	510
pss_c	9.47	5.67	0	27	510
tra	63.51	35.77	10.9	229.6	510
imp	32.65	17.24	6.9	104.8	510
fue	11.11	18.45	0	99.60	486
int	2.44	0.77	1	5	495
def	2.36	1.68	-2.2	12.4	509
ffc	0.02	0.14	0	1	500
fsc	0.2	0.4	0	1	500
fbc	0.28	0.45	0	1	500
parl	0.58	0.49	0	1	490
pres	0.36	0.48	0	1	490
maj	0.62	0.49	0	1	475
eng	0.31	0.46	0	1	510
soc	0.1	0.3	0	1	510
fre	0.41	0.49	0	1	510
ger	0.1	0.3	0	1	510
sca	0.08	0.27	0	1	510
elf	0.27	0.28	0	0.86	490
plist	0.55	0.45	0	1	500
mag	0.55	0.37	0	0.99	500
ever	0.66	0.47	0	1	500
cat_d	0.33	0.47	0	1	510
pro_d	0.08	0.27	0	1	510
exp	27.34	13.89	3.47	58.73	321
elfalt	36.36	31.31	0	90	440
news	173.35	157.88	1.8	610.2	416

Table A.2: **Correlations between selected variables**

var	*cpi*	*gdp*	*pri*	*d*50	*pss*	pss_a	pss_b	pss_c	*tra*	*fue*	*int*	*ffc*	*fsc*	*fbc*	*parl*	*pres*	*maj*	*exp*	*eng*	*soc*	*fre*	*ger*	*sca*	*pro*	*plist*	*mag*
cpi	1.0																									
gdp	0.8	1.0																								
pri	-0.6	-0.8	1.0																							
*d*50	0.6	0.6	-0.5	1.0																						
pss	-0.8	-0.8	0.9	-0.5	1.0																					
pss_a	-0.6	-0.7	0.9	-0.5	0.9	1.0																				
pss_b	-0.7	-0.7	0.8	-0.4	1.0	0.8	1.0																			
pss_c	-0.6	-0.6	0.7	-0.4	0.9	0.6	0.8	1.0																		
tra	0.2	0.2	-0.1	0.2	-0.1	0.0	-0.1	-0.1	1.0																	
fue	-0.3	-0.3	0.3	-0.0	0.3	0.3	0.2	0.3	-0.1	1.0																
int	0.1	-0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	-0.0	1.0															
ffc	-0.2	-0.2	0.4	-0.2	0.3	0.3	0.2	0.3	-0.1	0.2	0.0	1.0														
fsc	-0.4	-0.3	0.1	-0.3	0.2	0.1	0.2	0.1	-0.2	0.3	-0.3	-0.1	1.0													
fbc	-0.1	-0.4	0.4	-0.0	0.3	0.3	0.3	0.3	0.1	0.0	0.1	-0.1	-0.3	1.0												
parl	0.6	0.6	-0.5	0.5	-0.5	-0.5	-0.4	-0.4	0.2	-0.4	0.1	-0.2	-0.6	-0.0	1.0											
pres	-0.5	-0.5	0.4	-0.5	0.4	0.4	0.3	0.3	-0.2	0.3	-0.1	0.2	0.6	-0.1	-0.9	1.0										
maj	-0.2	-0.2	0.2	-0.3	0.2	0.1	0.2	0.2	-0.1	-0.2	-0.1	0.1	-0.1	0.3	-0.0	0.1	1.0									
exp	0.3	0.3	-0.2	0.4	-0.3	-0.3	-0.2	-0.1	-0.3	0.1	0.2	.	-0.1	0.1	0.1	-0.1	0.1	1.0								
eng	0.0	-0.2	0.1	0.2	0.1	0.0	0.1	0.1	0.0	-0.1	0.0	-0.1	-0.3	0.7	0.1	-0.1	0.2	0.0	1.0							
soc	-0.2	-0.1	0.1	-0.3	0.1	0.1	0.1	0.1	0.1	-0.0	0.1	-0.0	-0.1	-0.2	-0.1	0.1	0.1	-0.0	-0.2	1.0						
fre	-0.3	-0.1	0.1	-0.3	0.2	0.2	0.2	0.2	-0.1	0.2	-0.2	0.2	0.6	-0.4	-0.3	0.3	-0.1	-0.3	-0.6	-0.3	1.0					
ger	0.2	0.3	-0.2	0.2	-0.2	-0.2	-0.2	-0.3	-0.0	-0.2	-0.1	-0.0	-0.2	-0.2	0.3	-0.2	0.1	0.3	-0.2	-0.1	-0.3	1.0				
sca	0.5	0.3	-0.2	0.3	-0.3	-0.3	-0.3	-0.2	0.1	0.1	0.3	-0.0	-0.1	-0.2	0.3	-0.2	-0.4	0.3	-0.2	-0.1	-0.2	-0.1	1.0			
pro	0.6	0.4	-0.3	0.4	-0.5	-0.4	-0.5	-0.4	0.0	0.0	0.2	0.0	-0.3	-0.1	0.3	-0.3	-0.3	0.4	-0.0	-0.1	-0.4	0.1	0.8	1.0		
plist	0.2	0.3	-0.2	0.2	-0.2	-0.1	-0.2	-0.3	-0.1	0.1	0.1	0.0	0.2	-0.6	0.1	-0.1	-0.6	-0.0	-0.6	0.2	0.3	0.0	0.3	0.2	1.0	
mag	0.1	0.3	-0.2	0.0	-0.2	-0.1	-0.2	-0.3	0.1	0.1	0.1	0.0	0.2	-0.5	-0.1	-0.0	-0.6	-0.1	-0.6	0.1	0.3	0.0	0.3	0.2	0.8	1.0

The number of observations for the correlations is variable but for most correlations is around 500 observations. Only in the case of *exp* it drops to around 300. For a description of the each variable see Table B.4

Table A.3: **Variable description and data sources**

Code	Variable description	Detail and source
cpi	Corruption Perception Index	Elaborated by Transparency International. This measure provides (subjective) perceptions of bureaucratic corruption across countries. Scores range from 0 (most corrupt) to 10 (least corrupt). From 1995 to 2004. (Available at www.transparency.org)
loggdp	Logarithm of GDP per capita	The logarithm of real GDP per capita PPP was taken from the 2003 World Bank Indicators CD-Rom. From 1993 to 2001.
*d*50	Persistence of democracy in last 50 years	Proxy for stability of democracy in a country. It measures the extent to which a country has been a democracy over the last 50 years (dummy equals 1) or not (dummy equals 0).,From 1995 to 2004.
pri	Index of political rights	Index of political rights. Source: Freedom House.
tra	Trade as percentage of GDP	The sum of imports and exports in goods and services divided by GDP captures the degree of openness to foreign competition. Taken from the 2003 World Development Indicators CD-Rom. From 1993 to 2001.
imp	Imports of goods and services as a % of GDP	Capture the extent of openness to foreign competition. Measured as the share of imports of goods and services in GDP. Taken from the 2003 World Development Indicators CD-Rom. From 1994 to 2002.
fue	Proportion of fuel and mineral exports in merchandise exports	Proportion of fuel and mineral exports in merchandise exports, as a measure of the level of potential rents and quasi-rents. Source: 2003 World Development Indicators CD-Rom. From 1993 to 2001.
interv	Index of government intervention	Index of government intervention. Countries with low government intervention have low values on the index. Source: Heritage Foundation (www.heritage.org). From 1995 to 2003.

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Table A.3: (**continued**)

A.3 – Continued from previous page

Code	Variable description	Detail and source
def	Military expenditure as a % of GDP	Military expenditure as a percentage of GDP taken from Stockholm International Peace Research Institute (SIPRI). Available at http://databases.sipri.se/. From 1994 to 2002.
maj	Dummy for majoritarian system	Dummy for a plurality (majority) electoral system. Source: Database of Political Institutions, World Bank, 2001 (http://econ.worldbank.org). From 1993 to 2001.
pres	Dummy for presidential system	Dummy variable assigning ones to countries which have presidential executive systems. Source: Database of Political Institutions, World Bank, 2001 (http://econ.worldbank.org). From 1992 to 2000.
parl	Dummy for parliamentary system	Dummy assigning ones to countries which have parliamentary systems to elect the chief executive. Source: Database of Political Institutions, World Bank, 2001 (http://econ.worldbank.org). From 1992 to 2000.
fbc	Dummy for former British colony	Dummy variable taking value 1 if country has a British colonial legacy, 0 otherwise. Source: Warcziag (1996), Grier (1997), and Treisman (2000)).
ffc	Dummy for former French colony	Dummy variable taking value 1 if country has a French colonial legacy, 0 otherwise. Source: Warcziag (1996), Grier (1997), and Treisman (2000).
fsc	Dummy for former Spanish colony	Dummy variable taking value 1 if country has a Spanish colonial legacy, 0 otherwise. Source: Warcziag (1996), Grier (1997), and Treisman (2000).
ever	Dummy for any colonial history	Dummy variable taking value if a country has ever been a colony since 1776, and 0 otherwise. Source: Persson et al. (2003), based on Wacziarg (1996). From 1995 to 2003.

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Table A.3: (**continued**)

A.3 – Continued from previous page

Code	Variable description	Detail and source
pss	Aggregate press freedom index	Index of Press Freedom. Ranges from 0 to 100 with low scores indicating more press freedom and high values denoting less press freedom. Released by Freedom House (www.freedomhouse.org).
pss_a	Press freedom subindex: Laws and regulations	Subindex of Laws and regulations that influence press freedom. Ranges from 0 to 30 with low scores indicating more press freedom and high values denoting less press freedom. Released by Freedom House.
pss_b	Press freedom subindex: Political influences	Subindex of Political influences on press freedom. Ranges from 0 to 40 with low scores indicating more press freedom and high values denoting less press freedom. Released by Freedom House.
pss_c	Press freedom subindex: Economic influences	Subindex of Economic influences on press freedom. Ranges from 0 to 30 with low scores indicating more press freedom and high values denoting less press freedom. Released by Freedom House.
free	Index of economic freedom	The index measures how well countries score on a list of 10 different areas of economic freedom. Ranges from 1 (complete freedom) to 5 (lack of freedom). Source: The Heritage Foundation (www.heritage.org). From 1995 to 2003.
eng	Dummy for English legal system	Dummy for the origin of the legal system, taking value 1 if the country has English legal roots and 0 otherwise. Source: La Porta et al. (1999). From 1995 to 2003.
soc	Dummy for Socialist legal system	Dummy for the origin of the legal system, taking value 1 if the country has Socialist legal roots and 0 otherwise. Source: La Porta et al. (1999). From 1995 to 2003.
fre	Dummy for French legal system	Dummy for the origin of the legal system, taking value 1 if the country has French legal roots and 0 otherwise. Source: La Porta et al. (1999). From 1995 to 2003.

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Table A.3: (**continued**)

A.3 – Continued from previous page

Code	Variable description	Detail and source
ger	Dummy for German legal system	Dummy for the origin of the legal system, taking value 1 if the country has German legal roots and 0 otherwise. Source: La Porta et al. (1999). From 1995 to 2003.
sca	Dummy for Scandinavian legal system	Dummy for the origin of the legal system, taking value 1 if the country has German legal roots and 0 otherwise. Source: La Porta et al. (1999). From 1995 to 2003.
pro_d	Dummy for Protestantism as dominant religion	Dummy for Protestantism as a dominant religion in a country, taking value 1 if 2/3 or more of the population belong to the Protestant religion. Source: own elaboration drawing from La Porta et al. (1999). From 1995 to 2003.
cat_d	Dummy for Catholicism as dominant religion	Dummy for Catholicism as a dominant religion in a country, taking value 1 if 2/3 or more of the population belong to the Catholic religion. Source: own elaboration drawing from La Porta et al. (1999). From 1995 to 2003.
elf	Index of ethno-linguistic fractionalization	Index of ethno-linguistic fractionalization measuring the probability that two randomly selected persons from a given country will not belong to the same ethno-linguistic group. Source: La Porta et al. (1999). From 1995 to 2003.
news	Daily newspapers per 1000 people	Number of daily newspapers per 1000 people. Source: World Development Indicators (WDI).
exp	Sub-national expenditure as a % of total government expenditure	Proportion of total government spending accounted for by sub-national governments. Source: World Bank Dataset based on the Government Finance Statistics, IMF. From 1987 to 1998.

Table A.4: **Selected Data**

country	*year*	*cpi*	*pss*	pss_a	pss_b	pss_c	*gdp*	*pri*	*d*50
Argentina	2000	3.5	41	10	23	8	11730	2	0
Australia	2000	8.3	10	2	2	6	21680	1	1
Austria	2000	7.7	12	6	4	2	22870	1	1
Bangladesh	2000	2.29	60	18	29	13	1320	3	0
Belgium	2000	6.1	9	2	5	2	22220	1	1
Bolivia	2000	2.7	22	8	10	4	2180	1	0
Brazil	2000	3.9	33	8	14	11	6720	3	0
Cameroun	2000	2	77	25	33	19	1460	7	0
Canada	2000	9.2	14	3	6	5	23080	1	1
Chile	2000	7.4	27	9	11	7	8300	2	0
China	2000	3.1	80	30	35	15	2930	7	0
Colombia	2000	3.2	59	18	31	10	7030	4	1
Czech Republic	2000	4.3	20	6	9	5	12880	1	
Denmark	2000	9.8	9	2	2	5	25450	1	1
Ecuador	2000	2.6	44	16	20	8	3170	2	0
Egypt	2000	3.1	69	19	31	19	2990	6	0
Finland	2000	10	15	2	7	6	20090	1	1
France	2000	6.7	24	2	13	9	20500	1	1
Germany	2000	7.6	13	6	4	3	22390	1	1
Greece	2000	4.9	30	10	16	4	14020	1	0
Hungary	2000	5.2	30	5	18	7	9850	1	0
India	2000	2.8	42	4	27	11	2330	2	1
Indonesia	2000	1.7	49	19	18	12	3070	4	0
Ireland	2000	7.2	21	6	7	8	21080	1	1
Israel	2000	6.6	30	11	15	4	18880	1	1
Italy	2000	4.6	27	2	13	12	21810	1	1
Japan	2000	6.4	19	2	12	5	23740	1	1
Jordan	2000	4.6	57	24	23	10	3710	4	0

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Table A.4: (**continued**)

A.4 – Continued from previous page

country	*year*	*cpi*	*pss*	pss_a	pss_b	pss_c	*gdp*	*pri*	*d*50
Kenya	2000	2.1	70	22	36	12	990	6	0
Malaysia	2000	4.8	70	21	37	12	8140	5	1
Mexico	2000	3.3	50	10	25	15	7380	3	0
Netherlands	2000	8.9	14	6	4	4	23270	1	1
New Zealand	2000	9.4	8	4	3	1	17010	1	1
Nigeria	2000	1.2	53	16	19	18	790	4	0
Norway	2000	9.1	5	4	0	1	26780	1	1
Pakistan	2000	2.2	64	15	40	9	1710	7	0
Philippines	2000	2.8	30	10	14	6	3660	2	0
Poland	2000	4.1	19	8	7	4	7800	1	0
Portugal	2000	6.4	17	9	4	4	15060	1	0
Russia	2000	2.1	60	12	30	18	5700	4	
South Africa	2000	5	25	8	13	4	10320	1	1
South Korea	2000	4	27	6	16	5	12660	2	0
Spain	2000	7	18	6	8	4	16870	1	0
Sweden	2000	9.4	11	4	3	4	20430	1	1
Switzerland	2000	8.6	8	4	2	2	25770	1	1
Thailand	2000	3.2	30	12	11	7	6270	2	0
Turkey	2000	3.8	58	22	25	11	5880	4	1
Uganda	2000	2.3	40	18	19	3	1260	5	0
United Kingdom	2000	8.7	20	7	6	7	20900	1	1
United States	2000	7.8	13	2	5	6	30110	1	1
Venezuela	2000	2.7	34	12	14	8	5900	4	1

Appendix B

Appendix

B.1 Additional tables and data

Table B.1: **Pairwise correlations among selected decentralisation indicators**

	exp	*rev*	*muni*	*sta*	*const*	*auth*	*auto*	*dec4*	*dec2*	*fed1*	*fed2*	*fedi*	*unit*	*uhis*	*fis*	*pol*	*adm*	*tier*	*regj*	*locj*
exp	1.00																			
rev	0.95	1.00																		
muni	0.06	0.08	1.00																	
sta	0.41	0.38	0.55	1.00																
const	0.52	0.47	0.31	0.29	1.00															
auth	0.55	0.57	0.52	0.69	0.31	1.00														
auto	0.24	0.24	0.12	0.08	0.28	0.19	1.00													
dec4	0.53	0.48	0.89	0.89	0.26	0.71	0.26	1.00												
dec2	0.56	0.52	0.88	0.88	0.29	0.71	0.39	0.99	1.00											
fed1	0.47	0.44	0.21	0.36	0.48	0.67	0.07	0.31	0.32	1.00										
fed2	0.45	0.39	0.18	0.34	0.45	0.63	0.24	0.41	0.43	0.62	1.00									
fedi	-0.47	-0.47	-0.25	-0.32	-0.48	-0.61	0.00	-0.35	-0.35	-0.78	-0.62	1.00								
unit	-0.63	-0.65	-0.15	-0.41	-0.48	-0.61	-0.09	-0.30	-0.33	-0.88	-0.69	0.86	1.00							
uhis	-0.24	-0.32	0.14	0.04	-0.32	-0.19	-0.10	0.18	0.17	-0.33	-0.20	0.31	0.38	1.00						
fis	0.51	0.54	0.13	-0.01	0.08	0.39	0.04	0.22	0.20	0.17	0.03	-0.01	0.21	0.16	1.00					
pol	-0.03	0.15	-0.11	0.06	0.25	-0.23	0.03	-0.01	-0.01	-0.01	0.05	-0.13	-0.17	0.06	-0.04	1.00				
adm	-0.04	-0.06	0.13	-0.15	0.01	0.24	0.02	0.53	0.55	0.03	-0.04	0.17	0.42	0.36	0.04	0.04	1.00			
tier	0.22	0.13	0.48	0.36	0.50	0.40	0.05	0.42	0.42	0.44	0.35	-0.43	-0.42	0.14	-0.05	-0.16	-0.13	1.00		
regj	-0.05	-0.04	0.12	0.00	-0.14	-0.04	-0.04	0.04	0.03	-0.14	-0.01	0.00	0.06	0.08	0.45	-0.09	0.25	0.01	1.00	
locj	0.30	0.25	0.11	0.07	0.20	0.23	-0.03	0.22	0.23	0.27	0.20	-0.30	-0.28	-0.14	-0.10	-0.21	-0.12	0.19	0.00	1.00

Pairwise correlations are calculated for year 2000. * Denotes significance at the 5% level.

Table B.2: **Baseline regressions - Cross Section (Year= 2000) - Common subset of countries**

Dependent variable: Corruption - Method: OLS																		
	cpi	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*
	EXP			REV			MUNI			STATE			AUTHOR			AUTON		
DEC	0.03**	0.02**	0.01	0.03**	0.02*	0.01**	-0.74***	-0.16	-0.35***	-0.15	-0.25**	-0.04	-0.40	-0.64***	-0.30	-0.44	-0.28	-0.07
	[2.31]	[2.35]	[1.47]	[2.05]	[1.76]	[1.22]	[-3.01]	[-1.4]	[-3.17]	[-0.69]	[-1.95]	[-0.46]	[-0.71]	[-2.58]	[-1.21]	[-0.91]	[-1.21]	[-0.28]
GDP	3.75***	0.83*	1.83***	3.93***	0.87*	1.90***	3.85***	1.23***	1.86***	3.40***	1.23***	1.64***	3.50***	1.24**	1.70***	2.89***	0.97***	1.45***
	[6.48]	[1.92]	[7.4]	[6.58]	[1.92]	[7.55]	[8.22]	[4.86]	[8.33]	[6.64]	[5.8]	[6.78]	[4.7]	[3.97]	[4.69]	[6.16]	[4.78]	[6.5]
POPUL	-0.59**	-0.54***	-0.18*	-0.47**	-0.52***	-0.13	-0.39*	-0.43***	-0.13	-0.52 **	-0.35 **	-0.19 *	-0.30	-0.27	-0.05	-0.63 ***	-0.50 ***	-0.24 **
	[-2.67]	[-3.53]	[-1.82]	[-2.15]	[-3.42]	[-1.37]	[-1.82]	[-2.95]	[-1.3]	[-2.46]	[-2.33]	[-1.9]	[-0.97]	[-1.20]	[-0.34]	[-3.15]	[-3.86]	[-2.6]
PRESS	-0.02*	-0.03***	-0.02***	-0.02**	-0.03***	-0.02***	-0.02**	-0.02***	-0.01***	-0.02*	-0.02***	-0.01**	-0.02	-0.02***	-0.02***	-0.02**	-0.02***	-0.01**
	[-2.39]	[-3.42]	[-3.25]	[-2.35]	[-3.41]	[-3.23]	[-2.51]	[-4.8]	[-3.03]	[-1.9]	[-5.18]	[-2.32]	[-1.17]	[-3.82]	[-1.61]	[-2.18]	[-5.00]	[-2.42]
Obs	55	55	55	54	54	54	71	71	71	76	76	76	37	37	37	79	79	79
R^2	0.77	0.63	0.83	0.76	0.63	0.83	0.74	0.64	0.8	0.71	0.65	0.78	0.69	0.68	0.72	0.71	0.66	0.76
	cpi	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*
	DECENT4			FEDINDEX			UNITARYHIS			TIERS			REGJ			LOCJ		
DEC	-0.30*	-0.19**	-0.14**	0.04	0.06	0.04	0.01**	0.00	0.00**	-0.11	-0.29**	-0.03	0.00	0.00	0.00	0.00	0.00**	0.00
	[-1.9]	[-2.58]	[-2.05]	[0.37]	[0.92]	[0.80]	[2.17]	[0.41]	[2.12	[-0.56]	[-2.50]	[-0.29]	[0.45]	[-0.19]	[-0.15]	[0.88]	[2.64]	[1.75]
GDP	3.83***	1.35***	1.89***	2.86***	0.98***	1.45***	1.95***	0.60*	0.97***	2.61***	1.00***	1.31***	2.61***	0.99***	1.23***	2.76***	1.04***	1.37***
	[7.5]	[5.84]	[7.43]	[6.05]	[4.65]	[6.44]	[3.17]	[1.98]	[3.46]	[6.54]	[4.89]	[6.93]	[5.66]	[3.6]	[5.4]	[7.09]	[4.53]	[7.41]
POPUL	-0.36	-0.37**	-0.10	-0.59**	-0.40**	-0.16	-0.35*	-0.41**	-0.13	-0.39*	-0.33**	-0.11	-0.42	-0.30	-0.06	-0.54*	-0.55**	-0.19
	[-1.61]	[-2.28]	[-1.02]	[-2.08]	[-2.35]	[-1.33]	[-1.72]	[-2.52]	[-1.42]	[-1.72]	[-2.01]	[-1.07]	[-1.26]	[-1.24]	[-0.47]	[-1.88]	[-2.92]	[-1.6]
PRESS	-0.02**	-0.02***	-0.01***	-0.03**	-0.02***	-0.01***	-0.05***	-0.04***	-0.03***	-0.03***	-0.03***	-0.02***	-0.05***	-0.03***	-0.03***	-0.03***	-0.02***	-0.02***
	[-2.05]	[-4.97]	[-2.59]	[-2.33]	[-4.68]	[-2.74]	[-3.33]	[-4.36]	[-4.21]	[-3.52]	[-5.35]	[-3.99]	[-3.8]	[-4.03]	[-4.4]	[-3.29]	[-4.1]	[-3.88]
Obs	66	66	66	82	82	82	64	64	64	82	82	82	50	50	50	76	76	76
R^2	0.71	0.65	0.78	0.69	0.64	0.76	0.71	0.60	0.78	0.69	0.66	0.77	0.74	0.59	0.78	0.69	0.62	0.77

White-corrected standard errors. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level. The constant term is not reported in this table. DEC is the decentralisation indicator which varies across the different columns of the table according to the measure selected. We estimate each alternative model for three different corruption indexes. Data are for 2000 except for TIERS, REGJ and LOCJ with data for 1999. GDP and POPUL are in logs.

Table B.3: **Baseline regressions - Cross Section (Year= 2000) - Common subset of countries - Additional Decentralisation Indicators**

Dependent variable: Corruption - Method: OLS						
	cpi	*icrg*	*wbc*	*cpi*	*icrg*	*wbc*
	FEDERAL			UNITARY		
DEC	0.17	-0.01	0.01	-0.12	0.01	-0.03
	[0.40]	[-0.04]	[0.26]	[-0.47]	[0.09]	[-0.29]
GDP	2.88***	0.98***	1.45***	2.25***	0.64**	1.08***
	[6.22]	[4.68]	[6.51]	[3.92]	[2.03]	[4.05]
POPUL	-0.63**	-0.46***	-0.22**	-0.57**	-0.41**	-0.21*
	[-2.68]	[-3.31]	[-2.09]	[-2.16]	[-2.16]	[-1.8]
PRESS	-0.02**	-0.02***	-0.01***	-0.05***	-0.04***	-0.03***
	[-2.23]	[-4.9]	[-2.66]	[-3.98]	[-4.54]	[-4.75]
Obs	86	86	86	64	64	64
R^2	0.70	0.65	0.76	0.69	0.60	0.76

White-corrected standard errors. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level. The constant term is not reported in this table. DEC is the decentralisation indicator which varies across the different columns of the table according to the measure selected. We estimate each alternative model for three different corruption indexes. Data are for 2000 except for POL, FIS, and ADM with data for 1996. GDP and POPUL are in logs.

Table B.4: **Variable description and data sources**

Code	Variable description	Detail and source
cpi	Corruption Perception Index	Elaborated by Transparency International. This measure provides (subjective) perceptions of bureaucratic corruption across countries. Scores range from 0 (most corrupt) to 10 (least corrupt). From 1995 to 2004. (Available from www.transparency.org)
wbc	Control of Corruption Index	One of the indicators of the Worldwide Governance Research Indicators Dataset 2004 available from the World Bank at `www.worldbank.org/wbi/governance/data.html#dataset`.
icrg	ICRG Corruption Ratings	Corruption ratings included in the International Country Risk Guide Database elaborated by Political Risk Services. Accessible at `www.icrgonline.com`.
logGDP	Logarithm of GDP per capita	The logarithm of real GDP per capita PPP was taken from the 2003 World Bank Indicators CD-Rom. From 1993 to 2001.
logPOPUL	Logarithm of Total Population	Years available 1969-2004. Data from the Worldbank's World Development Indicators (2006).
pss	Press Freedom Index	Index of Press Freedom. Ranges from 0 to 100 with low scores indicating more press freedom and high values denoting less press freedom. Released by Freedom House (www.freedomhouse.org).
exp	Subnational expenditure as % of total government expenditure	Average for the period 1990-2000 of the IMF's Government Finance Statistics. Available at `http://www.worldbank.org/publicsector/decentralisation/data.htm`
rev	Subnational revenue as % of total government revenue	Average for the period 1990-2000 of the IMF's Government Finance Statistics. Available at `http://www.worldbank.org/publicsector/decentralisation/data.htm`
muni	Are municipal governments locally elected?	Categorical variable taking the value of 2 if both the local executive and legislative are locally elected, 1 if the executive is appointed but the legislature elected and 0 if both are appointed. Available from the Database of Political Institutions 2004 (DPI).
state	Are state/province governments elected?	Categorical variable taking the value of 2 if both the state/provincial executive and legislative are elected, 1 if the executive is appointed but the legislature elected and 0 if both are appointed. Available from the Database of Political Institutions 2004 (DPI).

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Table B.4: (**continued**)

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Code	Variable description	Detail and source
stconst	Are the constituencies of the senators the state/provinces?	Dummy variable taking value 1 if the Senate is elected on a state/province basis and 0 if otherwise. Taken from the Database of Political Institutions 2004 (DPI).
author	Do the state provinces have authority over taxing, spending or legislating?	Dummy variable taking the value of 1 if any of these is true, 0 otherwise. Available from the Database of Political Institutions 2004 (DPI).
auton	Are there autonomous regions?	Dummy variable taking the value of 1 if there exists autonomous contiguous regions, 0 otherwise. Available from the Database of Political Institutions (DPI).
pol	Factor score for political decentralization	It ranges from 0 (low decentralization) to 1 (high decentralization). Source: Schneider (2003). Year of observations, 1996.
fis	Factor score for fiscal decentralization	It ranges from 0 (low decentralization) to 1 (high decentralization). Source: Schneider (2003). Year of observations, 1996.
adm	Factor score for administrative decentralization	It ranges from 0 (low decentralization) to 1 (high decentralization). Source: Schneider (2003). Year of observations, 1996.
*dec*2	Political decentralization index	Constructed on the basis of aggregating *auton*, *muni* and *state*, from the Database of Political Institutions (DPI).
*dec*4	Political decentralization index	Constructed on the basis of aggregating *muni* and *state*, from the Database of Political Institutions (DPI).
federal	Dummy for a federal country	Variable taking the value of 1 if the country is federal, 0 otherwise. Based on the classification of Elazar (1995) and the Handbook of Federal Countries. Other sources: CIA World Factbook, and selected Constitutions of countries.
federal(2)	Dummy for a federal country (broader concept)	Variable taking the value of 1 if the country is federal, 0 otherwise. Based on the classification of Elazar (1995) and the Handbook of Federal Countries. Other sources: CIA World Factbook, and selected Constitutions of countries.
federal_alt	Dummy for a federal country (Treisman)	Dummy for federalism. Source: Treisman (2000).
fedindex	Index of federalism	Ranges from 1 to 5, with lower values indicating a more federal country. Source: STM103 Global Indicators Shared Dataset V2.0 available at `www.pippanorris.com`.

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Table B.4: (**continued**)

B.4 – Continued from previous page

Code	Variable description	Detail and source
unitary	Index of unitarism	Index taking the value of 0=federal (elective regional legislatures plus constitutional recognition of subnational authority) 1= semi-federal (where there are elective legislatures at the regional level enjoying important policy-making power but in which constitutional sovereignty is reserved to the national government) 2= unitary. Source: Gerring et al. (2005a,b) available at `www.pippanorris.com`. Year=2000.
unitaryhis	Index of Unitary History	Cumulative index constructed on the basis of the annual values of *unitary*. Source: Gerring et al. (2005a,b) available at `www.pippanorris.com`. Year=2000.
tiers	Number of elected sub-national tiers	Data for year 1999. Source: `www.worldbank.org`.
regj	Number of intermediate jurisdictions	Data for year 1999. Source: `www.worldbank.org`.
locj	Number of local jurisdictions	Data for year 1999. Source: `www.worldbank.org`.
polrights	Index of political rights	Political Rights Index (Freedom House). From 1 (most free) to 7 (least free). Source: `www.freedomhouse.org`.
ethno	Ethnolinguistic fractionalisation index	Average value of 5 different indexes of ethnolinguistic fractionalization. Its value ranges from 0 to 1. Source: La Porta et al. (1999).
bri	Dummy for former British colony	Variable taking the value of 1 if the country has ever been a British colony, 0 otherwise. Source: Treisman (2000), Persson et al. (2003) and CIA World Factbook.
fre	Dummy for former French colony	Variable taking the value of 1 if the country has ever been a French colony, 0 otherwise. Source: Treisman (2000), Persson et al. (2003) and CIA World Factbook.
spa	Dummy for former Spanish colony	Variable taking the value of 1 if the country has ever been a Spanish colony, 0 otherwise. Source: Treisman (2000), Persson et al. (2003) and CIA World Factbook.
por	Dummy for former Portuguese colony	Variable taking the value of 1 if the country has ever been a Portuguese colony, 0 otherwise. Source: Treisman (2000), Persson et al. (2003) and CIA World Factbook.
pro_d	Dummy for Protestantism as dominant religion	Dummy taking the value of 1 if the country's dominant religion is Protestantism. Source: CIA World Factbook.
eng	English legal origin	Dummy taking the value of 1 if the country has a tradition of English Common Law, 0 otherwise. Source: La Porta et al. (1999)

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Table B.4: (**continued**)

B.4 – Continued from previous page

Code	Variable description	Detail and source
soc	Socialist legal origin	Dummy taking the value of 1 if the country has a tradition of Socialist/Communist Laws, 0 otherwise. Source: La Porta et al. (1999)
fre	French legal origin	Dummy taking the value of 1 if the country has a tradition of French Commercial Code, 0 otherwise. Source: La Porta et al. (1999)
ger	German legal origin	Dummy taking the value of 1 if the country has a tradition of German Commercial Code, 0 otherwise. Source: La Porta et al. (1999)
sca	Scandinavian legal origin	Dummy taking the value of 1 if the country has a tradition of Scandinavian Commercial Code, 0 otherwise. Source: La Porta et al. (1999)

Table B.5: **Selected Data**

country	*year*	*wbc*	*gdp*	*pss*	*popul*	*rev*	*unitary*	*muni*	*state*	*locj*	*stconst*
Afghanistan	2000	-1.59	-	90	-	-	-	0	0	-	-
Albania	2000	-.6	3.57	56	6.49	1.85	18.98	2	1	374	-
Algeria	2000	-.7	3.73	83	7.48	-	-	1	1	1552	-
Angola	2000	-1.4	3.28	80	7.09	-	-	0	1	-	-
Argentina	2000	-.4	4.09	41	7.57	39.18	0	2	2	1617	1
Armenia	2000	-.8	3.38	57	6.49	-	15.24	2	0	931	-
Australia	2000	2.1	4.41	10	7.28	31.95	0	2	2	900	1
Austria	2000	1.9	4.46	12	6.90	26.39	44.17	-	2	2353	1
Azerbaijan	2000	-1.1	3.41	70	6.91	19.75	-	1	-	-	-
Bahamas	2000	.8	4.23	7	5.48	-	48.44	1	1	-	0
Bahrain	2000	.4	4.20	75	5.83	2.60	-	-	1	-	-
Bangladesh	2000	-.6	3.17	60	8.12	-	19.1	0	0	4642	0
Barbados	2000	-	4.19	16	5.43	-	58.1	-	-	-	0
Belarus	2000	-.1	3.68	80	7.00	29.13	-	0	0	179	0
Belgium	2000	1.4	4.44	9	7.01	5.85	63.61	2	2	589	0
Belize	2000	.2	3.77	25	5.40	-	36.2	0	0	-	0
Benin	2000	-.2	2.99	30	6.79	-	19.1	2	2	77	-
Bhutan	2000	1.3	-	76	5.91	-	-	-	0	-	-
Bolivia	2000	-.7	3.38	22	6.92	20.76	34.96	2	0	312	1
Bosnia and H.	2000	-.5	3.76	56	6.58	-	-	2	-	137	-
Botswana	2000	1	3.88	28	6.22	-	58.1	1	1	17	0
Brazil	2000	0	3.87	33	8.23	28.63	0	2	2	5581	1
Brunei	2000	-.2	-	74	5.53	-	-	-	0	-	-
Bulgaria	2000	-.2	3.78	30	6.91	13.79	20.9	2	2	294	-
Burkina Faso	2000	-.7	3.01	40	7.05	-	-	-	-	250	-
Burundi	2000	-1.4	2.78	83	6.83	-	-	2	1	-	-
Cambodia	2000	-.6	3.26	61	7.10	-	18.96	-	-	-	-
Cameroon	2000	-1.1	3.27	77	7.18	-	-	1	0	336	-
Canada	2000	2.3	4.44	14	7.49	52.97	0	2	2	4507	1
Cape Verde	2000	.2	3.69	32	5.64	-	17.28	-	1	-	-
C.A.R.	2000	-1	3.06	60	6.57	-	15.44	0	0	174	-
Chad	2000	-.6	2.93	72	6.90	-	-	0	0	-	-

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Table B.5: (**continued**)

B.5 – Continued from previous page

country	*year*	*wbc*	*gdp*	*pss*	*popul*	*rev*	*unitary*	*muni*	*state*	*locj*	*stconst*
Chile	2000	1.5	3.96	27	7.18	7.18	68.86	1	0	340	1
China	2000	-.3	3.58	80	9.10	51.48	-	2	2	-	-
Colombia	2000	-.4	3.79	59	7.63	-	73.39	2	2	1068	1
Comoro Is.	2000	-.6	3.24	40	5.75	-	-	-	1	-	1
Congo, DR	2000	-1.4	2.98	90	6.54	-	-	0	-	-	-
Congo, Rep. of	2000	-.9	2.83	77	7.69	-	-	-	1	-	1
Costa Rica	2000	1	3.95	16	6.58	2.89	101	2	0	496	-
Cote d'Ivoire	2000	-.6	3.20	74	7.20	-	-	1	1	196	-
Croatia	2000	0	3.98	63	6.64	10.69	3.98	2	1	543	1
Cuba	2000	-.3	-	94	7.05	-	-	1	0	169	-
Cyprus	2000	1.1	4.30	16	5.88	-	59.1	-	-	-	-
Czech Republic	2000	.4	4.19	20	7.01	16.39	15.44	2	1	5768	0
Denmark	2000	2.4	4.46	9	6.73	32.15	100.88	2	2	275	-
Djibouti	2000	-1	3.29	63	5.82	-	-	-	-	-	-
Dom. Republic	2000	-.3	3.80	30	6.92	0.81	44.5	2	0	90	1
Ecuador	2000	-1	3.53	44	7.09	-	56.16	2	-	1079	-
Egypt	2000	-.2	3.55	69	7.81	-	-	0	1	199	-
El Salvador	2000	-.2	3.67	40	6.79	-	34.58	2	0	262	-
Eq. Guinea	2000	-1.8	4.18	78	5.66	-	-	0	-	-	-
Eritrea	2000	-.1	2.97	68	6.61	-	-	0	0	-	0
Estonia	2000	.8	3.99	20	6.14	18.83	28.28	2	1	254	-
Ethiopia	2000	-.1	2.83	62	7.81	-	12.44	-	-	910	1
Fiji	2000	.5	3.70	58	5.91	3.11	52.82	1	1	-	-
Finland	2000	2.5	4.41	15	6.71	31.59	98.28	-	0	455	-
France	2000	1.5	4.41	24	7.77	13.21	96.8	2	1	36559	1
Gabon	2000	-.7	3.79	55	6.10	-	-	2	0	-	-
Gambia	2000	-.1	3.24	70	6.12	-	-	-	1	-	-
Georgia	2000	-.7	3.30	47	6.67	-	19.1	2	0	4000	-
Germany	2000	1.7	4.41	13	7.91	33.52	10.56	2	2	16121	1
Ghana	2000	-.4	3.29	61	7.29	-	9.8	-	1	110	-
Greece	2000	.8	4.24	30	7.04	-	81.6	2	1	5922	-

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Table B.5: (**continued**)

B.5 – Continued from previous page

country	*year*	*wbc*	*gdp*	*pss*	*popul*	*rev*	*unitary*	*muni*	*state*	*locj*	*stconst*
Grenada	2000	.2	3.88	20	5.01	-	38.88	-	-	-	0
Guatemala	2000	-.7	3.59	54	7.06	3.68	53.82	0	0	324	-
Guinea	2000	-.4	3.29	71	6.87	-	-	1	0	33	-
Guinea-Bissau	2000	-.4	2.89	56	6.14	-	11.62	-	-	-	-
Guyana	2000	-.4	3.60	22	5.88	-	34.44	2	2	-	-
Haiti	2000	-1	3.25	58	6.90	-	-	-	0	133	-
Honduras	2000	-.7	3.40	48	6.81	-	48.46	2	0	293	-
Hong Kong	2000	-	4.41	-	6.82	-	-	-	-	-	-
Hungary	2000	.8	4.13	30	7.00	12.65	20.9	2	0	3153	-
Iceland	2000	2.5	4.45	12	5.45	22.40	97.4	2	1	-	0
India	2000	-.2	3.38	42	9.01	33.64	0	2	1	237687	1
Indonesia	2000	-1.1	3.48	49	8.31	3.64	7.78	-	0	-	-
Iran	2000	-.6	3.75	68	7.80	-	7.88	-	-	720	-
Iraq	2000	-1.2	-	98	7.37	-	-	-	-	-	-
Ireland	2000	1.6	4.48	21	6.58	7.46	96.8	2	2	80	0
Israel	2000	1.3	4.38	30	6.80	9.45	78.44	-	1	273	-
Italy	2000	.9	4.40	27	7.76	10.97	54.85	2	2	8104	1
Jamaica	2000	-.2	3.53	11	6.41	-	66.78	-	-	-	0
Japan	2000	1.4	4.42	19	8.10	-	99.18	2	2	3233	1
Jordan	2000	.1	3.58	57	6.69	-	-	1	0	669	0
Kazakhstan	2000	-.9	3.66	58	7.18	28.77	-	1	1	303	-
Kenya	2000	-1.1	3.00	70	7.48	5.55	-	-	-	168	-
Kuwait	2000	.9	4.20	48	6.34	-	-	0	0	-	-
Kyrgyzstan	2000	-.9	3.19	61	6.69	17.90	-	1	1	61	-
Laos	2000	-.9	3.20	66	6.72	-	-	1	1	-	-
Latvia	2000	0	3.90	24	6.38	19.51	19.1	1	1	566	-
Lebanon	2000	-.5	3.62	61	6.64	-	-	0	0	-	-
Lesotho	2000	.2	3.33	56	6.24	-	11.5	0	0	-	0
Liberia	2000	-1.2	-	67	6.50	-	-	-	-	-	1
Libya	2000	-.9	-	90	6.72	-	-	2	2	1500	-
Lithuania	2000	.3	3.94	20	6.54	20.86	22.54	2	0	56	-

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Table B.5: (**continued**)

B.5 – Continued from previous page

country	*year*	*wbc*	*gdp*	*pss*	*popul*	*rev*	*unitary*	*muni*	*state*	*locj*	*stconst*
Luxembourg	2000	2.1	4.77	10	5.64	10.14	-	-	0	-	0
Macedonia	2000	-.5	3.78	42	6.31	-	19.1	2	-	-	-
Madagascar	2000	-.8	2.91	32	7.19	-	19.1	2	2	1391	0
Malawi	2000	-.2	2.78	52	7.01	-	13.58	0	0	-	-
Malaysia	2000	.2	3.95	70	7.37	15.82	0	2	1	143	0
Maldives	2000	-.6	-	65	5.44	-	-	-	0	-	-
Mali	2000	-.6	2.90	26	7.04	-	17.28	2	0	279	-
Malta	2000	.2	4.26	17	5.59	-	60.68	0	0	-	-
Mauritania	2000	-.7	3.22	67	6.42	-	-	-	-	-	-
Mauritius	2000	.5	3.98	17	6.07	1.96	55.4	2	-	-	-
Mexico	2000	-.4	3.96	50	7.99	21.86	0	-	2	2418	1
Moldova	2000	-.9	3.11	58	6.63	23.57	19.1	2	2	35	-
Mongolia	2000	-.4	3.21	29	6.38	25.43	20.9	1	1	-	-
Morocco	2000	.4	3.54	49	7.46	-	-	0	0	1547	-
Mozambique	2000	-.4	2.95	48	7.25	-	13.58	1	1	33	-
Myanmar	2000	-1.3	-	100	7.68	-	-	-	-	-	-
Namibia	2000	1.2	3.78	34	6.28	-	20.9	2	2	-	1
Nepal	2000	-.4	3.12	59	7.36	-	20.9	2	0	4053	-
Netherlands	2000	2.3	4.46	14	7.20	9.34	94.08	1	1	572	1
New Caledonia	2000	-	4.35	-	5.33	-	-	-	-	-	-
New Zealand	2000	2.4	4.29	8	6.59	9.43	101	2	2	155	-
Nicaragua	2000	-.9	3.51	40	6.71	9.02	20.9	2	0	143	-
Niger	2000	-.9	2.87	62	7.03	-	13.28	-	-	150	-
Nigeria	2000	-1.1	2.94	53	8.10	-	0	0	0	589	-
North Korea	2000	-1	-	100	7.35	-	-	2	2	-	-
Norway	2000	2.1	4.53	5	6.65	21.78	97.6	2	1	435	0
Oman	2000	.7	4.10	71	6.38	-	-	-	0	-	-
Pakistan	2000	-.7	3.28	64	8.14	-	-	1	1	5195	1
Panama	2000	-.4	3.80	30	6.46	2.60	38.54	1	1	-	-
Papua N. Guinea	2000	-1.1	3.37	28	6.71	-	22.75	2	2	284	-

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Table B.5: (**continued**)

B.5 – Continued from previous page

country	*year*	*wbc*	*gdp*	*pss*	*popul*	*rev*	*unitary*	*muni*	*state*	*locj*	*stconst*
Paraguay	2000	-1	3.67	51	6.72	1.48	24.96	2	-	212	0
Peru	2000	-.1	3.68	67	7.41	6.54	-	1	0	1808	-
Philippines	2000	-.5	3.60	30	7.88	5.38	-	2	2	1541	0
Poland	2000	.5	4.02	19	7.59	15.42	26.12	1	1	2489	1
Portugal	2000	1.4	4.26	17	7.01	7.77	52.5	2	0	275	-
Qatar	2000	.7	-	62	5.77	-	-	-	-	-	-
Romania	2000	-.5	3.78	44	7.35	7.98	20.9	2	1	2948	1
Russian Fed.	2000	-1.1	3.85	60	8.16	39.13	0	-	-	2000	1
Rwanda	2000	.1	3.04	72	6.89	-	-	1	0	143	-
Saudi Arabia	2000	.1	4.10	90	7.32	-	-	0	0	-	-
Senegal	2000	-.4	3.17	33	6.98	-	2	0	1	99	-
Serbia and M.	2000	-	-	81	7.03	-	-	-	-	-	-
Sierra Leone	2000	-.8	2.67	85	6.70	-	-	0	0	204	-
Singapore	2000	2.5	4.37	66	6.60	-	-	0	0	-	-
Slovakia	2000	.3	4.05	30	6.73	6.81	15.44	2	2	2834	-
Slovenia	2000	1.1	4.23	27	6.30	9.06	19.1	2	-	192	-
Solomon Is.	2000	-.2	3.27	18	5.62	-	0	-	2	-	-
Somalia	2000	-1.6	-	88	6.94	-	-	-	-	-	-
South Africa	2000	.5	3.98	25	7.64	12.20	93.31	2	2	840	0
South Korea	2000	.5	4.21	27	7.67	-	39.44	1	1	204	-
Spain	2000	1.7	4.33	18	7.61	16.34	33.18	2	2	8082	1
Sri Lanka	2000	-.1	3.56	70	7.27	-	65.35	2	2	238	-
St. Lucia	2000	.6	3.75	13	5.19	-	39.38	2	2	-	0
Sudan	2000	-1.1	3.25	85	7.50	-	-	-	0	615	-
Suriname	2000	.2	-	31	5.63	-	28.4	-	-	-	-
Swaziland	2000	-.2	3.64	77	6.02	-	-	-	0	-	0
Sweden	2000	2.5	4.41	11	6.95	31.19	100.1	2	1	286	-
Switzerland	2000	2.2	4.48	8	6.86	43.77	0	2	2	3000	1
Syria	2000	-.8	3.52	73	7.21	-	-	-	0	300	-
Taiwan	2000	.7	-	21	-	-	17.28	1	-	-	0
Tajikistan	2000	-1.2	2.90	94	6.79	27.79	-	0	1	41	-

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Table B.5: (**continued**)

B.5 – Continued from previous page

country	*year*	*wbc*	*gdp*	*pss*	*popul*	*rev*	*unitary*	*muni*	*state*	*locj*	*stconst*
Tanzania	2000	-1	2.71	49	7.53	-	-	-	0	101	-
Thailand	2000	-.3	3.80	30	7.78	5.85	42.1	-	0	149	0
Togo	2000	-.7	3.20	74	6.66	-	-	2	2	30	-
Trinidad and T.	2000	.4	3.95	28	6.11	4.42	63.18	2	-	-	0
Tunisia	2000	.7	3.80	74	6.98	-	-	2	1	257	-
Turkey	2000	-.3	3.81	58	7.83	-	72.58	2	1	2801	-
Turkmenistan	2000	-1.1	3.56	86	6.67	-	-	-	-	-	-
Uganda	2000	-.9	3.11	40	7.37	-	-	2	1	1040	-
Ukraine	2000	-1	3.61	60	7.69	-	19.1	2	-	619	-
U.A.E.	2000	.7	-	76	6.51	-	-	-	-	-	-
United Kingdom	2000	2.2	4.43	20	7.77	8.76	101	2	2	319	0
United States	2000	1.8	4.53	13	8.45	42.03	0	2	2	70500	1
Uruguay	2000	.7	3.95	29	6.52	-	64.52	2	2	19	0
Uzbekistan	2000	-.8	3.18	83	7.39	-	-	0	1	281	-
Vanuatu	2000	-.2	3.48	44	5.29	-	18.9	2	-	-	-
Venezuela	2000	-.6	3.75	34	7.39	-	0	2	1	330	-
Vietnam	2000	-.8	3.30	75	7.89	-	-	0	-	-	-
Western Samoa	2000	.2	3.70	34	5.24	-	29.28	0	-	-	-
Yemen	2000	-.7	2.90	68	7.24	-	-	0	-	-	-
Yugoslavia	2000	-1.1	-	-	-	78.12	-	2	-	-	-
Zambia	2000	-.9	2.89	62	7.00	-	19.1	-	-	72	-
Zimbabwe	2000	-.9	3.41	67	7.10	13.89	-	-	0	80	-

All the data are for year 2000. *wbc* is the World Bank Corruption index, *gdp* and *popul* are in logs, *pss* is press freedom index, *rev* is the share of sub-national revenue in total revenues, *unitary* is the index of unitary history, *muni* and *state* are categorical variable for municipal and state elections, *locj* is the number of elected local jurisdictions, and *stconst* is a dummy for the provinces as the senators constituencies.

Table B.6: **Rolling regressions - EXP and WBC**

model	*beta*	*t*	*ci(low)*	*ci(upp)*	*sd*	*var*	*r2*	*obs*
1	0.00	0.24	-0.02	0.03	0.02	0.00	0.78	30
2	0.00	0.01	-0.03	0.03	0.02	0.00	0.79	30
3	-0.01	-0.88	-0.04	0.01	0.02	0.00	0.78	30
4	-0.02	-1.35	-0.05	0.01	0.02	0.00	0.80	30
5	-0.03	-2.23	-0.06	-0.01	0.01	0.00	0.82	30
6	-0.03	-1.74	-0.05	-0.00	0.01	0.00	0.81	30
7	-0.02	-0.98	-0.04	0.01	0.02	0.00	0.81	30
8	-0.01	-0.44	-0.03	0.02	0.01	0.00	0.82	30
9	-0.01	-0.58	-0.03	0.02	0.01	0.00	0.83	30
10	-0.01	-0.97	-0.04	0.01	0.01	0.00	0.83	30
11	-0.00	-0.22	-0.03	0.02	0.02	0.00	0.84	30
12	-0.00	-0.22	-0.03	0.02	0.02	0.00	0.85	30
13	-0.01	-0.32	-0.03	0.02	0.02	0.00	0.86	30
14	-0.00	-0.23	-0.03	0.03	0.02	0.00	0.85	30
15	-0.00	-0.20	-0.04	0.03	0.02	0.00	0.85	30
16	0.01	0.32	-0.02	0.04	0.02	0.00	0.88	30
17	0.01	0.82	-0.01	0.03	0.01	0.00	0.89	30
18	0.02	1.32	-0.01	0.04	0.01	0.00	0.89	30
19	0.02	1.31	-0.01	0.04	0.01	0.00	0.89	30
20	0.02	1.68	-0.00	0.04	0.01	0.00	0.89	30
21	0.02	1.82	0.00	0.04	0.01	0.00	0.90	30
22	0.04	3.48	0.02	0.05	0.01	0.00	0.90	30
23	0.02	1.57	-0.00	0.05	0.01	0.00	0.88	30
24	0.02	1.56	-0.00	0.05	0.01	0.00	0.89	30
25	0.02	1.86	0.00	0.05	0.01	0.00	0.88	30
26	0.04	2.37	0.01	0.06	0.01	0.00	0.88	30
27	0.03	2.31	0.01	0.06	0.01	0.00	0.88	30
28	0.04	3.02	0.02	0.07	0.01	0.00	0.89	30
29	0.04	2.72	0.01	0.06	0.01	0.00	0.88	30
30	0.02	1.23	-0.01	0.06	0.02	0.00	0.86	30
31	0.02	1.30	-0.01	0.05	0.02	0.00	0.86	30
32	0.03	2.07	0.01	0.06	0.01	0.00	0.87	30
33	0.01	0.61	-0.02	0.04	0.02	0.00	0.85	30
34	0.01	0.79	-0.02	0.04	0.02	0.00	0.86	30
35	0.02	0.88	-0.02	0.05	0.02	0.00	0.85	30
36	0.02	0.83	-0.02	0.05	0.02	0.00	0.85	30
37	0.03	1.70	-0.00	0.05	0.02	0.00	0.87	30
38	0.03	2.04	0.00	0.05	0.01	0.00	0.86	30
39	0.03	2.46	0.01	0.05	0.01	0.00	0.87	30

Table B.7: **Rolling regressions - REV and WBC**

model	*beta*	*t*	*ci(low)*	*ci(upp)*	*sd*	*var*	*r2*	*obs*
1	0.05	1.17	-0.02	0.11	0.04	0.00	0.81	30
2	0.03	0.86	-0.03	0.09	0.04	0.00	0.81	30
3	0.01	0.48	-0.04	0.06	0.03	0.00	0.81	30
4	0.01	0.47	-0.04	0.06	0.03	0.00	0.80	30
5	-0.01	-0.22	-0.05	0.04	0.02	0.00	0.80	30
6	-0.01	-0.54	-0.05	0.02	0.02	0.00	0.83	30
7	-0.02	-1.02	-0.05	0.01	0.02	0.00	0.83	30
8	-0.01	-0.68	-0.05	0.02	0.02	0.00	0.83	30
9	0.00	0.22	-0.03	0.04	0.02	0.00	0.85	30
10	-0.02	-0.83	-0.05	0.02	0.02	0.00	0.83	30
11	-0.01	-0.34	-0.05	0.03	0.02	0.00	0.82	30
12	-0.01	-0.30	-0.04	0.03	0.02	0.00	0.82	30
13	-0.02	-0.79	-0.05	0.02	0.02	0.00	0.82	30
14	-0.01	-0.33	-0.04	0.03	0.02	0.00	0.83	30
15	-0.02	-0.73	-0.05	0.02	0.02	0.00	0.85	30
16	-0.02	-1.03	-0.06	0.02	0.02	0.00	0.85	30
17	-0.01	-0.64	-0.05	0.02	0.02	0.00	0.86	30
18	-0.03	-1.36	-0.06	0.01	0.02	0.00	0.86	30
19	-0.00	-0.26	-0.03	0.03	0.02	0.00	0.88	30
20	-0.00	-0.02	-0.03	0.03	0.02	0.00	0.87	30
21	0.00	0.21	-0.03	0.04	0.02	0.00	0.86	30
22	0.00	0.07	-0.03	0.03	0.02	0.00	0.87	30
23	0.02	0.96	-0.01	0.05	0.02	0.00	0.87	30
24	0.01	0.46	-0.02	0.04	0.02	0.00	0.87	30
25	-0.00	-0.11	-0.03	0.03	0.02	0.00	0.87	30
26	0.01	0.55	-0.02	0.03	0.01	0.00	0.87	30
27	0.03	2.08	0.00	0.05	0.01	0.00	0.89	30
28	0.04	2.85	0.01	0.06	0.01	0.00	0.90	30
29	0.03	3.03	0.01	0.05	0.01	0.00	0.90	30
30	0.03	3.11	0.02	0.05	0.01	0.00	0.91	30
31	0.03	3.03	0.01	0.05	0.01	0.00	0.91	30
32	0.04	3.54	0.02	0.06	0.01	0.00	0.90	30
33	0.03	1.50	-0.00	0.06	0.02	0.00	0.87	30
34	0.02	0.95	-0.01	0.05	0.02	0.00	0.83	30
35	0.02	0.90	-0.01	0.05	0.02	0.00	0.84	30
36	0.02	1.10	-0.01	0.04	0.02	0.00	0.84	30
37	0.02	1.48	-0.00	0.05	0.01	0.00	0.84	30
38	0.03	2.36	0.01	0.05	0.01	0.00	0.85	30

Table B.8: **Rolling regressions - UNITARYHIS and WBC**

model	*beta*	*t*	*ci(low)*	*ci(upp)*	*sd*	*var*	*r2*	*obs*
1	-0.01	-0.48	-0.03	0.01	0.01	0.00	0.69	45
2	-0.00	-0.30	-0.02	0.02	0.01	0.00	0.68	45
3	-0.01	-0.49	-0.03	0.02	0.01	0.00	0.68	45
4	-0.01	-0.94	-0.03	0.01	0.01	0.00	0.68	45
5	-0.01	-1.08	-0.04	0.01	0.01	0.00	0.65	45
6	-0.02	-1.60	-0.04	0.00	0.01	0.00	0.68	45
7	-0.03	-2.15	-0.05	-0.01	0.01	0.00	0.69	45
8	-0.03	-2.39	-0.06	-0.01	0.01	0.00	0.70	45
9	-0.03	-2.19	-0.05	-0.01	0.01	0.00	0.63	45
10	-0.04	-2.69	-0.06	-0.01	0.01	0.00	0.65	45
11	-0.03	-2.07	-0.05	-0.00	0.01	0.00	0.59	45
12	-0.02	-1.71	-0.05	0.00	0.01	0.00	0.60	45
13	-0.03	-2.41	-0.05	-0.01	0.01	0.00	0.63	45
14	-0.01	-0.53	-0.03	0.02	0.02	0.00	0.56	45
15	-0.02	-0.92	-0.05	0.01	0.02	0.00	0.55	45
16	-0.02	-0.95	-0.04	0.01	0.02	0.00	0.55	45
17	-0.03	-1.87	-0.05	-0.00	0.01	0.00	0.57	45
18	-0.02	-1.96	-0.05	-0.00	0.01	0.00	0.58	45
19	-0.03	-2.39	-0.05	-0.01	0.01	0.00	0.58	45
20	-0.02	-2.00	-0.04	-0.00	0.01	0.00	0.51	45
21	-0.01	-1.38	-0.03	0.00	0.01	0.00	0.53	45
22	-0.01	-1.22	-0.03	0.00	0.01	0.00	0.55	45
23	-0.01	-1.64	-0.03	0.00	0.01	0.00	0.59	45
24	-0.01	-0.72	-0.02	0.01	0.01	0.00	0.61	45
25	-0.01	-0.97	-0.02	0.01	0.01	0.00	0.65	45
26	-0.01	-0.91	-0.02	0.01	0.01	0.00	0.67	45
27	-0.01	-1.11	-0.02	0.00	0.01	0.00	0.67	45
28	-0.01	-0.79	-0.02	0.01	0.01	0.00	0.69	45
29	0.00	0.09	-0.01	0.01	0.01	0.00	0.66	45
30	-0.00	-0.18	-0.01	0.01	0.01	0.00	0.65	45
31	-0.00	-0.12	-0.01	0.01	0.01	0.00	0.66	45
32	-0.00	-0.14	-0.01	0.01	0.01	0.00	0.67	45
33	-0.00	-0.58	-0.01	0.01	0.01	0.00	0.67	45
34	-0.00	-0.07	-0.01	0.01	0.01	0.00	0.66	45
35	-0.00	-0.09	-0.01	0.01	0.01	0.00	0.67	45
36	-0.00	-0.61	-0.01	0.01	0.01	0.00	0.66	45
37	-0.00	-0.58	-0.01	0.01	0.01	0.00	0.65	45
38	-0.00	-0.49	-0.01	0.01	0.01	0.00	0.66	45
39	-0.00	-0.04	-0.01	0.01	0.01	0.00	0.65	45
40	0.00	0.02	-0.01	0.01	0.01	0.00	0.64	45
41	-0.00	-0.11	-0.01	0.01	0.00	0.00	0.64	45
42	0.00	0.32	-0.01	0.01	0.01	0.00	0.62	45
43	0.00	0.15	-0.01	0.01	0.01	0.00	0.61	45
44	-0.00	-0.00	-0.01	0.01	0.01	0.00	0.64	45
45	0.00	0.21	-0.01	0.01	0.01	0.00	0.66	45
46	0.00	0.23	-0.01	0.01	0.01	0.00	0.66	45
47	0.00	0.60	-0.00	0.01	0.00	0.00	0.69	45
48	0.00	1.12	-0.00	0.01	0.00	0.00	0.73	45
49	0.00	1.10	-0.00	0.01	0.00	0.00	0.73	45
50	0.00	0.97	-0.00	0.01	0.00	0.00	0.74	45
51	0.00	1.12	-0.00	0.01	0.00	0.00	0.76	45
52	0.01	2.22	0.00	0.01	0.00	0.00	0.81	45
53	0.01	2.42	0.00	0.01	0.00	0.00	0.82	45
54	0.01	2.32	0.00	0.01	0.00	0.00	0.81	45
55	0.01	2.37	0.00	0.01	0.00	0.00	0.81	45
56	0.01	2.50	0.00	0.02	0.00	0.00	0.82	45
57	0.01	2.69	0.00	0.02	0.00	0.00	0.83	45
58	0.01	3.06	0.00	0.02	0.00	0.00	0.83	45
59	0.02	4.59	0.01	0.02	0.00	0.00	0.85	45

B.2 Additional graphs

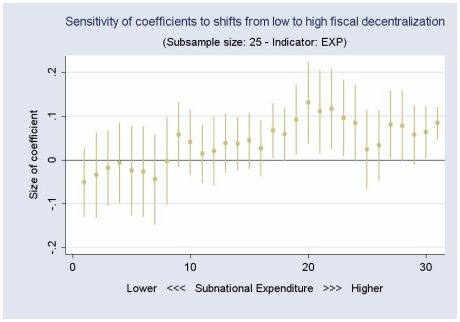

Figure B.1: **Rolling regression for** *exp* **and** *cpi*

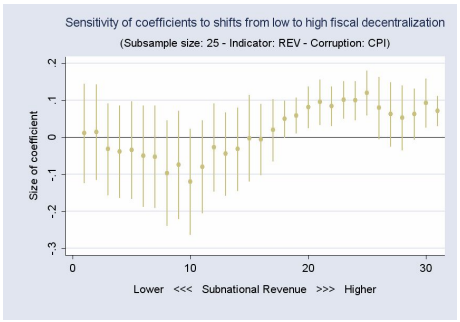

Figure B.2: **Rolling regression for** *rev* **and** *cpi*

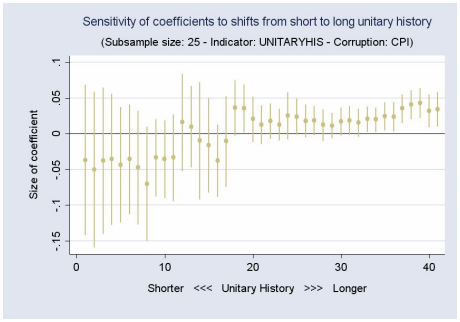

Figure B.3: **Rolling regression for** *unitaryhis* **and** *cpi*

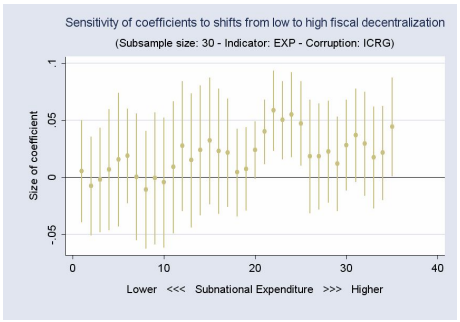

Figure B.4: **Rolling regression for** *exp* **and** *icrg*

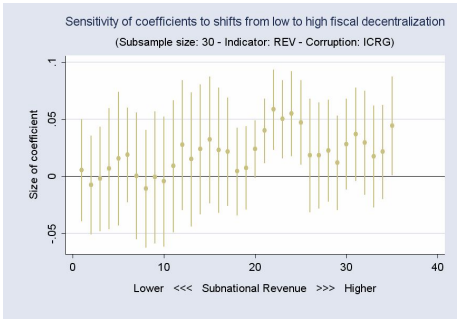

Figure B.5: **Rolling regression for** *rev* **and** *icrg*

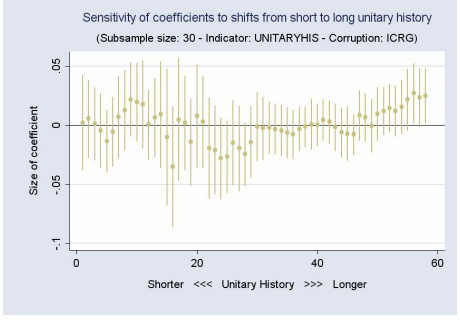

Figure B.6: **Rolling regression for** *unitaryhis* **and** *icrg*