Silje Aslaksen

On the Economics of Natural Resources and Institutions

Thesis for the degree philosophiae doctor

Trondheim, September 2007

Norwegian University of Science and Technology
Faculty of Social Sciences and Technology Management
Department of Economics

NTNU
Innovation and Creativity

NTNU
Norwegian University of Science and Technology

Thesis for the degree philosophiae doctor

Faculty of Social Sciences and Technology Management
Department of Economics

ISBN 978-82-471-3750-5 (printed version)
ISBN 978-82-471-3764-2 (electronic version)
ISSN 1503-8181

Doctoral theses at NTNU, 2007:171

Printed by NTNU-trykk

Preface

This thesis consists of an introductory chapter and four essays. The essay in Chapter 2 is joint work with my supervisor, Ragnar Torvik (Norwegian University of Science and Technology), and the essay in Chapter 3 is joint work with Jørgen Juel Andersen (Norwegian University of Science and Technology). The essay in Chapter 2, entitled A Theory of Civil Conflict and Democracy in Rentier States has been published in *Scandinavian Journal of Economics*.

Acknowledgements

I am deeply indebted to Ragnar Torvik for the guidance, encouragement, inspiration and support he provided throughout the completion of this work. I've learnt a lot from discussions with him during the four years of my PhD. I am also grateful to my colleagues at the Department of Economics at NTNU for helpful comments at seminars and for providing a stimulating working environment. I especially want to thank Bjarne Strøm, for taking the time to guide me in econometric matters. I have benefited and appreciated working with Jørgen Juel Andresen, who is the co-author of one of the essays. I am also grateful for the effective and rapid help with all practical matters that I have received from Gerd Helene Holm, and Øystein Røkke at the Department.

During Fall and Spring of 2004, I had the privilege to visit the Economics Department at University of California, Berkeley. I benefited a lot from participating in the arrangements at Berkeley, in particular the weekly Development Workshop and the weekly Development Seminars. I am grateful for being allowed to participate in this excellent research environment, and I want to thank Professor Edward Miguel for being my contact person at Berkeley.

I would also like to thank my family and friends for their support and encouragement along the way. Finally, I would like to express my gratitude to my boyfriend, Snorre, for his patience and support.

Trondheim, June 2007,

Silje Aslaksen

Contents

Chapter 1
Introduction and Summary

1.1 Introduction

Parts of the world have been blessed with plentiful natural resources. Paradoxically, such resource-rich countries underperform along several dimensions, a phenomenon that is often known as the resource curse. The term often refer to the fact that resource-rich countries have had disappointing economic performance the last decades. Resource-rich countries experience an increase in income at the time of the resource discovery, and thus the economy might benefit in the short run. Often, natural resources create a false sense of security and make people loose sight of the need for prudent and growth-promoting strategies. Governments misuse the resource revenues and do not exercise care when planning economic policies and opportunistic behavior often lead to the implementation of politics that directly harm the economy. King Faisal of Saudi Arabia once said of his country that the way resource rents are being wasted; they would soon end up riding camels again instead of Cadillacs (Papyrakis, 2006). For several reasons, resource-rich economies often find themselves much worse-off in terms of income growth and institutional quality in the long run. Diamond mines and vast oil reserves do not necessarily guarantee a high level of economic prosperity on the contrary they might inhibit it.

Recent empirical evidence and theoretical work provide strong support for the hypothesis that natural resource tends to impede rather than promote economic growth (Auty, 2000, 2001; Boschini et al., 2004; Gylfason et al. 1999; Leite and Widmann 1999; Mehlum et al. 2006; Sachs and Warner 1995, 1997a, 1997b 1999, 2001). Also, an increasing literature, theoretical and empirical, argues that natural resource income damage or hinders the development of institutions (Ades and Di Tella 1999; Bulte and Damania 2005; Isham et al. 2005; Jensen and Wantechekon 2004; Leite and Widmann 1999; Murshed 2003; Ross 2001; Sala-i-Martin and Subramanian 2003). In general, resource-dependent economies have not benefited from extracting and exporting their resource wealth. This said, the resource curse hypothesis is not an economic law without exceptions. Wright (1990) argues that the industrial expansion of the U.S. at the beginning of the 20th century was supported to a large extent by the discoveries of minerals, and Sachs and Warner (1999) argue that Ecuador benefited from its oil boom between 1972 and 1986. More recently, Norway, the worlds third largest oil exporter, manages to convert its resource wealth into economic prosperity showing no symptoms of stagnation, and Botswana, Canada and Australia are all rich in natural resources but do not lag behind in growth (Mehlum et al., 2006). This naturally raises the question of what determines whether or not a country escapes the resource curse. Why do the majority of resource-dependent countries lag behind in terms of income growth and welfare compared to their resource-poor counterparts? And what explains the diverging experience of countries rich in natural resources? These questions are at the heart of the resource curse.

The aim of this thesis is to contribute to the understanding of the interplay between different aspects of institutions and resource abundance. Institutional differences include quality differences (e.g. level of democracy, corruption, rule of law and conflict) and differences in institutional design (e.g. electoral rules, rules for legislation, size of voting districts and degree of federalism). The thesis looks at both the quality and design of institutions, and their interplay with natural resources. Chapter 2 aims at increasing our understanding of the relationship between natural resource income and conflict vs. democracy. Chapter 3 explains the diverging experience between countries rich in natural resources by constitutional differences. The emphasis in Chapter 4 and Chapter 5 is given on testing the validity of existing hypothesis (oil increases corruption and oil hinders democracy) and evaluating their importance.

1.2 Summary of the Essays

Chapter 2: A Theory of Civil Conflict and Democracy in Rentier States

The effects of resource rents on the political equilibrium have been studied in two main types of models. The first tradition employs models of conflict, and studies how resource rents affect the intensity and duration of civil conflict. The second tradition employs political economy models, where resource rents affect the political equilibrium because the costs and benefits of buying votes change. Although providing much insight, these traditions have little to say about when democracy emerges, and about when conflict emerges. In many cases, the actors that may run in an election are those that may alternatively engage in civil conflict. Examples include UNITA and MPLA in Angola, FRELIMO and RENAMO in Mozambique, and ZANU and ZAPU after the 1980 independence in Zimbabwe, La Violencia between the Liberal and Conservative parties in Colombia 1946-1963, and many more. While there are many well-articulated models of conflict and resource rents on one hand, and models of politics and resource rents on the other, even a basic theory of how the choice between democracy and conflict endogenously depends on resource rents has not been developed. This chapter attempts to address this theoretical deficiency by suggesting a simple framework that integrates these established model traditions, and allows politicians to choose endogenously the type of regime that is in their own interest. By integrating the earlier model traditions, this chapter suggest the simplest possible framework one can think of to study the choice between conflict and democracy. It demonstrates how factors such as resource rents, the extent of electoral competition, and productivity affect economic and political equilibria.

Chapter 3: Constitutions and the Resource Curse

Recent contributions to the political economy literature demonstrate systematic effects of constitutional features, such as the electoral rules and the rules for legislation, on a wide range of economic policy outcomes (e.g., Persson and Tabellini, 2003, 2004). This chapter argues that if economic policies are determined by the constitutional arrangements we might expect countries with different constitutional arrangements to react differently to income from natural resources. Exploiting the fact that natural resources are randomly distributed among countries provides us with a quasi-natural experiment designed to measure and compare differences in performance among countries with different types of constitutions. Using a cross-country sample of up to 90 countries from all continents, we empirically investigate whether constitutional features affect how natural resource abundance affects economic growth. By including democracies as well as non-democratic regimes in the sample, we can separate the effects of democracy as such, from the effects of constitutional form. We find strong evidence in favour of the hypothesis that constitutions matter for the resource curse. This chapter argues that (i) the so-called 'resource curse' is present in democratic presidential countries but not in democratic parliamentary countries, (ii) being parliamentary or presidential matters more for the growth effects of natural resources than being democratic or autocratic, and (iii) natural resources are more likely to reduce growth when proportional electoral systems are in place than when the electoral systems are majoritarian.

Chapter 4: Corruption and Oil: Evidence from Panel Data

The past decade has seen an exponential growth in cross-country studies on corruption. Some of these studies argue that issues of corruption may be particularly relevant in the context of natural resource abundance, as natural resource exploration is an extremely high rent activity likely to foster rent-seeking behavior (e.g. Sala-i-Martin and Subramanian 2003; Isham et al., 2005; Ades and Di Tella, 1999; Leite and Weidmann, 1999). However the existing cross-country literature suffers from omitted variable bias. Chapter 4 re-examines the effect of oil abundance on corruption using panel data as well as new measures of resource endowments. The contribution of this essay is the use of natural resource variables that are (at least partly) unrelated to export structure and GDP, and the use of panel estimation to deal with the possibility of omitted variables. One concern is that earlier results reflect the influence of variables not included in the regressions that affect both corruption and resource abundance. This chapter deals with this by controlling for country and time fixed effects in panel regressions covering the period 1982-1997 for up to 118 countries. Both cross country estimation, and panel fixed-effects estimation indicate that oil extraction is associated with more corruption in government.

Chapter 5: Oil, Democracy and Country Fixed Effects

It is widely thought that resource wealth, especially oil, is a curse for democracy (e.g. Ross, 2001; Jensen and Wantechekon, 2004). Existing literature looks mainly at the cross-sectional correlation between resource income and democracy rather than at the within variation. Hence existing inference may be potentially driven by omitted factors influencing both the oil abundance measure and democracy in the long run. Two of the most robust determinants of democracy per capita

GDP and schooling found by Barro (1999), have recently been put into doubt. Acemoglu et al. (2004) and Acemoglu et al. (2005) find little support for the hypothesis that income or education causes democracy, when country fixed effects are included. If insights regarding income level and education have been found to change when country fixed effects are included, perhaps it is necessary to put the insights regarding oil and democracy to a similar test. The question we should ask is whether a given country (with its other characteristics held constant) is more likely to become less democratic as it becomes richer in oil. This chapter argues that the answer to this question is yes. Using a system GMM approach, Chapter 5 shows that the cross-sectional relationship between oil and democracy persist when country and time effects are included, taking into account the persistency of some of the variables.

1.3 Discussion and Future Research Agendas

More than ten years after the seminal paper by Sachs and Warner (1995) on resource abundance and economic growth, much research has been undertaken at a theoretical and empirical level. Clearly the whole issue of what explains the resource curse and what determines whether resources are a curse or a blessing is rather complex and the thesis is not meant to be exhaustive in illuminating all aspects of the phenomenon. But the overall message from this thesis is that institutions are at the heart of the resource curse—resource wealth determines institutional outcomes, and institutional characteristics can help explain observed differences of countries rich in natural resources. That said, there are several remaining research questions that can potentially help us further in understanding the resource curse hypothesis.

It is of particular interest to examine the evolution of the resource impact on institutional quality and income over time. Due to data limitations, it is challenging to examine whether the resource curse is a recent phenomenon of the last four decades, or if the resource curse has existed longer than that. Exploiting information on the timing of oil discoveries might help us getting closer to answering this question.

Although the effects of constitutional variation on the resource experience (Chapter 3) seem fairly robust, there is always the concern of omitted variables in cross-country regressions. Regarding electoral rules and form of government, there is not enough constitutional time variation to make meaningful estimates from fixed effect. Future empirical research should try to solve this issue by focusing on different constitutional aspects (e.g. the degree of independence of the judiciary, the types of constitutional rights granted, bicameralism, agenda setting power, etc) where there is more variation across time. Also, the underlying mechanisms of the interplay between resource abundance and constitutions are unclear and require future research. In particular, theory should be developed to distinguish different potential interactions between natural resource abundance and different dimensions of a country's political institution.

Several econometric problems remain in the resource curse literature. We do not yet have a good instrument for resource endowments, and the causal effect of resource income on e.g. growth or institutions, is not yet established. Controlling for country fixed effects is an improvement compared to relying on simple cross-sectional variation, but there should be no presumption that fixed effects regressions will necessarily estimate causal effects. Using exogenous variation in commodity prizes over time might help us overcome some of the endogoneity problems that still exist in the literature.

The findings that resource income hinders democracy and increase corruption is no good news for developing countries, and it might be stultifying for policymakers. It is hard to imagine how a policymaker interesting in improving democracy or fighting corruption can change what is identified as one possible cause of inferior institutions. What the literature on the resource curse is lacking is constructive policy advises of how to best manage resources to avoid suffering institution breakdown. The literature on natural resources and institutions has been mostly concerned with identifying reduced form effects, and less concerned with policy advices.

References

Acemoglu, D., S. Johnson, J.A. Robinson and P. Yared (2004), “Income and Democracy”

Acemoglu, D., S. Johnson, J.A. Robinson and P. Yared (2005), “From Education to Democracy?” *American Economic Review Papers and Proceedings* 95, pp. 44-49.

Ades, A. and R. Di Tella (1999), “Rents, Competition and Corruption”. *American Economic Review* 89(4): pp. 982-993

Auty, R.M. (2000), “How natural resources affect economic development”. *Development Policy Review* 18, pp. 347-364.

Auty, R.M. (2001), *Resource Abundance and Economic Development,* Oxford University Press, Oxford.

Barro, R. J. (1999), “Determinants of Democracy” *Journal of Political Economy* 107, pp.158-183.

Bulte, E. H. and R. Damania (2005), “Resource Intensity, Institutions, and Development”. *World Development* 33(7): pp. 1029-1044.

Boschini, A.D., J. Pettersson, and J. Roine (2004), “Resource Curse or Not: A Question of Appropriability”, Working Paper, Department of Economics, Stockholm University.

Gylfason, T., T. T. Herbertsson, and G. Zoega (1999), “A mixed blessing: natural resources and economic growth”. *Macroeconomic Dynamics* 3, pp. 204-225.

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

Jensen, N. and L. Wantchekon (2004), “Resource Wealth and Political Regimes in Africa”. *Comparative Political Studies* 37(7) pp. 816-841.

Leite, C and J. Weidmann (1999), “Does mother nature corrupt? Natural resources, corruption, and economic growth” IMF Working Paper No.99/85.

Mehlum, H., K.O. Moene and R. Torvik (2006), “Institutions and the Resource Curse”. *The Economic Journal* 116, pp. 1-20.

Murshed, M. (2003), “When does natural resource abundance lead to a resource curse?” Mimeo, Institute of Social Studies, The Hague

Papyrakis, E. (2006), *The Political Economy of King Midas. Resource Abundance and Economic Growth.* Doctoral thesis Vrije University. Netherlands.

Persson, T. and G. Tabellini (2003), *The Economic Effects of Constitutions: What Do the Data Say?*, MIT Press, Cambridge MA.

Persson, T. and G. Tabellini (2004), "Constitutional Rules and Fiscal Policy Outcomes". *American Economic Review* 94, pp. 25-45.

Ross, M. L. (2001), "Does oil hinder democracy?", *World Politics* 53, pp. 325-361.

Sachs, J.D. and A.M. Warner (1995), "Natural Resource Abundance and Economic Growth", NBER Working Paper No. 5398.

Sachs, J.D. and A.M. Warner (1997a), "Natural Resource Abundance and Economic Growth". revised version, Mimeo, Harvard University.

Sachs, J.D. and A.M. Warner (1997b), "Sources of Slow Growth in African Economies". *Journal of African Economies* 6, pp. 335-376.

Sachs, J.D. and A.M. Warner (1999), "The Big Push, Natural Resource Booms and Growth". *Journal of Development Economics* 59, pp. 43-76.

Sachs, J.D. and A.M. Warner (2001), "The Curse of Natural Resources". *European Economic Review* 45, pp. 827-838.

Sala-i-Martin, X. and A. Subramanian (2003), "Addressing the Natural Resource Curse: An Illustration from Nigeria". NBER Working Paper 9804 (June).

Wright, G. (1990), "The origins of American industrial success, 1789-1940". *American Economic Review* 80, pp. 651-668.

Chapter 2
A Theory of Civil Conflict and Democracy in Rentier States

Paper 1 is not included due to copyright.

CHAPTER 3
CONSTITUTIONS AND THE RESOURCE CURSE

Constitutions and the Resource Curse[1]

Jørgen Juel Andersen
Norwegian University of Science and Technology, N-7491, Trondheim, Norway
jorgen.juel.andersen@svt.ntnu.no

Silje Aslaksen
Norwegian University of Science and Technology, N-7491, Trondheim, Norway
silje.aslaksen@svt.ntnu.no

Abstract

Utilizing the fact that natural resources are randomly distributed among countries, we investigate how public income shocks have different long run economic effects dependent on constitutional arrangements. We find that (i) the so-called 'resource curse' is present in democratic presidential countries—but not in democratic parliamentary countries, (ii) being parliamentary or presidential matters more for the growth effects of natural resources than being democratic or autocratic, and (iii) natural resources are more likely to reduce growth when proportional electoral systems are in place than when the electoral systems are majoritarian. The two first effects is shown to be very robust, the last effect less so.

Keywords: *Growth, Political economy. Constitution. Resource curse. Institutions.*

JEL: *E61, F43, O13, P51, Q32*

1. Introduction

Recent contributions to the political economy literature demonstrate systematic effects of constitutional features, such as the electoral rules and the rules for legislation, on a

[1] We thank two anonymous referees and Co-Editor Lant Pritchett in JDE, Ragnar Torvik, Egil Matsen and Kjetil Storesletten for valuable comments. In addition, we are grateful to participants in seminars at NTNU (Trondheim), UiO (Oslo), NHH (Bergen) and EEA/ESEM (Vienna). Finally we thank Jeffrey Sachs, Andrew Warner and Romain Wacziarg for providing us with data.

wide range of economic policy outcomes (see, e.g., Persson and Tabellini, henceforth PT, 2003). Causal effects of constitutions on policies that are important for long run economic performance have been harder to identify, and there are no evidence in the literature of *direct* long run effects of constitutions.[2] We suggest an indirect, reduced form approach to test the long term effects of constitutional arrangements. Exploiting the fact that natural resources are randomly distributed among countries provides us with a quasi-natural experiment designed to measure and compare differences in performance among countries with different types of constitutions. We argue that if economic policies are determined by the constitutional arrangements we might expect countries with different constitutional arrangements to react differently to exogenously determined income shocks.

Using a cross-country sample of up to 90 countries from all continents, we empirically investigate whether the constitutional features affect how natural resource abundance affects economic growth. By including democracies as well as nondemocratic regimes in the sample, we can separate the effects of democracy as such, from the effects of constitutional form. We find strong evidence in favour of the hypothesis that constitutions matter for the resource curse. The main point we make in this paper is illustrated in Figure 1 and Figure 2 below. Figure 1and 2, indicate that presidential regimes suffer from the resource curse but parliamentary regimes do not. In fact, we find that the overall resource curse identified by Sachs and Warner (1995, 1997a, 1997b, 2001), henceforth SW, is mainly driven by presidential countries and nondemocratic regimes.[3] In fact, the particular forms of democracy matter even more than democratic rule in itself.

[Figure 1 and 2]

The patterns in Figure 1 and 2 survives a number of robustness checks, such as different sample selections (e.g., inclusion/exclusion of non-democracies in the sample), inclusion of geographical and colonial dummies, robust estimation procedures, inference from different growth periods, using different model specifications, using different variables for resource abundance and using instrumental variable methods. In the IV-estimation, we follow Persson (2005) and use settler mortality to instrument for constitutional form. Regarding electoral rules, we find suggestive evidence that countries with a proportional electoral formula are more prone to the resource curse than are countries with a majoritarian voting rule.

We proceed as follows. In section 2 we briefly discuss the main findings of the literature on the economic effects of constitutions. This discussion will provide the basis for the hypotheses we take to the data. After these preliminaries, we formulate an empirical growth model in section 3. The empirical results are presented and discussed in section 4. Finally, in section 5, we sum up and conclude.

[2]Using within-country variation and instrumenting for constitutional features, Persson (2005) shows that reforms from non-democracy or presidential democracy into parliamentary democracy leads to more growth promoting trade and regulation policies. In turn, better "structural policies" has been shown to lead to higher long term growth (Hall and Jones, 1999; Acemoglu et al., 2001; replicated by Persson, 2005). The term "structural policies" in the literature of Persson and Tabellini (PT, 2003; Persson 2005) loosely corresponds to what Acemoglu et al., 2001 refer to as "economic institutions" e.g., trade and regulation policies. See Persson (2005) for a further discussion.

[3]In some regressions, we include exactly the same countries as SW (1995, 1997a), in order to compare our results with those of the previous literature.

2. Natural resource abundance, institutional design and economic performance

The literature on the resource curse seeks explanations to the paradoxical empirical pattern that countries rich in natural resources seem to be outperformed, in the long run, by countries with less, or even no, natural resources (SW, 1995; 1997a; 1997b; 2001).[4] The diverging experience of different countries has lead to an increasing focus on the importance of institutions. Significant interactions effects of institutional quality and natural resource abundance on long-term economic performance have been established. However, using measures of institutional quality, as in Boschini *et al.*, (2004) and in Mehlum *et al.* (2006) is problematic for, at least two reasons. First, institutional performance indicators are likely to be endogenous to growth, resulting in serious econometric problems of simultaneity.[5] Second, it is unclear which aspects of institutional performance that are important for economic growth.[6] We argue that investigating institutional *design*, as opposed to measures of institutional *performance*, is a key to solving some of the problems in the resource curse literature.[7] More importantly, the properties of constitutions provides a foundation for a better understanding of which aspects of institutions that are most essential to growth.

Why would we expect to observe interaction effects between institutional design and natural resource abundance on economic growth? The remainder of this section propose an intuitive and non-technical answer to this question. This will constitute the main motivation of this paper, and provide the basis for the hypothesis that we take to the data.

Constitutional design is an important aspect of a country's institutional arrangements, and defines the formal rules of 'the political game'. Two of the most fundamental sets of rules are the rules for legislation and the electoral rules (PT, 2003). Different rules have been found to translate into different policies. Presidential forms of government should be associated with less rent extraction and lower levels of taxation than parliamentary forms of government (Persson, Roland and Tabellini, 1997, 2000).[8] The fear of govern-

[4]The seminal theoretical literature on the resource curse focuses on the structural mechanisms of the so-called Dutch disease (see, e.g., Matsuyama, 1992; SW, 1999; Torvik, 2001). Subsequently, the rent-seeking approach has gained increased attention (see, e.g., Lane and Tornell, 1996; Tornell and Lane, 1999; Torvik, 2002). In the rent seeking models, economic performance is hurt because rent-seeking behavior implies that productive resources are allocated inefficiently. It now appears that there is little support for the Dutch disease explanation, as it fails explain the diverging experience of different economies (Bulte *et al.*, 2004; Auty, 2001). This critique also applies for the rent-seeking literature, with the exception of Mehlum *et al.* (2006) who show that the effect of natural resources on aggregate production may depend on the quality of institutions. The findings in Mehlum *et al.* (2006) are supported by Boschini *et al.* (2004).

[5]The measures of institutional quality that are applied in the resource curse literature are subjective indicators like Political Risk Services, Corruption Perceptions, and the World Bank Governance Indicators. Such indexes are indeed likely to be endogenous to economic development.

[6]By instrumenting for institutional quality Boschini *et al.*, (2004) propose a way around the first problem. The second problem, however, remains unsolved.

[7]There are several reasons for this. First, the literature on the economic effect of constitutions shows that institutional design is a significant determinant of institutional performance (PT, 2003). Second, institutional designs rarely change, a property that political scientists often refer to as an "iron law". This property of inertia is useful because it provides the analysis with a source of cross-country variation that is less sensitive to economic performance.

[8]In Persson, Roland and Tabellini (1997, 2000), the distinction between these forms of government centers on the rules for legislative bargaining. The bargaining between different legislative coalitions, inherent in

ment crises in parliamentary regimes creates strong incentives to maintain party discipline and induce the government to pursue the joint interests of it's voters, and thus create broad spending programs (Persson, Roland and Tabellini, 2000; Shugart and Carey, 1992; Huber, 1996). Presidential regimes, not being constrained by a confidence requirement, promote the allocation of spending to target powerful minorities within the constituencies of powerful officeholders, at the expense of broad spending programs.[9] Majority voting, combining small voting districts with plurality rule, tends to favor narrow spending programs, and are often associated with smaller overall government spending and taxes (PT, 2003).[10]

Persson (2005) argues that since constitutions do shape fiscal policy and other economic and institutional features, they are likely to be reflected also in the structural policies fostering economic development, such as regulations to preserve property rights and non-protectionistic trade policies. Hence, the specific political arrangements—the form of democracy, rather than democracy *per se*—may be one of the missing links between history, current policy and economic development. If structural policies are important for economic development, one would expect these regulations to be more conductive to growth when they apply to broad population groups rather than to small privileged groups. Persson's analysis suggests that introducing parliamentary democracy in a previously nondemocratic regime or, equivalently, in a presidential democracy, improves structural policy so as to raise long-run productivity by almost 50%. At a minimum, these estimates indicate that constitutional rules are systematically correlated with structural policies.

In addition, a growing body of literature investigates the relationship between constitutional arrangements and corruption. Gerring and Thacker (2004) examine the impact of territorial sovereignty (unitary or federal) and the composition of the executive (parliamentary or presidential) on levels of perceived political corruption. They find evidence indicating that parliamentary forms of government help reduce corruption. Kunicova and Rose-Ackerman (2005) show that proportional representation (PR) systems are more susceptible to corrupt political rent seeking than are plurality systems. They also examine the interaction between electoral rules and presidentialism, and find that PR systems, particularly when combined with presidentialism, are associated with higher levels of corrupt political rent seeking. Their results confirm PT's basic findings that proportional elections are associated with higher corruption levels, but contradict PT's findings on presidential systems.

Given these findings, it is reasonable to ask whether similar patterns can be found for

---

parliamentary democracies, is disciplined by the threat of a government crisis. As such a crisis would result in the loss of valuable agenda-setting powers for the government, party discipline and stable legislative coalitions are promoted. In a presidential system, the executive cannot be brought down by the legislator, but is directly accountable to the voters. Thus, legislators have weaker incentives to stick together and vote on party or coalition lines. These differences create larger overall and broader spending programs in parliamentary regimes compared to presidential regimes.

[9] There is much more to the dynamics of this class of models than we have space for in this paper; PT (2000, 2003) provide a detailed review of the literature of the economic effects of constitutions. PT (2003) also present extensive empirical research on whether the theoretical predictions of the political economy literature are supported by the data. For a brief overview of this literature's main predictions and findings, see Persson (2002).

[10] In Milesi-Ferretti *et.al.*, (2002) the reason for this association is a smaller district size, whereas in Austen-Smith (2000) the reason is plurality rule.

the growth effect of the resource endowment. If the form of government and the electoral system shape a country's structural policies and level of corruption, it is plausible that the same constitutional features also affect the way countries respond to resource windfalls. A country's resource endowment has important implications for politicians' opportunities to design policy. A larger government budget provides politicians with more resources which can be used to influence the outcome of elections. More resources also raise the value of being in power, which in turn amplifies the political incentives to distribute resources and political favors in an inefficient manner.

Mehlum *et al.* (2006) assert that the variance in growth performance of resource-rich countries is primarily a result of how resource rents are distributed through institutional arrangements. Given that different forms of government create different incentives for distributing political favors, one would expect countries with different constitutions to respond differently to resource booms. Based on the insights from the theoretical literature (that presidential systems favour powerful minorities and that structural programs in parliamentary systems targets broader measures), and based on empirical evidence (supporting the theoretical predictions of the constitutions literature, and providing evidence of less corruption in parliamentary democracies), we would expect resource abundance to be less damaging for long run economic performance in parliamentary democracies than in presidential democracies. The subsequent sections provide evidence that this indeed seems to be the case. In addition, we provide suggestive evidence indicating that electoral systems matter. Natural resources are more likely to reduce growth under proportional electoral rules than under majoritarian rules.[11]

3. Data and Econometric Model

We construct two data sets based on different data sources, one covering the period 1970–1990, the second covering the period 1990–2000. Our 1970–1990 data set includes information on 90 countries.[12] In this data set countries are classified as democratic or nondemocratic regimes on the basis of the definition used by PT (2003). Countries with an average value of less than 5 for the Gastil Index for the period 1972–1990 (corresponding to "partly free", according to the Freedom House) are treated as democracies.[13]

We further separate our democracies into presidential democracies and parliamentary democracies, and into majoritarian and proportional electoral systems. Our constitutional variables are primarily borrowed from PT (2003) and Persson (2005). PT (2003) classify regimes as presidential if the confidence of the assembly is not needed for the executive to stay in power (even if an elected president is not the chief executive, or if there is no

[11]This last effect may suggest that the negative effects of proportional electoral rules on the level of corruption found by Kunicova and Rose-Ackerman (2005) dominate the prospective positive effects of favoring representativeness (as opposed to the accountability, and hence the narrow spending programs, of majoritarian systems) when interacted with resource abundance.

[12]These are the countries included in SW's (1997a) main sample, with the exception of Hong Kong which is not classified in the Gastil Index (a democracy index) for the whole sample period (1970-1990).

[13]For a precise definition, consult: <http://www.freedomhouse.org/research/freeworld/2000/>. Note, however, that all our main findings are robust to a narrower categorization (i.e., when countries with a Gastil Index of < 3.5 are treated as democracies), although this respecification reduces the number of democracies in the sample. Thus, the democracy threshold is not critical for our main results.

elected president). On the basis of this definition, most semipresidential and premier-presidential systems are classified as parliamentary regimes. PT (2003) classify regimes as majoritarian if all of the lower house is elected under plurality rule. Only legislative elections (for the lower house) are considered. Persson (2005) lists reform episodes—that is, exits from and entries into different forms of democracy—for the period 1962-1998. We combine these two sources in order to classify countries according to their form of government and electoral system in 1970.[14]

Our 1990–2000 data set includes information on 61 democracies.[15] This data set is also separated into presidential regimes and parliamentary regimes, and into majoritarian and proportional electoral systems. Our constitutional variables are identical to PT's (2003) classification.[16]

To compare our findings with the influential contributions of SW, and in particular SW (1995,1997a), we mainly use their model specification and control variables. SW (2001) show that their previous results (1995, 1997a) are robust to conditioning on previous growth rates rather than levels. For simplicity, we condition on initial levels in our specifications. Thus, we expect average (log of) economic growth in country i, between time $t = 0$ and $t = T$ (in this case 1970–1990 or 1990–2000), $\frac{1}{t}\left(y_T^i - y_0^i\right)$, to be determined to (the log of) initial income, y_0^i, and a vector of country specific structural characteristics, Z^i, as follows.

$$\frac{1}{t}\left(y_T^i - y_0^i\right) = \alpha_0 + \alpha_1 y_0^i + \mathbf{Z^i}\beta + u_i \tag{1}$$

SW (1995, 1997a) suggest that that initial natural resource abundance should be included in Z^i. Given the recent contributions in the political economy literature relating structural (growth promoting) policies to different constitutional arrangements, we investigate whether constitutional features are incorporated in Z^ias well. More importantly, however, we check whether there are any interaction effects between constitutional arrangements and natural resource abundance. If constitutional arrangements affect structural policies, as predicted by the political economy literature, and structural policies matter for how countries deal with natural resource wealth, one would expect to observe such interaction effects in the data. Theory predicts presidential democracies to be associated with worse structural policies, in relation to growth, than parliamentary democracies. Assuming that increased access to resources amplifies political incentives, we expect presidential regimes with abundant natural resources to grow more slowly than resource abundant parliamentary regimes. Hence, in addition to the controls in SW's most robust specifications, we include constitutional dummies and their interaction with natural resource abundance. In particular, we include dummies for the form of government (presidential versus parliamentary) and electoral rules (majoritarian versus proportional electoral system). Finally, we control for geographic location (continent), colonial history, and the most robust significant determinants of growth according to Sala-i-Martin

[14]See Appendix A.1 - A.4 for details.

[15]To define democracy in the 1990–2000 data set, we rely on PT (2003). PT (2003) include a country as democracy if the GASTIL score is lower than an average of 5 for the 1990–1998 period. This rule permits 85 countries to be classified as democracies in PT (2003). We are able to utilize 61 out of these 85 countries due missing data on some of the relevant variables.

[16]See PT (2003) for a precise definition.

(1997). In the 1990–2000 data set we construct variables using the same definitions as SW (1997a), but for different time periods.

4. Results

4.1 The form of government

The group of parliamentary democracies comprises 33 countries, two of which are in the top 10 percent of natural resource abundant countries and six of which are in the bottom 10 percent. The group of presidential democracies comprises 25 countries, two of which are located in the top 10 percent of natural resource abundant countries and two of which are in the bottom 10 percent. In our data set, initial resource abundance—measured as the ratio of primary exports to GNI in 1970—ranges from 0.6% to 54%. We find all regime types represented among both resource rich countries and resource poor countries. Among the one-third of the countries with the most abundant natural resources, there are 6 parliamentary democracies, 9 presidential democracies and 15 nondemocratic regimes. Among the one-third of the countries least abundant in natural resources, there are 18 parliamentary democracies, 7 presidential democracies and 5 nondemocratic regimes. In the middle group, we find 9 parliamentary democracies, 9 presidential democracies and 12 nondemocratic regimes. Thus, there seems to be sufficient variation in resource abundance among all three categories of countries for statistical inference to be reliable.

To investigate whether the patterns found in Figure 1 and Figure 2 holds when controlling for other factors that have been found to be important for growth, we use alternative model specifications. We begin by replicating the regression results of the main model specification in SW (1997a).[17] Table 1, column (1), replicates the results in SW (1997a), without excluding outliers. Our results are consistent with those of SW regarding both convergence and the effects on growth of openness, the rule of law index, investment and natural resource abundance. On average, countries that where abundant in natural resources in 1970 experienced lower growth in the following two decades, with an estimated coefficient of -8.17 and a t-statistic of -6.71. The cross-country mean of natural resource abundance in our data is 0.13 with a standard deviation of 0.10.[18] The estimates in column (1) imply that a 10 percentage point increase—corresponding to an increase of one standard deviation—in the ratio of exports of natural resources to GNI in 1970 is associated with a reduction in annual average growth the two following decades of 0.82 percentage points (-8.17*0.10 = -0.82).

In column (2), we include dummies for the form of government, with the excluded category being parliamentary democracy. Including controls for the type of government (presidential democracy, parliamentary democracy and nondemocratic regime) does not

[17]SW exclude four outliers when estimating their main model specification. These countries are deemed to be outliers according to the procedure suggested by Belsley et al., (1980). SW identify the four outliers, regressing growth only on initial natural resource abundance and on the average degree of openness between 1970-1990. Note that the same countries will not necessarily be identified as outliers when additional controls for constitutional classification and its interaction with natural resource abundance are included. To estimate different specifications of the model consistently, we address the problem of possible outliers by applying different robust estimation techniques (discussed below).

[18]Thus, on average, about 13 percent of the gross national income (GNI) of the countries in the sample stems from exporting primary products.

change the effects of convergence, openness, rule of law, investment and natural resource abundance. However, presidential democracies are associated with lower growth than are parliamentary democracies. So far, our estimates have added little to SW's findings. Column (3), however, provides new insights into the resource curse. In this regression, we include interaction terms between the form of government and resource abundance. The direct effect of resource abundance is no longer statistically or economically significant. This indicates that there is no significant resource curse in parliamentary democracies (our excluded category). Not surprisingly, nondemocratic regimes abundant in natural resources perform worse than resource abundant parliamentary democracies, with an estimated interaction coefficient of -6.21 and a t-statistic of -1.98. However, more surprisingly, the performance of natural resource abundant presidential democracies is even worse.

Comparing natural resource abundant democracies, presidential democracies perform much worse than parliamentary democracies, with an estimated interaction coefficient of -7.85 and a t-statistic of -2.69. Thus, among presidential democracies and nondemocratic regimes, higher natural resource abundance in 1970 is associated with lower growth in the following two decades, whereas, for parliamentary democracies, higher natural resource abundance in 1970 does not significantly affect subsequent growth. Finally, note that allowing interaction effects eliminate the separate effect of form of government on growth.

It is well known that the SW measure of resource abundance—primary exports divided by GNI—has been criticized for being a measure of resource dependence, or intensity, rather than resource abundance. In addition, one might question whether it is absolute exogenous to growth. While natural resource endowments are randomly distributed among countries, the SW variable captures something broader. First, it measures export rather than absolute quantities. Second, it measures resource abundance relative to the size of the economy. One concern is that economies with institutions not conductive to growth will have lower income, and hence appear resource abundant according to the SW measure. The focus of this paper is not to solve the problem of how to measure natural resources in growth regressions, but to show that different constitutional arrangements can explain some of the heterogeneity in the effect of resource abundance on growth. Nonetheless, to meet this critique, we replicate Table 1 with an alternative resource measure. In Table A2, the resource abundance measure is "cleansed" from its endogenous denominator by multiplying with GNI, and dividing by population. Hence, the new resource measure captures export of primary products per capita (in 1970 current US dollars). The results in Table A2 reveal the same pattern as Table 1, indicating that our results are not driven by economic growth *per se*.[19]

In Table 2, nondemocratic regimes are excluded from the sample. Column (1) exhibits the same qualitative results as in Table 1, regarding convergence, natural resource abundance, openness, investment, the rule of law, and changes in the external terms of trade. This indicates that the negative correlation between resource abundance and growth also applies among democracies. As in Table 1, including controls for the form

[19] We have also used the value of oil per capita as our resource measure. This reveals a similar pattern regarding the effect of natural resources on growth. The effect on growth from having oil, for parliamentary democracies is positive, and the effect is negative for presidential democracies and nondemocracies, but the results are not statistically significant at conventional levels.

of government does not significantly change the estimated effects of any of the other explanatory variables. In column (3), we include interaction terms between the form of government and resource abundance. Again, the direct effect of resource abundance is no longer significant, hence there is no resource curse in parliamentary democracies. Among resource abundant democracies, presidential regimes perform much worse than parliamentary regimes, with a highly significant estimated interaction coefficient of -8.02 (for which the level of significance is 0.7 percent).

One objection to our interpretation of the results, namely that the resource curse seems to be determined by constitutional features, might be that constitutional classifications are merely proxies for geographic location and/or colonial history, which then are the real determinants of the curse. For example, the widespread use of presidentialism in the Americas has led political scientists to dub the Americas as the continent of presidentialism. We investigate this objection by including dummy variables for previous colonial rulers, continent and added interaction terms with resource abundance to see if this can explain the diverging growth performance among resource rich countries. Including these controls indicates that the resource curse occurs regardless of colonial history and location (table not shown). In Table 3, we include additional controls to check whether our previous findings are robust to the inclusion of dummies for previous colonial rule and continent. The patterns evident in Tables 1 and 2 are confirmed. Presidential regimes suffer the most from being rich in natural resources, relative to both parliamentary democracies and nondemocratic regimes.

Throughout the paper, the number of observations are limited by the rule of law index. One could argue that the 73 countries that do not have missing values of the rule of law index in our main regressions are not randomly selected, and that the statistical inference is limited to these countries. In Table A3, we report versions of the main regressions that include the average value of the Gastil Index rather than the rule of law index.[20] This gives us a total sample of 90 countries. As shown in Table A3, replacing the rule of law variable with the average value of the Gastil Index does not significantly affect the qualitative results already obtained. In fact, the estimated interaction coefficients are larger in absolute value in the extended sample. This confirms that there are statistically significant differences in the way different constitutions respond to natural resources.

A potential limitation of OLS estimators in general is that they may be highly influenced by outliers located at leverage points. This limitation applies particularly in small samples. To make sure that our results are not driven by outliers, we reran our regressions by using two alternative estimation methods that are robust to the presence of outliers. First, we used LAD regression, which is a special case of quantile regression, or more specifically, median regression (table not shown).[21] Minimizing the sum of absolute deviations makes the regression less sensitive to outliers than does minimizing the squared deviations. Thus, LAD estimates represent the bulk of the observations better than OLS estimates, particularly in small samples. Second, we used a reweighted least squares technique (table not shown). Reweighted least squares is recommended

[20]The correlation coefficient between the two variables is -0.72, which suggests that there is a reasonably close relationship between democratic and institutional quality. Thus, democratic quality may serve as a (weak) proxy for institutional quality, at least when data on institutional quality is not available.

[21]See, e.g., Greene (2003) for an introduction to LAD estimation and for a small sample Monte Carlo study showing the advantages of LAD estimation over OLS in the presence of outliers.

by Rosseeuw and Leroy (1987), among others. Under this procedure, OLS regression is applied, gross outliers are excluded and, then, observations with large residuals are iteratively downweighted.[22] Outliers are dropped if Cook's distance measure exceeds unity. On this criterion, no outliers were dropped in our regressions. Both estimation procedures suggest that outlying observations do not materially affect our results. The estimated coefficients and their p-values are similar to the OLS estimates. If anything, the effects appear stronger.[23]

In Figure 1, Mauritius and Malaysia appear to be important for the regression line. One might be concerned if the conclusion about the resource curse not being present in parliamentary democracies holds when these two countries are excluded from the regressions. In Table A3 both these countries are included whereas in Table 1, 2 and 3 Mauritius is not included because of missing value on the rule of law variable. When we drop these two potential outliers from Table A3, the coefficient of the direct effect of resource abundance change from -1.76 to -5.89 in column (1) and from -1.88 to -5.82 in column (2). However, the effect remains insignificant at any conventional values. In Figure 2 Guyana appear to be an outlier. Dropping Guyana from the regressions does not change the insight that resource abundant presidential democracies perform worse than resource abundant parliamentary democracies. The estimated interaction coefficient change from -8.32 to -6.28 in column (1) and from -8.41 to -6,70 in column (2), and it remains statistically significant.

Up to this point, our analysis suggests that different regime types generate different growth effects of natural resource abundance. In particular, we have found that parliamentary democracies seem to respond differently to their resource endowments than do other countries. For the whole sample, the variables for initial income, natural resource abundance, openness and the investment rate have the most explanatory power for growth. A related question is whether the effects of these other variables also differ systematically between parliamentary democracies and other regime types.[24] In Table 4, we report the SW growth regression separately for parliamentary democracies and all other countries to investigate whether parliamentary democracies respond differently to the other explanatory variables, or whether the difference is primarily the growth effects of resource abundance. Table 4 shows that the estimated coefficients on the initial income level variable, the openness variable, the investment rate and the rule of law index

[22] This technique corresponds to the *rreg* command in STATA. The actual algorithm may be found in the STATA (2003) manual.

[23] The quantile regression result indicate that the interaction term between *pres* and *resource abundance* is -8.385, whereas the robust regression result indicate an interaction term of -8.637 (both statistically significant at 1%). When only democracies are included, the interaction term ranges from -7.488 (quantile regression) to -6.949 (robust regression), again significant at 1%. When interaction terms are included, the direct effect of resource abundance do not turn out significant in neither the quantile or the robust regressions.

[24] The summary statistics in Table A1 indicate that the three forms of government have different average values for the important determinants of growth. Initial income levels are higher in parliamentary democracies than in the other two regimes. The overall sample mean for this variable is 8.31 with a standard deviation of 0.90. This indicates that the deviation in the regime-type mean is less than one standard deviation of the overall sample mean for all three categories. The measure of natural resource abundance is also lower in parliamentary democracies than in the other two regime types. The overall sample mean of natural resource abundance is 0.13 with a standard deviation of 0.10. Hence, the deviation in the regime-type mean is less than one standard deviation of the overall sample mean for all three categories. Presidential democracies and nondemocratic regimes are less open than parliamentary democracies and the investment rate is lower but, again, the difference from the overall sample mean is less than one standard deviation.

are within the same range when comparing parliamentary regimes to other countries. There is some deviation in the estimated effect of the growth in the external terms of trade. However, the *main difference* is in the estimated coefficient for the measure of natural resource abundance.

4.2 Electoral Rules

We now consider electoral systems. Table 5 reports the same model specification as in Tables 1 and 2, but compares different forms of electoral system. Columns (1) and (3) show that differences between electoral systems—majoritarian democracy, proportional democracy and no democracy—do not matter decisively for growth (note that proportional electoral rule is the excluded category). Majoritarian electoral systems perform better than proportional electoral systems with natural resources. The estimated interaction coefficient is 5.56 and the t-statistic is 1.99. However, majoritarian democracies remain adversely affected by natural resources given that the direct effect exceeds the additional effect of resource abundance, conditional on being a majoritarian democracy. That is, the direct effect of -9.36 and the interaction effect of 5.56 combine to generate a negative effect of -3.80. The same pattern is confirmed by including only democracies. Among democracies, majoritarian electoral systems perform better when there are natural resources, with an estimated interaction coefficient of 8.40, which is significant at the 0.9 percent significance level. As shown in Table 6, including controls for colonial rule and continental location does not change the qualitative results from Table 5.

Again we use LAD estimation and reweighted least squares to check the effect of outliers on the results (tables not shown). The quantile regression results for the full sample indicate that there is no significant difference in the growth effect of resource abundance between different electoral systems. Among democracies, the interaction effect is statistically significant (at 0.3 percent). The robust regressions confirm the pattern found in Table 5, but the estimated interaction coefficient (between majoritarian electoral systems and resource abundance) is lower in magnitude and less significant than the OLS estimates.

4.3 Additional robustness checks

Our results support the primary idea behind the paper, which is that the well-documented systematic effects of constitutions on different measures of economic policy may also extend to growth promoting policies (including measures of economic policy). However, can we interpret the estimates as reflecting a causal mechanism? This requires that the constitutional variables are exogenous with respect to economic performance. Although barely any reforms altering the PT (2003) classification of forms of government have occurred, this might not be sufficient for exogeneity. To deal with potential endogeneity problems, whether they are due to reverse causality and/or omitted variables, we apply an IV approach. As suggested by Persson (2005), we assume that Western colonization affects current policies, and thereby growth, only through the form of political institutions. Evidence of greater Western influence is consistent with observing the same type of political arrangements in former colonies as those observed in Western Europe; i.e., parliamentary democracies. Suppose, in line with Acemoglu *et al.*, (2001), that settler mortality is a good measure of Western influence. Given the validity of the identifying assumption that the influence on current policies operates only through the form of political institutions, settler mortality is a valid instrument for parliamentary democracy. To be consistent with the rest of the paper, we define a new dummy variable, *non_parl*. The *non_parl* dummy is equal to unity if the country is classified as either a presidential regime or a nondemocratic regime and is equal to zero if the country is classified as a parliamentary regime. We use *settler mortality* as an instrument for *non_parl*. To implement this method we apply Wooldridge's approach to instrumentation of the endogenous interaction terms by first predicting *non_parl* from the following regression.[25]

$$non\_parl = \alpha_0 + \alpha_1 lsettler + \mathbf{Z^i}\beta + u_i \tag{2}$$

Then, we use the interaction term of the predicted variable and resource abundance as an instrumental variable in the IV estimation. The results are reported in Table A4. As expected a priori, the likelihood of parliamentary democracy increases with Western influence, i.e., with lower values of settler mortality. Although there are data on settler mortality for only 44 countries in our main data set, the results from these 44 countries are similar to the OLS estimates in column 3. The difference between different forms of government is no longer significant, but the pattern is the same as that implied by the OLS estimates. The direct effect of initial resource abundance is neither economically nor statistically significant. As before, this implies that parliamentary regimes seem free of the resource curse. With only 44 countries, we have too few observations to further distinguish between democracies and nondemocratic regimes. Since the sample size is limited by the rule of law variable, one way of expanding the sample would be to use a different measure of institutional quality. SW (1997b) use an institutional quality index that is related to, but differs from, the rule of law index. This index is an unweighted average of five indexes based on data from Political Risk Services and is available for a larger number of countries than is the rule of law index. In columns (4) and (5) we report IV estimates for democracies only, using the quality of institution variable rather than the rule of law index. This provides a sample of 34 countries. In fact the estimated interaction effect is larger when instrumented with settler mortality, compared with the OLS estimates.

One concern, which applies to the empirical literature on economic growth in general, is the basic concern of model specification. In particular, there is a significant degree of uncertainty attached to identifying which variables are robustly related to growth.[26] Among the most influential contributions addressing this question is Sala-i-Martin (1997). Sala-i-Martin choose a total of 62 variables from the growth literature and test their correlation with the rate of economic growth. He choose three fixed variables (i.e., the variables that appear in all regressions) that are assumed to be "good" *a priori*.[27] These three variables include; level of income in the beginning of the period, life expectancy and the primary school enrollment rate. Sala-i-Martin finds that 22

[25] See Wooldridge (2002), Chapters 9 and 18.

[26] Levine and Renelt (1992) is the first contribution in the growth literature that systematically address this question. They do so by applying Leamer's (1985) extreme-bounds test to identify robust empirical relations in the growth literature.

[27] By this he mean that they have to be widely used in the literature, they have to be variables evaluated in the beginning of the period to avoid endogenity, and they have to be variables that are somewhat "robust" in the sense that they systematically seem to matter in all regressions run in the previous literature (Sala-i-Martin,

out of the remaining 59 tested variables appear to be significantly related to growth.[28] The most "significant" variables include: regional variables; political variables; religious variables; variables describing market distortions and market performance; variables for types of investment; primary sector production variables; openness; type of economic organization; and former Spanish colonies. Table 7, 8 and 9 reports the results when we include the variables that emerges as the most robust correlates of growth according to Sala-i-Martin (1997).[29] As reported in the tables, we observe the exact same pattern as before, regarding the effects of natural resource abundance, constitutional forms and the interaction effects: on average there seems to be a resource curse; form of government and electoral rule is not significantly related to growth; presidential regimes and regimes with a proportional electoral rule which are abundant in natural resources performs significantly worse in the long run (1970-1990) than their resource-abundant counterparts.[30]

Up to this point, we have investigated the heterogeneity in the long-term effects of resource abundance, by contrasting form of government and electoral systems. Of course, each form of government is combined with an electoral system. We now subdivide our constitutional classification into four separate groups to combine electoral systems and form of government (*parl_maj*, *parl_prop*, *pres_maj*, *pres_prop*) and interact them with resource abundance. The results are displayed in Table 10. Column (1) include the SW (1997) controls whereas Column (2) include the Sala-i-Martin (1997) controls. As seen from Table 10, the direct effect of resource abundance is not statistically significant (the excluded category being *parl_maj*).[31] Resource abundant presidential democracies with proportional electoral systems do worse than their resource abundant counterparts. The estimated effect of the interaction term between *pres_prop* and *resource abundance* ranges between -11.28 and -9.08 and is statistically significant at the 5% level.[32]

The final concern we address is that our findings may rely on the specific dataset, and in particular on whether the patterns are evident also in more recent periods of growth. Tables 11-13 report the regression results of our main model specification for the growth period 1990-2000.[33] We find evidence for the same patterns concerning the growth interactions of constitutions and natural resources as in the 1970-1990 regressions. There is no evidence of a resource curse in parliamentary regimes (Table 11, column 3) and in regimes with majoritarian elections (Table 12, column 2). Presidential regimes and regimes with proportional electoral rules initially endowed with abundant natural resources, on the other hand, experience lower growth on average in the subsequent decade, 1990-2000. In the regressions reported in Table 13 (column 2), we reproduce the re-

(1997).

[28] See Sala-i-Martin (1997) for method and specification.

[29] The Sala-i-Martin (1997) data is available at http://www.columbia.edu/~xs23/data.htm.

[30] Sala-i-Martin *et al.* (2004) find that the strongest evidence for growth is for the relative price of investments, primary school enrollment and the initial level of GDP per capita. Including the relative price of investment do not significantly change our results.

[31] When the three constitutional dummies are included (but not their interactions with resource abundance), the direct effect of resource abundance ranges between -7.35 and -3.70 (significant at the 1% level with the SW(1997) controls, and significant at the 10% level with the Sala-i-Martin (1997) controls.

[32] As in the previous specifications, the constitutional dummies turn out statistically insignificant when interaction terms between the constitutional variables and resource abundance are not included.

[33] As the SW dataset does not contain many of the variables required in the 1990's regressions, these had to be constructed. The data have been constructed in a similar way as possible to the SW data, in order to compare all our results. See Appendix A.3 for a precise definition of variables.

sults for the 1970-1990 sample (Table 10), that the worst combination of constitutional regimes, when it comes to attracting the resource curse, is the combination of a presidential form of government and a proportional electoral system.

5. Conclusion

The empirical results of this paper suggest that economies' long-run abilities to deal with natural resource abundance depend largely on country specific constitutional arrangements. We find that the form of government seems to matter more than being nondemocratic in relation to whether a country is afflicted by the so-called resource curse. Revisiting the seminal growth analysis of Sachs and Warner (1995, 1997a), we find that the resource curse is explained by the poor performance of resource abundant presidential and nondemocratic regimes—there is no resource curse in democracies with a parliamentary form of government. This empirical finding is consistent with recent contributions to the political economy literature, which suggests that presidential regimes pursue inferior growth-promoting structural policies compared with parliamentary regimes. Interestingly, constitutions do not significantly affect growth directly, they simply have a negative interaction with resource abundance. We tentatively interpret this result as a budget constraint effect—the negative growth dynamics of presidential regimes, through inappropriate structural policies, seem to play a quantitatively significant role only when governments face a less rigid budget constraints. We also find patterns in the data suggesting that the electoral system may matter for the resource curse. Proportional electoral systems seem more likely to be afflicted by the resource curse. However, these effects are empirically less robust than the effects of the form of government.

Although our results seem fairly robust, there is always the concern of omitted variables in cross-country regressions. The concern that our results reflect the influence of variables not included in the regressions affecting both growth, constitutional arrangements and primary resource export, calls for panel fixed-effect estimation. The constitutional classification we focus on in this paper does not have enough constitutional time variation for meaningful estimates from fixed-effect. Future empirical research should try to solve this issue by, e.g., focusing on different constitutional aspects or exploiting the new wave of democracies in the eastern Europe. There is also the possible problem of endogeneity, that resource endowments determine institutions and, possibly, constitutions. Some researchers (see, e.g., Sokoloff and Engerman (2000)) discuss the possibility that initial factor conditions could have had profound and enduring impacts on long-run paths of institutional and economic development. Future work should seek ways to deal with this possibility in empirical work. In addition, the underlying mechanisms are unclear and require future research. In particular, theory should be developed to distinguish different potential interactions between natural resource abundance and different dimensions of a country's political institution.

References

Acemoglu, D., S. Johnson, and J. Robinson (2001), "The Colonial Origins of Comparative Development: An Empirical Investigation", *American Economic Review* 91, pp. 1369–1401.

Austen-Smith, D. (2000), "Redistributing Income under Proportional Representation", *Journal of Political Economy* 108, pp. 1235–1269.

Auty, R.M. (2001), *Resource Abundance and Economic Development*, Oxford University Press, Oxford .

Belsley , D.A., Kuh, E and R.E. Welsch (1980), *Regression Diagnostics.* New York: John Wiley and Sons, 1980.

Boschini, A.D., J. Pettersson, and J. Roine (2004), "Resource Curse or Not: A Question of Appropriability", Working Paper, Department of Economics, Stockholm University.

Bulte, E.H., R. Demania, and R.T. Deacon (2004), "Resource Abundance, Poverty and Development", ESA Working Paper No. 04-03.

Demania, R. and E. Bulte (2003), "Resources for Sale: Corruption, Democracy and the Natural Resource Curse", CiES Discussion Paper No. 0320.

Gerring, J and S.C. Thacker (2004), "Political Institutions and Corruption: The Role of Unitarism and Parliamentarism", *British Journal of Political Science* 34, pp. 295–330.

Greene, W. (2003), *Econometric Analysis*, 5th Edition, Prentice Hall.

Hall, R. and C. Jones (1999), "Why Do Some Countries Produce so Much More Output Per Worker than Others?", *Quarterly Journal of Economics* 114, pp. 83–116.

Heston, A., R. Summers and B. Aten (2002), Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.

Huber, J. (1996), "The Vote of Confidence in Parliamentary Democracies", *American Political Science Review* 90, pp. 269–282.

Kaufmann, D. A. Kraay, and M: Mastruzzi, "Governance Matters IV: Governance Indicators for 1996-2004" World Bank Group Working paper, May 2005.

Knack, S. and P. Keefer (1995), "Institutions and Economic Performance: Cross-country Tests Using Alternative Institutional Measures", *Economics and Politics* 7, pp. 207–227.

Kunicova, J. and S. Rose-Ackerman (2005), "Electoral Rules and Constitutional Structures as Constraints on Corruption", *British Journal of Political Science* 35, pp. 573–606.

Lane, P.R. and A. Tornell (1996), "Power, Growth and the Voracity Effect", *Journal of Economic Growth* 1, pp. 213–241.

Leamer, E. (1985), "Sensitivity Analyses Would Help", *American Economic Review*, Vol. 57, n3, pp. 308-313.

Levine, R. and D. Renelt (1992), "A Sensitivity Analysis of Cross-Country Growth Regressions", *American Economic Review*, Vol. 82, n4, pp. 942-963.

Matsuyama, K. (1992), "Agricultural Productivity, Comparative Advantage and Economic Growth", *Journal of Economic Theory* 58, pp. 317–334.

Mehlum, H., K.O. Moene and R. Torvik (2006), "Institutions and the Resource Curse", *The Economic Journal* 116, pp. 1–20.

Milesi-Ferretti, G.M., R. Perotti and M. Rostagno (2002), "Electoral Systems and the Composition of Public Spending", *Quarterly Journal of Economics* 117, pp. 609–657.

Persson, T., G. Roland and G. Tabellini. (1997), "Separation of Powers and Political Accountability", *Quarterly Journal of Economics* 112, pp. 1163–1202.

Persson, T., G. Roland and G. Tabellini (2000), "Comparative Politics and Public Finance", *Journal of Political Economy* 108, pp. 1121–1141.

Persson, T. (2002), "Do Political Institutions Shape Economic Policy?", *Econometrica* 70, pp. 883–905.

Persson, T. and G. Tabellini (2000), *Political Economics: Explaining Economic Policy*, Cambridge MA, MIT Press.

Persson, T. and G. Tabellini (2003), *The Economic Effects of Constitutions: What Do the Data Say?*, MIT Press, Cambridge MA.

Persson, T. (2005), "Forms of Democracy, Policy and Economic Development", NBER Working Paper No. 11171.

Robinson, J.A., R. Torvik and T. Verdier (2002), "Political Foundations of the Resource Curse", CEPR Discussion Paper No. 3422.

Rosseeuw, P.J. and A.M. Leroy (1987), *Robust Regression and Outlier Detection*, John Wiley, New York.

Sachs, J.D. and A.M. Warner (1995), "Natural Resource Abundance and Economic Growth", NBER Working Paper No. 5398.

Sachs, J.D. and A.M. Warner (1997a), "Natural Resource Abundance and Economic Growth" – revised version, Mimeo, Harvard University.

Sachs, J.D. and A.M. Warner (1997b), "Sources of Slow Growth in African Economies", *Journal of African Economies* 6, pp. 335–376.

Sachs, J.D. and A.M. Warner (1999), "The Big Push, Natural Resource Booms and Growth", *Journal of Development Economics* 59, pp. 43–76.

Sachs, J.D. and A.M. Warner (2001), "The Curse of Natural Resources", *European Economic Review* 45, pp. 827–838.

Sala-i-Martin, X. (1997), "I Just Run Two Million Regressions" *American Economic Review*, Vol. 87, n.2, pp. 178-183.

Sala-I-Martin , G. Doppelhofer and R. I. Miller (2004), "Determinants of Long-Term Growth: A Bayesian Averaging of Classical Estimates (BACE) Approach" *American Economic Review*, Vol. 94, n4, pp.813-835

Shugart, M. and J. Carey (1992), *Presidents and Assemblies: Constitutional Design and Electoral Dynamics*, Cambridge: Cambridge University Press.

Sokoloff, K.L. and S.L. Engerman (2000), "Institutions, Factor Endowments, and the Paths of Development in the New World", *Journal of Economic Perspective* 14, pp.217-232.

Tornell, A. and P.R. Lane (1999), "The Voracity Effect", *American Economic Review* 89, pp. 22–46.

Torvik, R. (2001), "Learning by Doing and the Dutch Disease", *European Economic Review* 45, pp. 285–306.

Torvik, R. (2002), "Natural Resources, Rent Seeking and Welfare", *Journal of Development Economics* 76, pp. 455–470.

Wacziarg, R. (1996), "Information to Create Colonization Dummies", Harvard University, Cambridge, MA. Mimeograph.

Wooldridge, J.M. (2002), *Econometric Analysis of Cross Section and Panel Data*, MIT Press (2002).

A.1 Data appendix 1970-1990 sample

Using our definition of democracy we identify 58 countries as democracies. Some of these countries are not classified according to their constitutional form by PT (2003) or Persson (2005). These countries are Egypt, Morocco and Nigeria. In order to classify these countries according to their form of government we rely primarily on the *SYSTEM* variables in the World Bank DPI data set. The *SYSTEM* variable classifies countries as either Parliamentary, Assembly-elected President or Presidential systems. Systems with unelected executives, those scoring 2 or 3 on the Executive Index of Political Competitiveness, are classified as presidential. The Executive Index of Political Competitiveness scale is defined as follows:

1 if no legislature;

2 if unelected legislature;

3 if elected, one candidate;

4 if one party, multiple candidates;

5 if multiple parties are legal but only one party won seats;

6 if multiple parties did win seats but the largest party received more than 75 percent of the seats;

7 if largest party got less than 75 percent of the seats.

Systems with presidents who are elected directly or by an electoral college (whose only function is to elect the president), in cases where there is no prime minister, are also classified as presidential. In systems with both a prime minister and a president, the following factors are used to categorize the system:

a) Veto power: president can veto legislation and the parliament needs a supermajority to override the veto;

b) Appoint prime minister: president can appoint and dismiss the prime minister and/or other ministers;

c) Dissolve parliament: president can dissolve parliament and call for new elections;

d) Mentioning in sources: If the sources mention the president more often than the PM then this serves as an additional indicator to call the system presidential;

The system is presidential if (a) is true, or if (b) and (c) are true. If there is no information or ambiguous information on (a), (b), (c), then (d) applies.

Countries in which the legislature elects the chief executive are parliamentary, with the following exception: if that assembly or group cannot easily recall the president (if it needs a two-thirds majority to impeach, or must dissolve itself while forcing the president out) then the system is classified as an assembly-elected presidential system.

Two of the countries not classified by PT (Morocco and Nigeria) are classified as "presidential" according to the *SYSTEM* variable, and we classify these countries as presidential (*pres* = 1) in our data, as this closely corresponds to the definition used by PT. Egypt is categorized as having a "strong president elected by assembly" according to the *SYSTEM* variable. Egypt is categorized as parliamentary (*pres* = 0) in our data set because the assembly may recall the chief executive, either by a two-third majority or by dissolving itself; thus the chief executive is subject to a confidence requirement.

We use the International Institute for Democracy and Electoral Assistance (1997) to classify countries according to their electoral systems, and use the same approach as PT (2003). According to this definition, Morocco is classified as having a proportional electoral system (*maj* = 0), and Egypt and Nigeria are classified as having majoritarian electoral systems (*maj* = 1).

A.2 Variable definitions, 1970-1990 Sample

africa
Geographic binary indicator for Africa. Source: Wacziarg (1996).

asiae
Geographic binary indicator for (East) Asia. Source: Wacziarg (1996).

avgastil7290
Average of indexes for civil liberties and political rights for the period 1972–1990, with each index measured on a 1 to 7 scale, which 1 represents the highest degree of freedom and 7 the lowest. Countries with combined averages for political rights and civil liberties score between 1.0 and 2.5 are classified as "free"; those scoring between 3.0 and 5.5 are "partly free"; and those that score between 5.5 and 7.0 are "not free". Source: Freedom House, Annual Survey of Freedom Country Ratings. For a precise definition, see http://www.freedomhouse.org/research/freeworld/2000/

change in tot
Average annual growth in the log of the external terms of trade between 1970 and 1990. The external terms of trade is the ratio of an export price index to an import price index. Source: SW (1997a).

civlibb
Index of civil liberties. Source: Sala-i-Martin (1997).

col_esp, col_uk and col_oth
Binary indicators for British, Spanish and Other colonizers. Source: Wacziarg (1996).

confuc
Fraction of Confucius. Source: Sala-i-Martin (1997).

dem
Dummy variable that is equal to 1 if the average of indexes for civil liberties and political rights for the period 1972–1990 is lower than 5 (corresponding to the definition "partly free" based on ratings for 2003). Dem = 1 if *avgastil7290* < 5, and is 0 otherwise.

dem_maj
Dummy variable for electoral system, equal to 1 if the country was classified as having a majoritarian electoral system in 1970 (conditional on the country being a democracy), and 0 otherwise. Source: PT (2003); Persson (2005); International Institute for Democracy and Electoral Assistance (1997).

dem_maj_ra
Interaction term between *dem_maj* and *resource abundance* (resource abundance from SW, 1997a).

dem_parl
Dummy variable for forms of government, equal to 1 if the county was non classified as a presidential regime in 1970 (conditional that the country is classified as democracy), and 0 otherwise. Source: PT (2003), Shugart and Carey (1992), World Bank DPI data set, and national sources.

dem_parl_ra
Interaction term between *dem_parl* and *resource abundance* (resource abundance from SW 1997a).

dem_pres
Dummy variable for forms of government, equal to 1 if the county was classified as a presidential regime in 1970 (conditional on the country being a democracy), and 0 otherwise. Only regimes in which the confidence of the assembly is not necessary for the executive (even if an elected president is not chief executive, or if there is no elected president) are classified presidential regimes. Most semi-presidential and premier-presidential systems are classified as parliamentary. Source: PT (2003), Shugart and Carey (1992), World Bank DPI data set, and national sources.

dem_pres_ra
Interaction term between *dem_pres* and *resource abundance* (resource abundance from SW 1997a).

dem_prop
Dummy variable for electoral system, equal to 1 if the country was classified as not having majoritarian electoral system in 1970 (conditional that the country is classified as democracy), and 0 otherwise. Source: PT (2003), Persson (2005), International Institute for Democracy and Electoral Assistance (1997).

dem_prop_ra
Interaction term between *dem_prop* and *resource abundance* (resource abundance from SW 1997a).

ecorg
Degree of capitalism. Index of degree in which economies favor capitalist form of production. Source: Sala-i-Martin (1997).

eqinv
Equipment investment. Source: Sala-i-Martin (1997).

growth7090

Average annual growth in real GDP divided by the economically active population between the 1970 and 1990. Source: SW (1997a).

initial income70
Natural log of real GDP divided by the economically-active population in 1970. Source: SW (1997a).

institutional quality
An unweighted average of five indexes based on data from Political Risk Services. Source: SW (1997b).

invest7089
The logarithm of average investment to GDP ratio during the two decades. Source: SW (1997a).

laam
Geographic binary indicator for Latin America. Source: Wacziarg (1996).

lifee
Life Expectancy 1960. Source: Sala-i-Martin (1997).

mining
Fraction of GDP in Mining. Source: Sala-i-Martin (1997).

muslim
Fraction of Muslim. Source: Sala-i-Martin (1997).

non_dem
Dummy variable equal to 1 if the average of the indexes for civil liberties and political rights for the period 1972–1990 is higher than or equal to 5 (corresponding to the definition "not free", based on ratings for 2003). non_dem = 1 if avgastil7290 = 5, and 0 otherwise.

non_dem_ra
Interaction term between *non_dem* and *resource abundance* (resource abundance from SW 1997a).

non _parl
Dummy variable for form of government, equal to 1 if the country is classified as non democracy or a presidential democracy, and 0 if the country is classified as a parliamentary democracy. Source: PT (2003), Shugart and Carey (1992), World Bank DPI data set, and national sources.

openness
Openness variable measuring the fraction of years between 1970 and 1990 that the country was integrated in the global economy. A country is integrated during a particular year

if it maintained reasonably low tariffs and quotas, and did not have an excessively high black market exchange rate premium. Source: SW (1997a).

prot
Fraction of Protestant. Source: Sala-i-Martin (1997).

rerd
Exchange Rate Distortions. Source: Sala-i-Martin (1997).

resource abundance70
Share of exports of primary products in GNP in 1970. Primary products or natural resource exports are exports of "fuels" and "non-fuel primary products" from the World Data 1995 CD-ROM disk, produced by the World Bank. Non-fuel primary products correspond to SITC categories 0, 1, 2, 4 and 68. Fuels correspond to SITC category 3. Source: SW (1997a).

resource abundance per capita
Share of exports of primary products per capita 1970. The calculation is resource abundance70 times GNI in 1970 (formerly GNP), divided by population in 1970. Data are in current U.S. dollars. Source: GNI data are from World Development Indicators, Population data from PWT.

rule of law
The variable "reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implements laws and adjudicate disputes". Ranges from 0 (low) to 6 (high). Measured as of 1982. Source: SW (1997a).

safrica
Sub-Sahara African Dummy. Source: Sala-i-Martin (1997).

spain
Dummy variable for former Spanish colonies. Source: Sala-i-Martin (1997).

school enrollment
Primary School Enrollment 1960. Source: Sala-i-Martin (1997).

settler mortality
Log of mortality rate among non-military settlers in Western European colonies in the early 1800s. Source: Acemoglu et al. (2001).

A.3 Variable definitions, 1990-2000 Sample

GROWTH9000
Average annual growth in real GDP divided by the economically active population between the 1990 and 2000. Exact calculation is

100*(1/10)*ln(GDPEA00/GDPEA90).

LGDPEA90
Natural log of real GDP divided by the economically-active population in 1990. The Real GDP data correspond to the series RGDPCH from the Penn World Tables Version 6.1 (see Heston, Summers and Aten 2002), and are in 1996 Constant Prices. The economically active population is defined as the number of people between the ages 15-64. The source for the population data is World Development Indicators database. Since the World Bank population data is given as percentage shares of total population, and the real gdp data is given in per-capita terms, the actual calculation is
ln(RGDPCH90*(100/pop15-64)). Note: This is the same calculation as SW (1997a).

LINVEST9099
Natural log of the ratio of real gross domestic investment to real GDP, averaged over the period 1990-1999. Penn World Tables Version 6.1

MAJ
Dummy variable for electoral system, equal to 1 if all the lower house in a country is elected under plurality rule, 0 otherwise. See PT (2003) for definition.

MAJ_RA
Interaction term between *MAJ* and *RESOURCE ABUNDANCE*.

PARL_PROP
Dummy variable. (1-*PRES*)*(1-*MAJ*)

PRES
Dummy variable for forms of government, equal to 1 in presidential regimes, 0 otherwise. See PT (2003) for definition.

PRES_MAJ
Dummy variable. *PRES* * *MAJ*.

PRES_PROP
Dummy variable. *PRES* *(1-*MAJ*)

PRES_RA
Interaction term between *PRES* and *RESOURCE ABUNDANCE*.

RESOURCE ABUNDANCE80
Share of exports of primary products in GNP in 1980. Primary products or natural resource exports are exports of "fuels" and "non-fuel primary products" from the World Data 1995 CD-ROM disk, produced by the World Bank. Non-fuel primary products correspond to SITC categories 0, 1, 2, 4 and 68. Fuels correspond to SITC category 3. Source: SW (1997a).

RULE OF LAW
Point estimate of "Rule of Law", the fifth cluster of Kaufmann et al. (2005) governance indicators, measured in 1996. The indicator measure the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence. Ranges from -2.5 to 2.5 (higher values correspond to better outcomes). Source: Kaufmann et al. (2005). The data, as well as a web-based graphical interface, are available at:
www.worldbank.org/wbi/governance/govdata/. The Appendices and a synthesis of the paper are available at:
www.worldbank.org/wbi/governance/pubs/govmatters4.html.

YEARSOPEN
Index for openness to international trade in a country, complied by SW (1995), measuring the fraction of years during 1950-1994 that the economy in the country has been open. Ranges between 0 and 1. Source: PT (2003).

A.4 Countries included in our data set, and their constitutional classification

1970-1990 Data Set		
	Maj	Prop
Pres	Cyprus, Gambia, Nigeria, Pakistan Philippines, U.S.A	Argentina, Bolivia, Brazil, Columbia, Costa Rica, Dominican Rep., Ecuador, El Salvador, Guatemala, Guyana, Honduras,
Parl	Australia, Bangladesh, Canada, Egypt, France, India, Jamaica, Japan, Malaysia, Mauritius, New Zealand, Singapore, Sri Lanka, Thailand, Trinidad&Tobago, U.K	Austria, Belgium, Denmark, Finland, Germany West, Greece, Ireland, Israel, Italy, Netherlands, Norway, Portugal, Senegal, Spain, Sweden, Taiwan, Turkey,

Non Democracies
Algeria, Ghana, Benin, Indonesia, Burkina Faso, Iran, Burundi, Cameroon, Central African Rep. Ivory Coast, Chad, Chile, China, Jordan, Kenya, Congo, Madagascar, Malawi, Mali, Mauritania, Gabon, Syria, Paraguay, Togo, Tunisia, Rwanda, Sierra Leone, Uganda, South Africa, Zambia, Sudan, Zimbabwe

1990-2000 Data Set		
	Maj	Prop
Pres	Chile, Gambia, Malawi, Pakistan, Philippines, Uganda, USA, Zimbawe	Argentina, Bolivia, Brazil, Columbia, Costa Rica, Dominican Rep., Ecuador, El Salvador, Guatemala, Honduras, Korea Rep., Mexico, Nicaragua, Paraguay, Peru, Sri Lanka, Switzerland, Uruguay, Venezuela
Parl	Australia, Bangladesh, Barbados, Canada, Egypt, France, India, Jamaica, Japan, Malaysia, Mauritius, Nepal,New Zealand, Thailand, Trinidad&Tobago, U.K	Austria, Belgium, Denmark, Finland, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Netherlands, Norway, Portugal, Senegal, South Africa, Spain, Sweden, Turkey,

Figure 1: Growth 1970-1990. Parliamentary Democracies

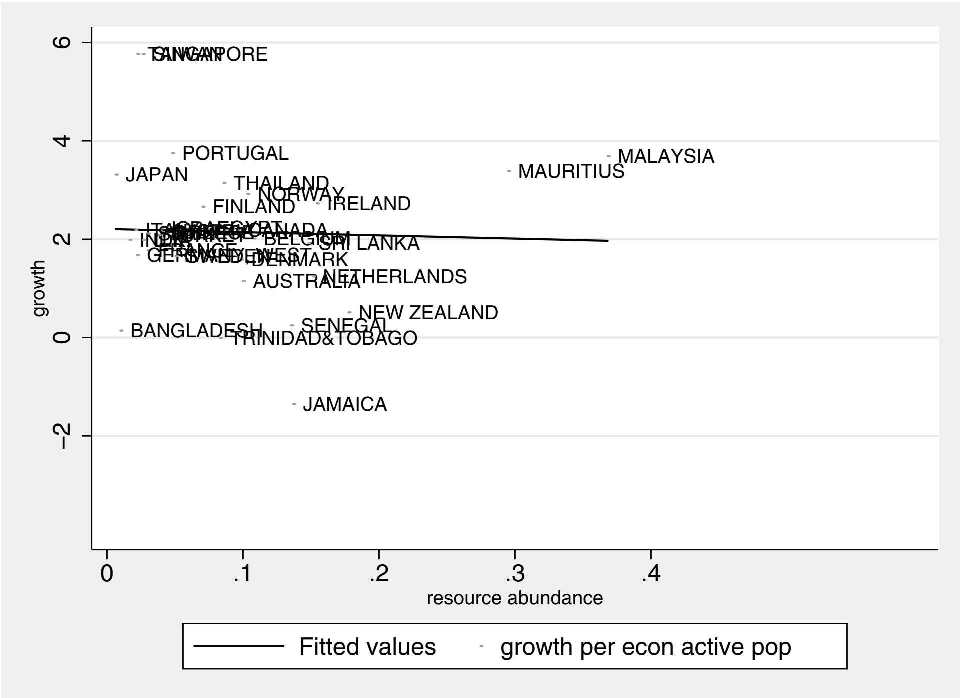


Figure 2: Growth 1970-1990 Presidential Democracies

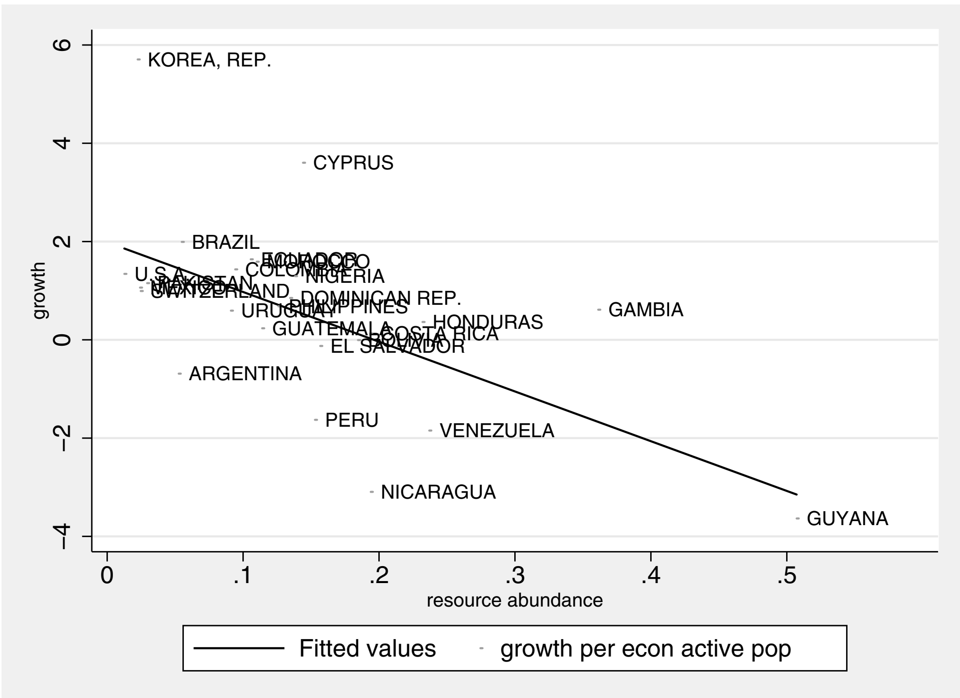


Table 1: Growth 1970-1990. Form of government and interactions with resource abundance. All countries included.

	(1)	(2)	(3)
initial income70	-1.776	-1.79	-1.781
	(0.206)***	(0.217)***	(0.209)***
resource abundance70	-8.167	-7.952	-2.836
	(1.217)***	(1.246)***	(2.258)
openness	1.534	1.329	1.244
	(0.388)***	(0.399)***	(0.389)***
invest7089	0.867	0.993	1.064
	(0.316)***	(0.320)***	(0.309)***
rule of law	0.383	0.333	0.315
	(0.103)***	(0.106)***	(0.108)***
change in tot	0.117	0.113	0.100
	(0.045)**	(0.047)**	(0.045)**
dem_pres		-0.57	0.131
		(0.310)*	(0.399)
non_dem		-0.452	0.112
		(0.370)	(0.568)
dem_pres_ra			-7.854
			(2.925)***
non_dem_ra			-6.205
			(3.139)*
Constant	13.067	13.337	12.774
	(1.590)***	(1.716)***	(1.663)***
Observations	73	73	73
Adjusted R-squared	0.73	0.73	0.76

NOTE: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2: Growth 1970-1990 with form of government and interactions with resource abundance. Only democracies included.

	(1)	(2)	(3)
initial income70	-1.922	-1.906	-1.87
	(0.270)***	(0.264)***	(0.246)***
resource abundance70	-7.299	-7.214	-2.645
	(1.635)***	(1.593)***	(2.199)
openness	1.475	1.186	1.123
	(0.477)***	(0.490)**	(0.458)**
invest7089	0.838	1.058	1.194
	(0.416)**	(0.421)**	(0.396)***
rule of law	0.458	0.397	0.342
	(0.135)***	(0.135)***	(0.128)**
change in tot	0.038	0.041	0.035
	(0.072)	(0.070)	(0.065)
dem_pres		-0.601	0.111
		(0.319)*	(0.390)
dem_pres_ra			-8.022
			(2.843)***
Constant	14.08	13.915	13.114
	(2.109)***	(2.057)***	(1.941)***
Observations	55	55	55
Adjusted R-squared	0.73	0.74	0.77

NOTE: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 at for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: Growth 1970-1990. Form of government and interactions with resource abundance. Controlling for colonial power and continent.

	All countries		Democracies	
initial income70	-1.527***	(0.262)	-1.558***	(0.331)
resource abundance70	-2.533	(2.277)	-2.754	(2.323)
openness	1.274***	(0.400)	1.138**	(0.498)
invest7089	0.751**	(0.320)	1.002**	(0.443)
rule of law	0.368***	(0.104)	0.413***	(0.126)
change in tot	0.080	(0.050)	0.003	(0.077)
dem_pres	0.246	(0.432)	0.212	(0.442)
dem_pres_ra	-6.947**	(2.894)	-6.569**	(2.922)
non_dem	0.245	(0.548)		
non_dem_ra	-6.361**	(3.072)		
col_esp	0.401	(0.469)	0.330	(0.497)
col_uk	0.465	(1.034)	0.444	(0.858)
col_oth	1.034***	(0.288)	0.858**	(0.326)
asiae	0.245	(0.503)	0.344	(0.580)
laam	-0.188	(0.544)	-0.094	(0.571)
africa	0.005	(0.712)	0.728	(0.878)
Constant	10.674***	(2.498)	10.073***	(3.115)
Observations	73		55	
Adjusted R-squared	0.792		0.798	

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: Growth 1970-1990. Parliamentary democracies and all other countries estimated separately

	Parliamentary dem.	All other countries
	(1)	(2)
initial income70	-1.871	-1.830
	(0.301)***	(0.268)***
resource abundance70	-3.586	-9.730
	(2.215)	(1.543)***
openness	1.267	1.218
	(0.592)**	(0.552)**
invest7089	1.121	0.938
	(0.434)**	(0.445)**
rule of law	0.300	0.341
	(0.152)*	(0.146)**
change in tot	0.323	0.102
	(0.184)*	(0.051)*
Constant	13.592	13.578
	(2.338)***	(2.073)***
Observations	32	41
Adjusted R-squared	0.66	0.72

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Growth 1970-1990. Electoral systems and interactions with resource abundance

	All countries		Democracies	
	(1)	(2)	(3)	(4)
initial income70	-1.785	-1.762	-1.907	-1.833
	(0.224)***	(0.222)***	(0.275)***	(0.260)***
resource abundance70	-8.045	-9.360	-7.287	-9.958
	(1.276)***	(1.796)***	(1.649)***	(1.832)***
openness	1.524	1.460	1.466	1.408
	(0.394)***	(0.392)***	(0.482)***	(0.453)***
invest7089	0.886	0.790	0.870	0.736
	(0.323)***	(0.322)**	(0.427)**	(0.403)*
rule of law	0.378	0.392	0.450	0.438
	(0.106)***	(0.110)***	(0.137)***	(0.129)***
change in tot	0.119	0.120	0.038	0.015
	(0.048)**	(0.048)**	(0.073)	(0.069)
dem_maj	0.135	-0.395	0.116	-0.687
	(0.279)	(0.383)	(0.284)	(0.398)*
non_dem	-0.039	-0.091		
	(0.338)	(0.590)		
dem_maj_ra		5.558		8.401
		(2.787)*		(3.086)***
non_dem_ra		0.519		
		(2.929)		
Constant	13.065	13.270	13.842	13.938
	(1.804)***	(1.777)***	(2.206)***	(2.070)***
Observations	73	73	55	55
Adjusted R-squared	0.72	0.73	0.72	0.75

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2. for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: Growth 1970-1990. Electoral system and interactions with resource abundance. Controlling for colonial power and continent

	All Countries		Democracies	
initial income70	-1.466***	(0.268)	-1.375***	(0.327)
resource abundance70	-8.225***	(1.758)	-9.011***	(1.765)
openness	1.274***	(0.411)	1.263**	(0.481)
invest7089	0.518	(0.329)	0.607	(0.418)
rule of law	0.451***	(0.103)	0.480***	(0.119)
change in tot	0.095*	(0.051)	-0.011	(0.075)
dem_maj	-0.706*	(0.375)	-1.102***	(0.397)
dem_maj_ra	4.617*	(2.708)	6.058**	(2.880)
non_dem	-0.134	(0.534)		
non_dem_ra	-0.700	(2.954)		
col_esp	0.345	(0.465)	0.305	(0.472)
col_uk	0.661*	(0.334)	0.876**	(0.388)
col_oth	1.013***	(0.297)	0.713**	(0.327)
asiae	0.471	(0.538)	0.774	(0.601)
laam	-0.305	(0.537)	-0.199	(0.531)
africa	-0.019	(0.722)	0.920	(0.827)
Constant	10.905***	(2.612)	9.728***	(3.051)
Observations	73		55	
Adjusted R-squared	0.783		0.809	

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Growth 1970-1990 including the most robust significant determinants of growth according to Sala-i-Martin (1997). Form of government. All countries included

	(1)	(2)	(3)
initial income70	-2.296***	-2.291***	-2.334***
resource abundance70	-4.591***	-4.570***	-0.569
lifee	0.090***	0.096***	0.085***
school enrollment	1.925*	1.895*	1.861*
safrica	0.077	0.228	-0.182
laam	-0.361	-0.423	-0.731
civlibb	-0.081	-0.003	-0.057
confuc	4.783***	4.181**	3.988**
muslim	1.616***	1.571***	1.247**
rerd	-0.002	-0.002	0.000
eqinv	15.083***	15.485***	18.746***
mining	3.685	4.082	3.888
sopen	1.652***	1.684***	1.422***
ecorg	0.085	0.086	0.053
spain	0.447	0.376	0.683
dem_pres		0.185	0.828
non_dem		-0.274	0.382
dem_pres_ra			-7.905*
non_dem_ra			-5.956*
Constant	13.049***	12.416***	13.297***
Observations	73	73	73
Adjusted R-squared	0.746	0.741	0.753

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Growth 1970-1990 including the most robust significant determinants of growth according to Sala-i-Martin (1997). Form of government. Only democracies included.

	(1)	(2)	(3)
initial income70	-2.001***	-2.052***	-2.043***
resource abundance70	-3.915*	-3.754*	-1.332
lifee	0.055	0.062	0.051
school enrollment	2.439	2.247	2.572*
safrica	1.337*	1.465*	1.104
laam	-0.008	-0.013	-0.236
civlibb	-0.064	-0.076	-0.105
confuc	4.345**	4.100**	3.550**
muslim	1.625**	1.611**	1.514*
rerd	-0.009	-0.010*	0.005
eqinv	17.038***	18.236***	20.354***
mining	2.316	2.453	1.751
sopen	2.195***	2.271***	2.114***
ecorg	-0.117	-0.137	-0.262
spain	0.273	0.121	0.473
dem_pres		0.324	0.880*
dem_pres_ra			-7.441*
Constant	12.963***	13.227***	13.475***
Observations	54	54	54
Adjusted R-squared	0.783	0.782	0.793

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Growth 1970-1990 including the most robust significant determinants of growth according to Sala-i-Martin (1997). Electoral Systems.

	All Countries		Democracies	
	(1)	(2)	(3)	(4)
initial income70	-2.286***	-2.272***	-2.030***	-1.966***
resource abundance70	-4.568***	-5.283*	-3.858*	-8.590***
lifee	0.094***	0.094***	0.054	0.045
school enrollment	1.884*	1.127	2.339	1.469
safrica	0.193	-0.145	1.363*	0.947
laam	-0.418	-0.546	-0.058	-0.033
civlibb	0.011	-0.040	-0.055	-0.215
confuc	4.169**	4.489**	4.195**	4.611***
muslim	1.532***	1.257**	1.501*	1.431*
rerd	-0.002	-0.002	-0.010*	-0.008
eqinv	15.081***	17.611***	17.300***	21.067***
mining	4.351	4.528	3.177	0.737
sopen	1.656***	1.455***	2.168***	1.989***
ecorg	0.095	0.096	-0.080	-0.195
spain	0.383	0.469	0.195	0.521
dem_maj	-0.133	-0.527	-0.172	-0.809*
non_dem	-0.464	-0.106		
dem_maj_ra		4.469		9.334**
non_dem_ra		-1.042		
Constant	12.597***	13.377***	13.431***	15.064***
Observations	73	73	54	54
Adjusted R-squared	0.740	0.744	0.779	0.798

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10: Growth 1970-1990. Form of government and electoral system.

	(1)	(2)
resource abundance70	-1.834	-1.105
	(2.691)	(3.080)
parl_prop	0.354	0.595
	(0.559)	(0.545)
pres_maj	0.120	0.303
	(0.849)	(0.802)
pres_prop	0.340	1.415
	(0.498)	(0.646)**
parl_prop_ra	-3.177	-7.118
	(5.795)	(5.729)
pres_maj_ra	-11.791	-0.966
	(9.349)	(7.939)
pres_prop_ra	-9.077	-11.285
	(3.251)***	(5.375)**
Constant	13.439	14.482
	(2.039)***	(3.218)***
Observations	55	54
Adjusted R-squared	0.758	0.786

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. Column (1) include the same controls as Table 1 (*initial income70, openness, invest7089, rule of law, and change in tot*), whereas column (2) include the same controls as Table 5 (*initial income70, lifee, school enrollment, safrica, laam, civlibb, confuc, muslim, rerd, eqinv, miningm, sopen, ecorg, and spain*). * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 11: Growth 1990-2000. Form of Government. Only Democracies included

	(1)	(2)	(3)
LGDPEA90	-0.905	-0.913	-1.031
	(0.407)**	(0.411)**	(0.409)**
LINVEST9099	0.075	0.090	0.052
	(0.586)	(0.595)	(0.584)
YEARSOPEN	0.279	0.258	0.319
	(0.376)	(0.391)	(0.385)
RESOURCE ABUNDANCE 80	0.183	0.188	2.913
	(2.175)	(2.194)	(2.639)
RULE OF LAW	1.218	1.190	1.156
	(0.390)***	(0.413)***	(0.405)***
PRES		-0.116	0.847
		(0.513)	(0.742)
PRES_RA			-8.014
			(4.541)*
Constant	8.847	8.954	9.885
	(3.678)**	(3.740)**	(3.706)**
Adjusted R-squared	0.136	0.120	0.154
Observations	61	61	61

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1990 and 2000 (*GROWTH9000*). See Appendix A.3 for a precise definition of variables. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 12: Growth 1990-2000. Electoral system. Only Democracies included

	(1)	(2)
LGDPEA90	-0.855	-0.893
	(0.435)*	(0.428)**
LINVEST9099	0.104	0.126
	(0.597)	(0.587)
YEARSOPEN	0.259	0.375
	(0.383)	(0.383)
RESOURCE ABUNDANCE80	0.142	-3.821
	(2.196)	(1.113)
RULE OF LAW	1.174	1.113
	(0.413)***	(0.408)***
MAJ	0.160	-0.828
	(0.463)	(0.739)
MAJ_RA		7.251
		(4.270)*
Constant	8.283	9.050
	(4.052)**	(4.008)**
Adjusted R-squared	0.136	0.120
Observations	61	61

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1990 and 2000 (*GROWTH9000*). See Appendix A.3 for a precise definition of variables. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table 13: Growth 1990-2000. Electoral system and form of government. Only Democracies included

	(1)	(2)
LGDPEA90	-1.005	-0.953
	(0.473)**	(0.499)*
LINVEST9099	-0.003	0.123
	(0.620)	(0.622)
YEARSOPEN	0.179	0.351
	(0.405)	(0.403)
RESOURCE ABUNDANCE80	-0.109	-2.910
	(2.241)	(3.195)
RULE OF LAW	1.355	1.130
	(0.487)***	(0.507)**
PARL_PROP	-0.451	-0.141
	(0.594)	(0.924)
PRES_MAJ	-0.620	-0.983
	(0.813)	(1.324)
PRES_PROP	-0.190	1.320
	(0.643)	(0.983)
PARL_PROP_RA		-0.682
		(6.355)
PRES_MAJ_RA		2.967
		(8.550)
PRES_PROP_RA		-10.911
		(5.294)**
Constant	10.280	9.048
	(4.465)**	(4.736)*
Adjusted R-squared	0.101	0.142
Observations	61	61

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1990 and 2000 (*GROWTH9000*). See Appendix A.3 for a precise definition of variables. * Significant at 10%; ** significant at 5%; *** significant at 1%

Table A1a. Summary Statistics

Variable	Obs	Mean	Std Dev	Min	Max
growth7090	90	1.13	1.87	-3.64	5.77
initial income70	90	8.31	0.90	6.43	9.95
resource abundance70	90	0.13	0.10	0.01	0.54
openness	90	0.37	0.44	0.00	1.00
invest7089	90	2.66	0.70	0.31	3.58
rule of law	73	3.16	2.05	0.00	6.00
change in tot	90	-0.32	2.77	-6.46	7.97
ra 70 per capita	82	75.36	93.85	1.81	445.20

Table A1b. Summary Statistics. Parl. Dem.

Variable	Obs	Mean	Std Dev	Min	Max
growth7090	33	2.15	1.44	-1.35	5.77
initial income70	33	8.91	0.74	7.27	9.75
resource abundance70	33	0.09	0.08	0.01	0.37
openness	33	0.73	0.43	0.00	1.00
invest7089	33	2.97	0.57	1.14	3.58
rule of law	32	4.50	1.93	1.00	6.00
change in tot	33	-0.25	0.96	2.75	1.73

Table A1c. Summary Statistics. Pres. Dem.

Variable	Obs	Mean	Std Dev	Min	Max
growth7090	25	0.57	1.90	-3.64	5.71
initial income70	25	8.81	0.71	7.17	9.95
resource abundance70	25	0.14	0.11	0.01	0.51
openness	25	0.27	0.36	0.00	1.00
invest7089	25	2.76	0.39	1.80	3.36
rule of law	23	2.39	1.76	0.00	6.00
change in tot	25	-0.71	2.69	-3.61	5.95

Table A1d. Summary Statistics. Non Democracies

Variable	Obs	Mean	Std Dev	Min	Max
growth7090	32	0.52	1.82	-2.40	4.56
initial income	32	7.62	0.68	6.43	9.16
resource abundance	32	0.16	0.11	0.02	0.54
openness	32	0.09	0.24	0.00	1.00
investment	32	2.25	0.83	0.31	3.34
rule of law	18	1.78	1.11	1.00	5.00
change in tot	32	-0.08	3.90	6.46	7.98

Table A1e. Summary Statistics. Maj. Dem.

Variable	Obs	Mean	Std Dev	Min	Max
growth7090	22	1.84	1.56	-1.35	5.77
initial income70	22	8.55	0.93	7.17	9.95
resource abundance70	22	0.11	0.11	0.01	0.37
openness	22	0.55	0.46	0.00	1.00
invest7089	22	2.76	0.63	1.14	3.58
rule of law	19	3.68	2.24	1.00	6.00
change in tot	22	-0.55	1.97	-3.18	5.95

Table A1f. Summary Statistics. Prop Dem.

Variable	Obs	Mean	Std Dev	Min	Max
growth7090	36	1.24	1.95	-3.64	5.77
initial income70	36	8.78	0.64	7.67	9.89
resource abundance70	36	0.11	0.09	0.02	0.51
openness	36	0.52	0.46	0.00	1.00
invest7089	36	2.95	0.40	1.63	3.52
rule of law	36	3.58	2.05	0.00	6.00
change in tot	36	-0.38	1.89	-3.61	5.37

Table A.2 Alternative Table 1
Primary export per capita as alternative resource measure

	(1)	(2)	(3)
initial income70	-1.227	-1.282	-1.123
	(0.283)***	(0.301)***	(0.283)***
resource abundance per capita	-0.006	-0.006	-0.003
	(0.002)***	(0.002)***	(0.002)
openness	2.030	1.670	1.201
	(0.498)***	(0.511)***	(0.492)**
invest7089	0.557	0.678	0.909
	(0.426)	(0.420)	(0.395)**
rule of law	0.474	0.420	0.389
	(0.135)***	(0.134)***	(0.125)***
change in tot	0.133	0.135	0.127
	(0.056)**	(0.057)**	(0.053)**
dem_pres		-0.817	-0.008
		(0.392)**	(0.450)
non_dem		-0.847	-0.088
		(0.453)*	(0.517)
dem_pres(ra per capita)*			-0.013
			(0.004)***
non_dem(ra per capita)*			-0.011
			(0.005)**
Constant	8.265	9.216	7.245
	(2.142)***	(2.361)***	(2.249)***
Observations	67	67	67
Adjusted R-squared	0.575	0.596	0.656

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.3 Gastil index included rather than the rule of law index

	Form of Government		Electoral system	
	(1)	(2)	(3)	(4)
initial income70	-1.465	-1.569	-1.384	-1.249
	(0.227)***	(0.325)***	(0.234)***	(0.333)***
resource abundance70	-1.755	-1.884	-10.379	-11.640
	(2.265)	(2.267)	(1.836)***	(1.925)***
openness	1.981	2.201	2.251	2.304
	(0.369)***	(0.445)***	(0.353)***	(0.424)***
invest7089	1.383	1.143	1.269	1.016
	(0.220)***	(0.401)***	(0.223)***	(0.397)**
avgastil7290	0.050	0.011	0.035	0.064
	(0.142)	(0.166)	(0.142)	(0.165)
change in tot	0.053	0.015	0.073	0.032
	(0.044)	(0.073)	(0.045)	(0.073)
non_dem	-0.651		-0.883	
	(0.572)		(0.573)	
non_dem_ra	-4.261		4.649	
	(2.937)		(2.590)*	
dem_pres	0.097	0.139		
	(0.438)	(0.440)		
dem_pres_ra	-8.318	-8.413		
	(2.935)***	(2.934)***		
dem_maj			-0.222	-0.582
			(0.391)	(0.414)
dem_maj_ra			6.467	9.477
			(2.423)***	(2.886)***
Constant	9.716	11.285	9.536	9.114
	(2.219)***	(2.969)***	(2.306)***	(3.103)***
Observations	90	58	90	58
Adjusted R^2	0.71	0.70	0.69	0.70

Note: Dependent variable is average annual growth in real GDP divided by the economically active population between 1970 and 1990 (*growth7090*). See Appendix A.2 for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.4 Instrumental-variable approach.

	(1) 1. Stage	(2) 2. Stage	(3) OLS	(4) 1. Stage	(5) 2. Stage	(6) OLS
Dep. var.	Non_parl	growth7090	growth7090	Non_parl	growth7090	growth7090
lsettler	0.18			0.19		
	(0.08)**			(0.10)*		
ra70		-1.28	-2.81		0.90	-3.19
		(6.03)	(2.24)		(4.97)	(2.20)
non_parl.		-1.69	0.11		-0.10	0.37
		(2.03)	(0.37)		(1.91)	(0.39)
non_parl_ra		-6.36	-6.85		-10.12	-6.20
		(7.40)	(2.60)***		(5.93)*	(2.75)**
Observations	44	44	73	34	34	57

Note: Second stage (column 2) *includes initial income70, resource abundance70, invest7089, openness, rule of law* and *change in tot*, in addition to the ones shown in Table A4. First stage (column 1) includes the same exogenous second-stage variables as column 2 and instrument as shown in column (1). Second stage (column 5) includes *initial income70, resource abundance70, invest7089, openness, institutional quality* and *change in tot*, in addition to the ones shown in Table A4. First stage (column 4) includes the same exogenous second-stage variables as column 5 and instrument as shown in column (4). Column (3) and (6) represent the corresponding OLS regressions. See Appendix A.2 for a precise definition of variables. The numbers in parentheses are standard errors. * Significant at 10%; ** significant at 5%; *** significant at 1%.

CHAPTER 4
CORRUPTION AND OIL: EVIDENCE FROM PANEL DATA

Corruption and Oil:Evidence from Panel Data[1]

Silje Aslaksen
Norwegian University of Science and Technology, N-7491, Trondheim, Norway
silje.aslaksen@svt.ntnu.no

Abstract

The past decade has seen exponential growth in cross-country studies on corruption. Some of these studies argue that issues of corruption may be particularly relevant in the context of natural resource abundance, as natural resource exploration is an extremely high rent activity likely to foster rent-seeking behavior. However, the existing cross-country literature suffers from omitted variable bias. This paper reexamines the effect of natural resource abundance on corruption using panel data as well as new measures of resource endowments. I find evidence indicating that both oil extraction and mineral income is associated with more corruption. This holds when controlling for country and time fixed effects. The adverse effect of oil on corruption is present both for democratic and nondemocratic countries, whereas minerals seem to be a problem for corruption only in nondemocratic regimes.

Keywords: Natural resources, corruption.

JELclassification: Q26; Q32; D73

1. Introduction

Sachs and Warner (1995) made a major contribution when they found a negative association between natural resource abundance and growth in a large cross-country study. A substantial number of papers since then have considered the natural resource curse hypothesis from different points of view. Ross (2001) and Collier and Hoeffler (2005)

[1] Helpful comments from Ragnar Torvik, Jørgen Juel Andersen, Bjarne Strøm and participants at seminars at the Department of Economics, Norwegian University of Science and Technology, are gratefully acknowledged.

focus on the negative associations between resource abundance and the stability and quality of the political system. From a qualitative angle, historians, political scientists, and economists generally agree that the presence of abundant natural resources (especially minerals) leads to rent-seeking behavior and corruption, thereby decreasing the quality of government (e.g. Auty, 2001; Leite and Weidmann, 1999; Isham *et al.*, 2005). For example, Sala-i-Martin and Subramanian (2003) find that corruption, weak governance, rent-seeking, plunder, etc. are a problem intrinsic to countries that own natural resources such as oil and minerals. Isham *et al.* (2005) argue that the problem is specific to what they call "point source" resources such as oil, minerals, and plantation crops, while natural resource exports that are "diffuse" do not seem to have the same consequences. According to Ross (2001), one explanation as to why oil might hinder democracy, is what he calls the rentier effect. The argument is that, when a government earns significant and direct ”rent” from a natural resource, it hinders the development of representative politics by removing the need to collect taxes effectively. When governments derive sufficient revenues from the sale of oil, they are likely to tax their population less heavily, and the public in turn will be less likely to demand accountability from, and representation in, their government.

The past decade has seen exponential growth in cross-country studies on corruption. Issues of corruption may be particularly relevant in the context of natural resource abundance, as natural resource exploration is an extremely high rent activity likely to foster rent-seeking behavior. Leite and Weidmann (1999) argues that the associated increase in rent-seeking opportunities may help to explain Sachs and Warner's (1995) paradoxical finding of a negative relationship between natural resource abundance and long-run economic growth. The problem arises from the possible effect of windfall gains on rent-seeking behavior. Theoretically, the effect of rents on corruption is ambiguous. Higher rents means that bureaucrats can extract more rents from firms they control, but it also means that it is more valuable for the public to avoid corruption and, thus, more likely that the public will try to control the bureaucrats (Ades and Di Tella, 1999). However, Ades and Di Tella states that there are indeed examples of a positive connection between rents and corruption:

> Consider, for example, the case of Nigeria in the 1970's. When compared to other, non-oil-producing countries in the region, like Togo, Nigeria provides what is almost a natural experiment for the hypothesis that rents cause corruption. After the oil shock, observers noted that Nigeria's oil income created extraordinary opportunities for corruption (1999, p. 982).

An article in The Economist (August 4, 1984) went so far as to observe:[2]

> Oil and corruption go together. Nigeria's oil account for about 80% of government revenue. The official price of crude increased 17-fold in eight years from about \$2 a barrel in 1973-4 to \$34 by the end of 1981. Nigeria went on construction and importing spree: Parties and party officials grew rich.

More recently, similar claims have been made for a broad group of countries. At the launch of the Transparency Internationals Corruption Perception Index 2004, Peter Eigen (Chairman, TI) said the following.

[2] This quotation is from Ades and Di Tella (1999, p.982).

> As the Transparency International Corruption Perception Index shows, oil-rich Angola, Azerbaijan, Chad, Ecuador, Indonesia, Iran, Iraq, Kazakhstan, Libya, Nigeria, Russia, Sudan, Venezuela and Yemen all have extremely low scores. In these countries, the oil sector is plagued by revenues vanishing into the pockets of western oil executives, middlemen and local officials (International Foreign Press Association, London, October 20, 2004).

He further stated: "In the Middle East and elsewhere, economies have become over-dependent on oil, and corruption is rifle". BBC news report on this launch with the headline "Oil wealth can cause corruption" (October 20, 2004).

Along similar lines Jeffrey D. Sachs state:

> [T]he data show that corruption is highest in oil and gas-producing countries. In general, natural resources like oil, gas, diamonds, and other precious minerals breed corruption, because governments can live off of their export earnings without having to compromise with their own societies. The natural resources are therefore not only a target of corruption but also an instrument of holding power. Many foreign companies, intent on cashing in, fuel the pathology of corrupt regimes by peddling in bribes and political protection (Daily Times, September 25, 2005).

Other minerals also generate substantial rents, and have in similar ways been accused of fueling corruption. The rents are largely captured by states via export taxes, corporate taxes, and state-owned enterprises. More than most industries, mining relies on a high level of public consent to continue its activities because states tend to exercise a significant degree of control over access to and exploitation of mineral resources. In the mining sector, large sums of money flow from mining companies to governments in the form of royalties, taxation, and other payments. Great discretionary power lies in the hands of those responsible for collecting and distributing these revenuers, as well as those who grant the license and monitor the operations at both the permitting and the operation phase (Collis and Lee, 2001).

In this paper, I examine the validity of the claim that natural resources, like oil and minerals, increase corruption. This question has been investigated by others (e.g. Sala-i-Martin and Subramanian 2003; Isham et al., 2005; Ades and Di Tella, 1999; Leite and Weidmann, 1999). I extend this literature in two ways. First, I use panel data, and second, I use different measures of resource endowments. Common among the existing literature is that they use export shares or export data to measure natural resource abundance. Over the past decade, a distinguished body of empirical literature has emerged in support of arguments that institutional form and quality are deeply embedded in history and geography[3]. This work suggests that combinations of climate (disease environment, rainfall levels, temperature), topography (soil and mineral quality, access to ports), and labor (degrees of scarcity) in the early colonial period interacted in different places with the profitability of natural resources. This in turn made it more or less necessary to build governance institutions geared toward controlling the domestic population by an expatriate minority. Countries where extractive institutions were initially laid down organized

[3] See, for example, Acemoglu *et al.* (2001, 2002, 2003) and Easterly and Levine (2002).

themselves in ways that reduce the likelihood that over time they would have either more diverse revenue (export) streams or more open political structures (Isham et al., 2005). If this is so, one could argue that attempts to measure (natural resource) export structures and institutional quality (corruption) in the late twentieth century, as is done in most cross country studies, are merely capturing paths of development laid down many decades ago. Therefore, in this paper I use natural resource variables that are (at least partly) unrelated to export structure. In this paper, natural resources are either measured as the unit rent (price less extraction costs) times the extracted amount (in gross national income) or simply as the extracted quantity per capita. In addition, this paper uses panel estimation to deal with the possibility of omitted variables. One concern is that earlier results reflect the influence of variables not included in the regressions that affect both corruption and export structure (natural resource abundance). I deal with this by controlling for country and time fixed effects in panel regressions covering the period 1982-1997 for up to 118 countries. Both cross-country estimation, and panel fixed-effects estimation indicate that minerals and oil are associated with more corruption in government. The adverse effect of oil on corruption is present both for democratic and nondemocratic countries, whereas mineral income seems to be a problem for corruption only in nondemocratic regimes.

The paper is organised as follows: Section 2 reviews the literature on natural resource abundance and institutions. Section 3 describes the dataset used and my empirical strategy. Section 4 presents the empirical results. Section 5 concludes.

2. Natural Resources and Institutional Quality

A number of papers over the past decade have argued that the natural resource environment influences different aspects of institutional quality. Ross (2001) use pooled time-series cross-national data from 113 countries between 1971 and 1997 and find that oil and non-fuel mineral wealth impedes democratization. Jensen and Wantechekon (2004) present empirical evidence suggesting a robust and negative correlation between the presence of a sizable natural resource sector and the level of democracy in Africa. They show that natural resource dependent economies are more likely to be authoritarian, exhibit higher levels of government spending, are associated with worse governance, and were more likely to lead to a breakdown in democracy after the third wave of democratic transitions in the 1990s. Auty and Gelb (2001) likewise concluded that point resources such as minerals, have a particularly strong association with destabilizing social tension, and Murshed (2003) suggests that point resources retard democratic and institutional development.

Bulte and Damania (2005) find that point resources are typically associated with less productive social institutions (lower government effectiveness and rule of law scores). Isham et al. (2005) compute four export indexes (manufactures; diffuse; point source; coffee and cocoa) to capture countries reliance on different sources of export revenues. They find that data on classification of export structure, controlling for other potential determinants of governance, shows that point source and coffee and cocoa exporting countries do poorly across an array of governance indicators, including corruption. Countries with natural resource exports that are diffuse are not found to have the same strong effect on governance indicators. Sala-i-Martin and Subramanian (2003) find that exports of fuel, natural gas, ores and minerals have a negative effect on growth via their deleterious impact on institutional quality, including corruption. They stress that the natural resource curse only holds for mineral, and particularly oil, abundance, and not agricultural products and food (all measured by their respective export shares). Leite and Weidmann (1999) use data on exports of fuel, minerals, agriculture and food products and find that the extent of corruption depends on natural resource abundance. Fuel and ores are consistently related to worse scores of corruption, whereas agriculture and food exports are associated with better scores. Ades and Di Tella (1999) use the proportion of total exports accounted for by fuels, minerals, and metals as a measure related to rents for domestic firms. They find that this variable is significantly related to more corruption for the period 1980-1983. When country and year fixed effects are included, the fuel and mineral export variable become insignificant. There is also evidence that natural resource abundance considerably increase the potential of violent civil conflict. For example Collier and Hoeffler (2002) show that natural resources increase the chances of civil conflict. Civil conflict, of course, is an extreme manifestation of institutional collapse, and this literature is therefore suggestive of a role for natural resources in affecting institutional quality more generally.

Although several authors support the view that natural resource abundance is a curse for institutional quality, there is no absolute consensus. Brunnschweiler and Bulte (2006) challenge the findings of the resource curse, and dispute that abundant resources lead to bad institutions or slow growth. Their finding is that the chain of causality is opposite to the traditional view: bad institutions are associated with high scores on the (Sachs and Warner) resource abundance indicator. Contrary to the result that resource abundant countries tend to suffer from worse institutions, they find that countries with certain institutional designs fail to develop significant non-resource sectors and thereby make themselves dependent on primary sector extraction. Properly accounting for resource wealth (as opposed to resource abundance) they find that resources are a blessing for both institutional and economic development. In addition, Brunnschweiler (2006) challenge the so-called resource curse. Using a new measure of resource endowment, natural capital per capita, she finds no evidence of a negative effect of natural resources on institutional quality.

3. Data and Econometric Specification

A common definition of public corruption is the misuse of public office for private gain. Corruption defined this way would capture, for example, the sale of government property by government officials, bribery and embezzlement of government funds (Svensson, 2005). Corruption is not the same as rent-seeking, although the terms are often used interchangeably. Measuring corruption across countries is a difficult task, both because of the secretive nature of corruption because of and the variety of forms it takes. No definition of corruption is completely clear-cut. Three types of corruption measures have been exploited in the literature. The first type, used initially by Knack and Keefer (1995) and Mauro (1995), is based on indicators of corruption assembled by private risk-assessment firms. Of these, the corruption indicator published in the International Country Risk Guide has become the most popular, because of better coverage across time and countries (Svensson, 2005). The second type is averages of ratings reported by a number of perception-based sources. The Corruption Perception Index produced by Transparency International is within this set. Third, Kaufmann *et al.* (2003) derive a complementary measure, Control of Corruption, based on a larger set of sources. They have a broader definition of corruption and include most cross-country indices reporting rankings of countries on some aspect of corruption. However, because corruption reflects an underlying institutional framework, different forms of corruption are likely to be correlated[4].

The emphasis in this paper is on public corruption. My measure of corruption (*corruption in government*) is the International Country Risk Guide (ICRG) corruption index, from the IRIS-3 dataset. This index has been used by Ades and Di Tella (1999), Persson et al. (2003), Leite and Weidmann (1999), and Svensson (2005) among others. It is released by Political Risk Services, a private think tank specializing in international political and economic country-risk assessment. The IRIS dataset was originally constructed in 1993 by Steve Knack and Philip Keefer for the IRIS Center at the University of Maryland, based on data obtained from the International Country Risk Guide. Knack produced subsequent issues of the data for an ongoing series of working papers from the IRIS Center. The IRIS-3 dataset contains data for the period 1982-1997. The index is based on the opinion of a pool of country analysts. Corruption in Government ranges in value from 0 to 6, with higher values indicating "better" ratings. Lower scores indicate "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".

The data on natural resources are from the World Development Indicators and the World Bank Adjusted Net Savings dataset (also called the genuine savings dataset). *Mineral rent*, *energy rent*, and *oil quantity* are from the World Bank's dataset on genuine savings (adjusted net savings). The dataset represents a comprehensive attempt to estimate the value of natural resource extraction. It covers 149 countries, both developed and developing, over the period 1970-2004. Energy rent consists of oil, gas and coal, whereas Mineral rent encompasses bauxite, copper, iron ore, lead, nickel, phosphate rock, tin, zinc, gold and silver. Both *mineral rent* and *energy rent* are measured as a percentage of Gross National Income (GNI). The value of natural resource extraction is generally computed as unit rent, that is price minus average extraction cost, times the amount of the resource extracted. For minerals, the unit rent is computed as the world price of the resource minus mining, milling, benefication, melting and transportation to port costs minus a normal return to capital. For oil, gas and coal, the unit rent is the world price minus lifting costs. For some resources, such as natural gas, where, strictly speaking, there is no single world price, a shadow world price is computed as the average free-on-board price from several points of export.

Compared with the commonly used primary exports variable the data have a number of advantages. First, rents from production represent a more comprehensive measure of the relative economic importance of natural resources than export, for judging arguments about state capacity. Natural resources can be harmful to state capacity because of the

[4]The correlation between Control of Corruption (from 2002) and the Corruption Perceptions Index (from 2003) is 0.97, and the correlation between Control of Corruption or the Corruption Perceptions and the corruption scores from the International Country Risk Guide (from 2001) is 0.75 (Svensson, 2005).

enormous rents they generate, so it might be better to measure these rents directly, rather than indirectly with exports data. Second, the data are explicitly focused on a clear set of natural resources (de Soysa and Neumayer, 2005).

Oil quantity is measured as the oil production volume (in metric tons) per capita. The *oil quantity* variable has two advantages compared with the *energy rent* variable. First, it is not directly related to GDP and hence is less likely to be subject to the reverse causality of corruption causing changes in gross domestic product. Second, in a world with big changes in the oil price, the value of resource extraction might be a poor measure of the activity in the resource sector. An expanding resource sector, new discoveries, new participants entering the sector and new licenses being issued, might be important when determining corruption. The *oil quantity* variable, in its original form, only contains values for oil-extracting countries. Countries that do not produce oil have missing values for this variables. Therefore, for some countries it is unclear whether *oil quantity* is zero or actually missing. I follow two different approaches to deal with this potential problem. First, I replace the missing value with zero, if the *energy rent* variable is not missing. By definition the *energy rent* variable consists of oil, gas and coal, and if this variable is not missing, then I interpret that *oil quantity* also is not missing and equal to zero. Second, in some specifications I include the *oil quantity* variable in its original form, and hence only include countries that do extract oil.

The third category of natural resources, *agriculture*, is from the World Development Indicators. *Agriculture* represent agriculture, value added (% of GDP). Agriculture value added corresponds to ISIC divisions 1-5, and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3.

Earlier empirical work has identified a number of economic variables correlated with corruption. To take account of economic development, I consider the logarithm of GDP per capita, *lgdp*. GDP per capita is gross domestic product divided by midyear population. Data are in constant 2000 U.S. dollars and obtained from the World Development Indicators.

Restricted market and political competition has been suggested to influence corruption (e.g. Djankov et al., 2002; Svensson, 2005; Leite and Weidmann, 1999). Earlier literature has suggested that trade restrictions generate rents and rent-seeking activities, e.g. attempts to evade tariffs, efforts at premium seeking when agents compete for premium-fetching licenses, revenue seeking when agents try to appropriate a share of revenues from import restrictions, and tariff seeking when agents lobby for protectionist tariffs (Leite and Weidmann, 1999). Thus, the degree of openness to foreign trade should be a factor in determining the level of rent-seeking activities, or the extent of corruption. Variables that capture restrictions in the marketplace include openness to external competition from imports (Ades and Di Tella, 1999) and the extent of regulation of entry of start-up firms (Djankov et al., 2002). I include two measures of openness, *trade* and *import*. *Trade* is defined as the sum of exports and imports, and *import* is the value of all goods and other market services received from the rest of the world, both are measured as percentage of GDP. To account for the extent of regulation of entry, I include the number of business days it takes to obtain legal status (*days to obtain legal status*). This is a measure of the time it takes to obtain legal status to operate a firm in 1999, in business days (a week has five business days and a month has 22) (the data are taken from Djankov et al., 2002)[5]. On the political side, a free press provides greater information than a government-controlled press to voters on government and public sector misbehavior, including corruption (Besley and Burgess, 2002). To account for press freedom, I include the freedom of media index (*freedom of media*). The freedom of media index is the score of four criteria "Laws and regulations that influence media content", "Political pressures and controls on media content", Economic influence over media content", and "Repressive actions" for print and broadcast media. Higher scores indicate less press freedom (data are from Freedom House). Svensson (2005) shows that corrupt countries have significantly lower levels of human capital stock, proxied by years of schooling of the total population older than 25 years. To take account of human capital, I consider years of schooling of the total population older 25 years in 1985 (*schooling*). Data on years of schooling are from Barro and Lee (2000). Swamy et al. (2001) show, using cross-country data, that corruption is less severe where women hold a larger share of parliamentary seats and senior positions in the government bureaucracy, and comprise a larger share of the labor force. To control for the gender effect, I include the female labour force participation rate (*female participation rate*). Data on female labour force participation are from Neumayer (2005).

Democratic countries might have better systems of checks and balances to fight corruption and the misuse of power. Moreover, in democratic countries, voters can hold their elected representatives accountable at the polls and punish corruption and misbehavior of their representatives. In nondemocratic countries, this is not the case. The nature and determinant of corruption might therefore be different in democracies and non-democracies. To capture the possibility that corruption might be determined differently in democracies and nondemocracies, I include a variable that indicates whether the country is democratic (*dem*). The democracy variable is a binary variable equal to 1 if the country was considered democratic in 1982 (the first year in my panel data), and 0 otherwise. Countries are considered democratic if the Polity score of democracy was strictly positive in 1982[6]. The score of democracy is computed by subtracting the institutional autocracy score from the institutional democracy score. Data are taken from the Polity IV Project. In some specifications I include the score of democracy (*PolityIV*), instead of a binary variable to account for the level of democracy. Ades and Di Tella (1999) argue that the amount of monitoring by civil society might be relevant for corruption. One variable that captures the ability of civil society to judge government performance in a country is the index of political rights (*Political Rights*). This variable is published by Freedom House and measures the respect for political rights that facilitate the functioning of independent political parties. Political rights enable people to participate freely in the political process, including through the right to vote, compete for public office, and elect representatives who have a decisive impact on public policies and are accountable to the electorate. The index varies from 1 to 7, with low values associated with greater

[5]Svensson (2005) shows that the (log of) number of business days to obtain legal status is positively correlated with corruption.

[6]This definition is used by Persson and Tabellini (2003) among others. The Polity IV Data can be obtained from http://www.cidcm.umd.edu/inscr/polity/index.htm.

political rights.

I follow two different strategies in order to investigate the correlation between natural resources and corruption. I start out with a simple OLS specification of the following form:

$$y_i = \alpha + \beta x_i^l + u_i \tag{1}$$

Countries are indicated by i; y is the average corruption rate between 1982 and 1997; x' is a vector of explanatory variables; and β is the corresponding vector of coefficients to be estimated. Next, I formulate a fixed-effects panel data model. All unobserved time-invariant influences captured by the country fixed effects, and common cycles are controlled for by time fixed effects.

$$y_{it} = \alpha + \beta x_{it} + \mu_i + \eta_t + u_{it} \tag{2}$$

Again countries are indicated by i; time is indicated by t; y is corruption; x' is a vector of explanatory variables; β is the corresponding vector of coefficients to be estimated; μ represent individual country effects, capturing cultural and other time-invariant factors; η and represent time fixed effects. The fixed-effects estimator is based on the time variation within each cross-sectional unit only. Exploiting the time variation in the data provides additional information, because it allows me to relax the assumption of conditional independence underlying the cross-sectional estimates. Specifically, (non time-varying) omitted variables jointly determining corruption levels and the rate of natural resource extraction are unlikely to cause problems in this panel. Although time variation does not guarantee exogeneity, the fixed-effects estimation provides useful information (and a check on the cross-section estimation) regarding the correlation between corruption and natural resources. The panel estimation allows me to determine if the correlation between of corruption and natural resources hold when controlling for country and year fixed effects, or if they are primarily because of omitted variables. For some of the variables described above, there is no variation across time, and hence they are only included in the cross-country estimation.

4. Results

My first regression results are reported in Table 1, which presents the results using the average corruption index between 1982 and 1997 as the dependent variable, with a high score, on a 0-6 scale, indicating less corruption.

Column (1) reports the correlation between corruption and the three measures of natural resource income. All three measures of natural resource income are associated with more corruption. When economic controls (*lgdp)* and openness variables *(import, trade*) are included, *agriculture* is no longer statistically significant. Richer countries have lower corruption, consistent with the theories of corruption that argue that institutional quality is shaped by economic factors. Neither of the two measures of trade openness (*import* and *trade)* is significantly related to corruption, indicating that there is no evidence that regulations on foreign trade generate corruption. Column 4 shows that democratic countries are less corrupt, but including a dummy variable for democracy does not significantly change any of the other parameter estimates. Less *freedom of*

Table 1: Cross-Country Regressions

	1	2	3	4	5	6	7	8
energy rent	-0.061	-0.067	-0.070	-0.055	-0.041	-0.037	-0.034	-0.130
	(0.014)***	(0.010)***	(0.009)***	(0.010)***	(0.011)***	(0.013)***	(0.012)***	(0.103)
mineral rent	-0.137	-0.071	-0.071	-0.070	-0.079	-0.067	-0.078	-0.111
	(0.053)**	(0.037)*	(0.038)*	(0.035)*	(0.035)**	(0.038)*	(0.031)**	(0.038)***
agriculture	-0.060	0.005	0.005	0.002	-0.006	0.012	0.004	-0.019
	(0.009)***	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)	(0.017)	(0.020)
lgdp		0.725	0.719	0.597	0.424	0.453	0.502	0.227
		(0.154)***	(0.153)***	(0.169)***	(0.179)**	(0.212)**	(0.164)***	(0.163)
import		0.006		0.004	0.001	0.012	0.011	0.016
		(0.006)		(0.008)	(0.007)	(0.007)*	(0.007)	(0.010)
trade			0.003					
			(0.003)					
dem				0.480	0.177	0.247	0.244	0.327
				(0.236)**	(0.299)	(0.336)	(0.289)	(0.353)
freedom of media					-0.016	-0.004	-0.001	0.002
					(0.007)**	(0.008)	(0.008)	(0.009)
schooling						0.160	0.109	0.129
						(0.087)*	(0.079)	(0.152)
female participation rate							0.032	0.031
							(0.011)***	(0.012)**
days to obtain legal status								-0.004
								(0.007)
r2	.4384	.6113	.6112	.6162	.6397	.6853	.7356	.8015
Countries	83	83	83	81	81	71	71	49

NOTE: OLS estimated. Dependent variable is the average score of "corruption in government" 1982-1997. Energy, mineral, Agriculture, lgdp, import and trade are measured in 1972 (10 years prior to the corruption scores). Countries are classified as democratic (dem=1) if the polity score was strictly positive in 1982. Press freedom is measured in 1994, average years of schooling is measured in 1995, the female participation rate is measured in 1983 whereas days to obtain legal status is from 1999. Robust standard errors in parenthesis. * Significant at 10%; ** significant at 5%; *** significant at 1%.

media is associated with more corruption (column (5)) and higher *schooling* is associated with less corruption (column (6)). A higher *female participation rate* is associated with less corruption in government (column (7)) whereas *days to obtain legal status* is not statistically significant (column (8)). *Energy rent* is statistically significant and related to worse corruption scores in column (1) to (7). In column (8), the effect is no longer statistically significant, but this is probably because of the drop in the number of countries in this specification. Columns (1) to (7) indicate that an increase in *energy rent* by one standard deviation (7.46) is associated with a reduction in the corruption score of about 0.25 to 0.52, which correspond to a worsening of the corruption index of about 19.08 to 39.69 percent of a standard deviation. In the full model specification, including all variables, the only two variables that remain statistically significant are *mineral rent* and the *female participation rate*. An increase in *mineral rent* by one standard deviation (3.29), is associated with a reduction in the corruption score of about 0.22 to 0.41, which correspond to a worsening of the corruption index of about 16.78 to 31.30 percent of a standard deviation.

As discussed earlier, cross-country evidence, such as that of Table 1 and in the earlier literature on natural resources and corruption, has a number of shortcomings. It may be problematic to base inference on variation between countries if cross-section heterogeneity is large, as is clearly the case in this setting. Panel data have both time series and cross-sectional variation, unlike cross-section data. There are a number of benefits of panel data. Because there are multiple observations per year, one can remove year fixed effects. Thus, any unobserved shocks that affect the entire world (e.g., changes in oil price or technology) can be controlled for. Similarly, country fixed effects can be included in the analysis so that comparisons are not made across countries, but only using within-country deviations over time. Again, this allows one to control for differences across countries that are not easily quantified. Norway and the United Arab Emirates are clearly very different countries, and they differ along so many dimensions that it is likely to be very difficult to capture the differences fully using typical covariates. With panel data, country fixed effects eliminate anything consistent about a country over time, only time-varying characteristics need to be taken into account. Although there is nothing explicitly causal about panel data estimates, by eliminating these important sources of omitted variables, one may obtain coefficients that come closer to representing a causal impact.

Panel data also have weaknesses. By including country and year fixed effects, only the short-term relationship between the variables will be reflected in the parameter estimates. If there is a high degree of correlation in variables over time, there will be little remaining variation with which to identify the coefficients. Table 2 displays the summary statistics for the panel data. As seen from Table 2, there is more variation between countries than within countries. Corruption in government ranges from 0 to 6. The within standard deviation of corruption is about 25 percent of the overall standard deviation in corruption. The energy rent variable varies between 0 and 53.847 (the maximum level of 53.857 is for Qatar, 1984). The within standard deviation of energy rent is about one-third of the overall standard deviation in energy rent. The mineral rent variable varies between 0 and 57.999 (the maximum level of 57.999 is for Namibia, 1988). The within standard deviation of mineral rent is about 50 percent of the overall standard deviation in mineral rent. The oil quantity variable varies between 0 and 59.804 (the maximum level

Table 2: Descriptive Statistics Panel Data

	Variable	Mean	Std.Dev	Min	Max	Obs	Variable	Mean	Std.Dev	Min	Max	Obs
overall	corruption	3.362	1.472	0.000	6.000	N = 1941	import	36.084	21.569	1.349	153.918	N = 1826
between	in government		1.325			n = 129			19.747			n = 123
within			0.600			T = 15.05			8.067			T = 14.85
overall	energy rent	5.323	10.713	0.000	53.857	N = 1855	trade	68.585	42.171	2.153	294.651	N = 1826
between			10.324			n = 123			39.209			n = 123
within			3.397			T = 15.08			13.872			T = 14.85
overall	mineral rent	1.215	3.982	0.000	57.999	N = 1854	polityIV	1.080	7.642	-10.000	10.000	N = 1871
between			4.050			n = 123			6.763			n = 120
within			2.033			T = 15.07			3.564			T = 15.59
overall	oil quantity	2.461	7.783	0.000	59.804	N = 1969	political	3.802	2.228	1.000	7.000	N = 1962
between			7.604			n = 127	rights		2.024			n = 125
within			1.781			T = 15.50			0.943			T = 15.67
overall	agriculture	17.816	14.725	0.116	69.325	N = 1740	oil	18.842	16.664	1.853	83.317	N = 176
between			14.657			n = 120	production		15.971			n = 11
within			3.372			T = 14.50			6.669			T = 16
overall	lgdp	7.666	1.614	3.799	10.605	N = 1867	ceiling	18.550	16.745	2.800	80.340	N = 174
between			1.597			n = 121	allocation		16.009			n = 11
within			0.165			T = 15.43			6.610			T = 15.82

of 59.804 is for Qatar, 1984). The within standard deviation of oil quantity is about 25 percent of the overall standard deviation in oil quantity. The agriculture variable varies between 0.116 and 69.325 (the maximum level of 69.325 is for Somalia, 1988). The within standard deviation of agriculture is about 25 percent of the overall standard deviation in agriculture.

Using panel data, inference can be based on variation across countries and/or variation within countries. There are good arguments for relying primarily on the latter. Inherent features of different countries that affect corruption in government, which are not captured in any of the included regressors yield biased estimates. Inference based on within country variation is less likely to be subject to omitted variable bias. The problem with the within country approach is that resource environment vary considerably more across countries than within countries. Thus basing inference purely on within country variation removes a lot of the variation in the data. Statistically, fixed effects are always a reasonable thing to do with panel data. Random effects estimation might be more efficient, and therefore random effects is preferable if it is statistically justifiable to do so[7].

Using my unbalanced panel data, I am able to include more countries than the cross-country estimation. Column (1) of Table 3 reproduces the cross-country results with period averages for the same countries that where included in the baseline estimation of Table 1. I include this specification to make sure that any change in results from the cross-country estimation is not primarily because of the inclusion of more countries. Column (2) reports the fixed effect results on corruption in government, including only natural resources for the same countries that where included in the baseline specification of Table 1. As seen from column (2) only *mineral rent* is statistically significant. Column (3) repeats the specification of column (2), but includes all countries with non-missing observations for at least two years. As seen from column (3) the results do not change considerably when including all countries. Columns (4) and (5) indicate that the openness variables and income level are not associated with less corruption in government. Columns (6) and (7) include controls for the level of democracy and political rights. Not surprisingly, a higher democracy score is associated with better ratings of corruption. When period fixed effects are included, the only variable that remains statistically significant is mineral rent (Column (8)). I have also tried to estimate the model with a random-effects estimator (result not shown). Results on the resource environment are generally rather similar to the fixed-effects model, but the Hausman test results rejects the random-effects assumption.

In all specifications in Table 3, *mineral rent* is statistically significantly correlated with corruption scores. A one (within country) standard deviation increase in mineral rent (2.03) corresponds to an reduction of the corruption score of about 0.05, which is equivalent to a worsening of the corruption index of about 8.33 percent of a (within country) standard deviation. Surprisingly, *energy rent* is not statistically significant in any of the specifications of Table 3. What does this mean? Is energy production really unrelated to corruption within countries, or is it the case that the value of energy production in GNI is a poor measure for determining the effect on corruption. In real terms, the oil price drastically decreased in the period 1982-1997, with the exception of a price peak in 1991

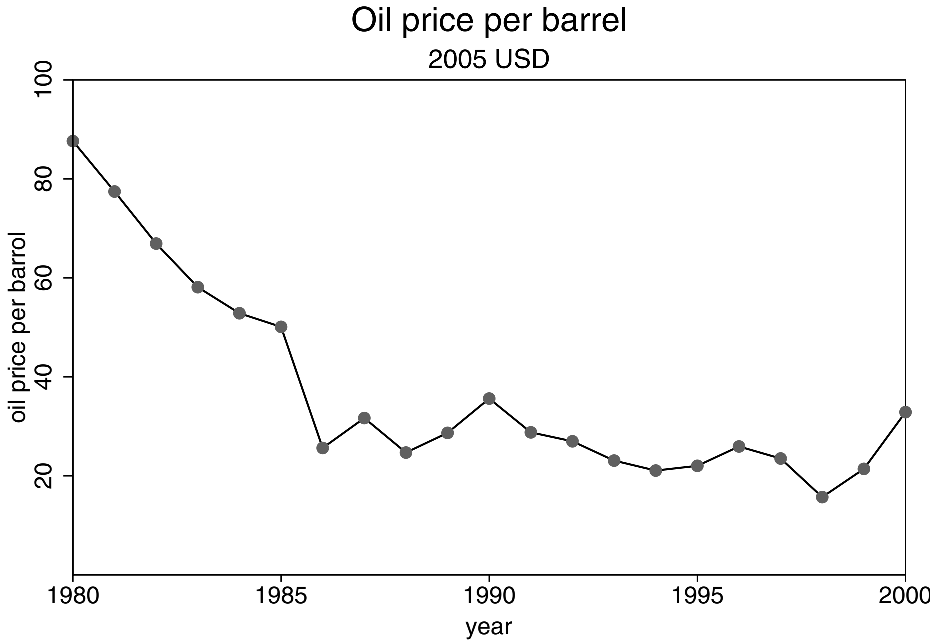
[7] Random effects (RE) are only displayed when the Hausman test results does not reject the random-effect assumption

Table 3: Panel Data Estimates

	BE	FE	FE	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
energy rent	-0.054	-0.004	-0.001	-0.002	-0.003	-0.001	-0.001	0.005
	(0.011)***	(0.013)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)
mineral rent	-0.090	-0.032	-0.034	-0.033	-0.034	-0.030	-0.029	-0.028
	(0.040)**	(0.017)*	(0.015)**	(0.014)**	(0.014)**	(0.014)**	(0.015)**	(0.016)*
agriculture	-0.069	-0.001	-0.009	-0.009	-0.009	-0.008	-0.007	-0.005
	(0.009)***	(0.013)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)
lgdp				-0.035	-0.050	0.009	-0.016	-0.106
				(0.300)	(0.298)	(0.312)	(0.324)	(0.342)
import				0.005		0.002	0.002	0.001
				(0.003)		(0.003)	(0.003)	(0.004)
trade					0.003			
					(0.002)			
polity IV						0.021	0.032	0.019
						(0.011)*	(0.014)**	(0.014)
political rights							0.054	0.024
							(0.045)	(0.044)
Year fixed effects	No	No	No	No	No	No	No	Yes
r2_w	0.002	0.006	0.009	0.013	0.013	0.031	0.035	0.065
r2_o	0.422	0.120	0.206	0.105	0.081	0.359	0.269	0.004
Countries	83	83	118	116	116	108	107	107
Observations	1260	1260	1620	1599	1599	1518	1502	1502

Note: Dependent variable is yearly CORRUPTION IN GOVERNMENT". Between effects (BE) and Fixed effects (FE). A constant term is included in all specifications (not reported). In the FE model, Huber robust standard errors are in parentheses and regression disturbance terms are clustered at the country level. The symbols ***, ** , and * denote significant at the 1%, 5%, and 10%, respectively.

Figure 1: Crude Oil Price per Barrel 1980 - 2000



with the invasion of Kuwait. Figure 1 displays the crude oil prices per barrel from 1980 to 2000 in 2005 U.S. dollars[8].

A lot of the within country variation in energy rent is because of the change in the oil price in this period, and the trend is quite similar for all countries that produce oil. Revenues from energy production is therefore not a good proxy for energy production. With the oil price varying so much in this period, many countries will be measured to be less energy intensive, even if production has increased quite a lot in this period. It is plausible that the size of the oil sector, the number of participants in the energy sector, and the extracted quantity, is important when determining the effect on corruption. It seems reasonable that a falling oil price will not necessarily reduce corruption, if the size of the sector is unchanged or increasing. I therefore include the quantity of oil extracted per capita instead of energy rent. The results are displayed in Table 4.

Contrary to the energy rent variable, oil quantity per capita is associated with more corruption in government. A one (within country) standard deviation increase in *oil quantity* (1.78) corresponds to an worsening of the corruption score of about 0.05, which is equivalent to about 8.33 percent of a (within country) standard deviation. The results for the other variables are similar to the results in Table 3. Again the Hausman test results rejects the random-effect assumption (results not shown). I have deleted one country at

[8]The oil price data are from BP Statistical Review of World Energy 2006.
http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/publications/energy_reviews_2006/STAGING/local_assets/downloads/spreadsheets/statistical_review_full_report_workbook_2006.xls

Table 4: Panel Data Estimates, Oil Quantity

	(1)	(2)	(3)	(4)
oil quantity	-0.025	-0.025	-0.031	-0.031
	(0.010)**	(0.010)**	(0.011)***	(0.011)***
mineral	-0.029	-0.029	-0.027	-0.027
	(0.015)*	(0.015)**	(0.016)*	(0.016)*
agriculture	-0.007	-0.007	-0.005	-0.005
	(0.011)	(0.011)	(0.011)	(0.011)
lgdp	0.031	0.024	-0.073	-0.076
	(0.328)	(0.326)	(0.345)	(0.344)
import	0.002		0.001	
	(0.003)		(0.004)	
trade		0.001		0.001
		(0.002)		(0.002)
polity IV	0.033	0.033	0.018	0.018
	(0.014)**	(0.014)**	(0.014)	(0.014)
political rights	0.057	0.056	0.024	0.024
	(0.044)	(0.044)	(0.044)	(0.043)
Year fixed effects	No	No	Yes	Yes
r2_w	0.039	0.039	0.070	0.070
r2_o	0.278	0.267	0.015	0.013
Countries	107	107	107	107
Observations	1502	1502	1502	1502

Note: Fixed effects (FE) estimates. Dependent variable is yearly CORRUPTION IN GOVERNMENT". A constant term is included in all specifications (not reported). Huber robust standard errors are in parentheses. Regression disturbance terms are clustered at the country level. The symbols ***, ** , and * denote significant at the 1%, 5%, and 10%, respectively.

a time using the full model specification of column (3) to make sure that the results are not driven by one single country. The lowest absolute value of the estimated effect of oil quantity is -0.0236 (when dropping Gabon) and the highest absolute value of the estimated effect of oil quantity on corruption is -0.0396 (when dropping Norway).

As mentioned earlier, there are reasons to believe that the determinant of corruption might be different in democracies and nondemocracies. To capture the possibility that corruption might be determined differently in democracies an non-democracies, I reestimate the model separately for non democratic countries and countries at different levels of democracy. Countries are classified as nondemocratic if the Polity score was zero or negative in 1982, countries are classified as having a medium level of democracy if the Polity score was strictly positive but lower that the maximum level of 10 in 1982, and countries are classified as having a high level of democracy if the Polity score was at the maximum level of 10 in 1982. The results are displayed in Table 5[9].

Among nondemocratic countries, neither income level, the openness variables or the political rights variable are statistically significant (column (1) and (2)). In nondemocratic countries, both oil quantity and mineral rent are associated with more corruption in government. Among countries at medium level of democracy, the only variables that are statistically significant are oil quantity and log of GDP per capita (columns (3) and (4)). The effect of oil quantity on corruption in government is larger in nondemocratic countries than in countries at a medium level of democracy. Among countries at high levels of democracy, none of the natural resource variables are statistically significant (columns (5) and (6)). Among countries at high levels of democracy, worse scores for political rights are associated with more corruption in government (significant at the 5% level).

Not all countries extract oil. As mentioned earlier the *oil quantity* variable, in its original form, only contains values for oil-producing countries. Up to this point, all countries have been included in the regression[10]. In Table 6, I include only oil extracting countries. Columns (1) and (2) indicate that, within countries that extract oil, a higher extraction quantity of oil is associated with more corruption in government. The results regarding *oil quantity* are similar to those obtained when including all countries.

One potential critique might be that oil quantity is determined by unobserved variables that correlate with corruption in government. One potential solution is to include only countries that where members of the Organization of the Petroleum Exporting Countries (OPEC). OPEC is a permanent, intergovernmental organization, created at the Baghdad Conference 1960, by Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. The five founding members were later joined by eight other members: Qatar (1961); Indonesia (1962); Socialist Peoples Libyan Arab Jamahiriya (1962); United Arab Emirates (1967); Algeria (1969); Nigeria (1971); Ecuador (1973 1992) and Gabon (1975 1994). OPEC's objective is to coordinate and unify petroleum policies among member countries. OPEC member countries coordinate their oil production policies to help stabilize the oil market and to help oil producers achieve a reasonable rate of return on their investments. The ministers of energy and hydrocarbon affairs meet twice a year to review the status of the international oil market and examine forecasts for the future to

[9] Table A2 displays the descriptive statistics separately for these three groups of countries.

[10] Missing values for *oil quantity* have been replaced by zero if the *Energy rent* variable is not missing (see section 3).

Table 5: Countries at different level of democracy

	Non democratic countries		Medium level of democracy		High level of democracy	
	(1)	(2)	(3)	(4)	(5)	(6)
oil quantity	-0.0429	-0.0437	-0.3015	-0.3118	-0.0060	-0.0072
	(0.0186)**	(0.0189)**	(0.1277)**	(0.1286)**	(0.0100)	(0.0097)
mineral rent	-0.0498	-0.0502	0.0402	0.0436	-0.0668	-0.0637
	(0.0140)***	(0.0140)***	(0.0246)	(0.0259)	(0.0590)	(0.0564)
agriculture	-0.0007	-0.0007	-0.0195	-0.0202	-0.0706	-0.0705
	(0.0121)	(0.0120)	(0.0135)	(0.0126)	(0.0443)	(0.0441)
lgdp	0.4935	0.4888	-0.9824	-0.9148	0.6692	0.7575
	(0.4747)	(0.4726)	(0.3786)**	(0.3637)**	(1.1172)	(1.0637)
import	0.0019		-0.0014		-0.0067	
	(0.0040)		(0.0079)		(0.0185)	
political rights	-0.0106	-0.0100	0.0272	0.0286	-0.1537	-0.1645
	(0.0452)	(0.0455)	(0.0536)	(0.0536)	(0.0878)*	(0.0925)*
trade		0.0016		-0.0032		-0.0070
		(0.0023)		(0.0049)		(0.0086)
r2_w	0.128	0.129	0.138	0.142	0.181	0.187
r2_o	0.066	0.064	0.117	0.105	0.368	0.362
Countries	61.000	61.000	21.000	21.000	22.000	22.000
Observations	806.000	806.000	331.000	331.000	345.000	345.000

Note: Fixed effects (FE) estimates. Dependent variable is yearly CORRUPTION IN GOVERNMENT". A constant term and period fixed effects are included in all specifications (not reported). Huber robust standard errors are in parentheses. Regression disturbance terms are clustered at the country level. The symbols ***, ** , and * denote significant at the 1%, 5%, and 10%, respectively.

Table 6: Oil Extracting Countries

	All Oil Extraction Countries		OPEC members
	(1)	(2)	(3)
oil quantity	-0.0236	-0.0291	-0.0493
	(0.0113)**	(0.0119)**	(0.0149)**
Year fixed effect	No	Yes	No
r2_w	0.062	0.094	0.332
r2_o	0.007	0.007	0.157
Countries	69	69	9
Observations	964	964	117

Note: Fixed effects (FE) estimates. Dependent variable is yearly CORRUPTION IN GOVERNMENT". A constant term, mineral rent, lgdp, import, polity IV and political rights are included in all specifications (not reported). Huber robust standard errors are in parentheses. Regression disturbance terms are clustered at the country level. The symbols ***, ** , and * denote significant at the 1%, 5%, and 10%, respectively.

agree on appropriate actions that will promote stability in the oil market (OPEC‘s official homepage, http://www.opec.org.). One could argue that oil production within individual OPEC member countries is less endogenous to omitted variables than oil production in other countries. At least in theory, individual OPEC members are restricted by quotas. Although OPEC member countries have been cheating on their quotas, the quotas are subject to some external (to the individual country) control. Column (3) includes only countries that where members of OPEC during the whole period.

For OPEC countries, one could push the exogeneity issue one step further. OPEC's Annual Statistical Bulleting release crude oil ceiling allocations for OPEC members (in thousands of barrels per day), together with actual crude oil production (in thousands of barrels per day). Ceiling allocation is a valid instrument for oil quantity (oil production) if it is correlated with oil quantity (oil production) but uncorrelated with corruption in government: ceiling allocation should affect corruption in government only through actual oil quantity (oil production). In Table 7, variation in ceiling allocation, as captured in current and lagged values, is used as an instrument for oil quantity (oil production) in the first stage, with other country characteristics controlled for. Again, oil quantity is associated with more corruption in government. Current values of ceiling allocation are statistically significantly correlated with oil production, and according to the Sargan tests, we cannot reject that the instruments are uncorrelated with the errors, implying the validity of the instruments.

Could the results obtained so far be driven by atypically high or low values in any one single year? I repeat the regressions using three-year averages of the dependent and all independent variables for the period 1983-1997 to reduce the impact of atypically high or low rates in any one single year. Because inference is based on within country variation, countries are dropped if there is less than two observations for that specific country (Czech Republic, Oman, Slovakia, Korea, Mongolia, and Sudan are dropped in

Table 7: OPEC Members

	Fixed-effect	Fixed-effects IV regression		Fixed-effect	Fixed-effects IV regression	
		1.stage	2.stage		1.stage	2.stage
	(1)	(2)	(3)	(4)	(5)	(6)
Ceiling Allocation		0.2616			1.1093	
		(0.0729)***			(0.0638)***	
Ceiling Allocation_lag		-0.0329			-0.1328	
		(0.0716)			(0.0626)**	
Oil quantity	-0.0493		-0.0789			
	(0.0171)***		(0.0322)**			
Oil production				-0.0163		-0.0185
				(0.0082)**		(0.0076)**
Countries	9	9	9	9	9	9
Observations	117	108	108	117	108	108
r2_w	0.332	0.371	0.407	0.305	0.918	0.407
r2_o	0.157	0.660	0.152	0.145	0.841	0.130
Sargan statistic (over identification test of all instruments)			2.513			2.547
Chi-sq(1) P-val			0.1129			0.1105

Note: Dependent variable in column (1), (3), (4), and (6) is yearly *CORRUPTION IN GOVERNMENT*. Dependent variable in column (2) is *oil quantity* and dependent variable in column (5) is *oil production*. The instrumental variable specification is estimated using the xtivereg command in Stata. A constant term, lgdp, import, polityIV and political rights are included in all specifications (not reported). Standard errors are in parentheses. The symbols ***, ** , and * denote significant at the 1%, 5%, and 10%, respectively.

Table 8). The results are displayed in Table 8.

In the random-effects model, oil quantity, mineral rent, income level and the female participation rate are statistically significant with expected signs. When period fixed effects are not included, the mineral rent variable and the female participation rate variable are statistically significant at 10% (columns (2) and (3)), but these variables become statistically insignificant when period fixed effects are included (columns (4) and (5)). In the full model specification, with country and year fixed effects included (columns (4) and (5)), the only variable that is statistically significant is oil quantity. These results indicate that at least the effect of oil on corruption is not driven by atypically high values in any one single year. Columns (6) and (7) only includes countries that extract oil. Within countries that extract oil, higher extraction quantities are associated with worse scores of corruption in government (significant at the10% percent level).

5. Conclusion

This paper has presented new empirical results on natural resource abundance and corruption. The main lesson of the data is that corruption is affected by the resource environment. Evidence from a cross section of countries shows that both oil extraction and mineral income are associated with more corruption in government, whereas agricultural production is not significantly related to corruption. In both the cross-section analysis and controlling for country and time fixed effects, I find that, other things equal, oil and minerals are associated with more corruption. The adverse effect of oil on corruption is present both for countries at medium levels of democracy and nondemocratic countries, whereas minerals are a problem only in nondemocratic regimes. Within countries at the highest level of democracy, corruption in government is unaffected by the resource environment. As pointed out by Isham *et al.* (2005) these results might be stultifying for policymakers. It is hard to imagine how a policymaker interested in fighting corruption can change what is identified here as one possible cause of high corruption. Optimistic and constructive proposals can be found, however, such as those made by *The Economist* (2003) and Sala-i-Martin and Subramanian (2003), among others. They suggest making publicly available all revenues and expenditures associated with natural resource rents. This is a necessary first step towards a more accountable system for the management of revenues in resource-rich countries.

Table 8: Panel Estimation. Three Year Averages.

	All Countries					Oil Producing Countries	
	RE	FE	FE	FE	FE	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
oil quantity	-0.035	-0.038	-0.040	-0.041	-0.043	-0.037	-0.042
	(0.011)***	(0.017)**	(0.018)**	(0.018)**	(0.019)**	(0.020)*	(0.022)*
mineral rent	-0.041	-0.047	-0.048	-0.044	-0.044	0.011	0.031
	(0.021)**	(0.027)*	(0.027)*	(0.030)	(0.031)	(0.045)	(0.052)
agriculture	0.002	-0.007	-0.007	-0.003	-0.003	-0.019	-0.015
	(0.009)	(0.015)	(0.014)	(0.015)	(0.015)	(0.021)	(0.021)
lgdp	1.232	-0.105	-0.148	0.083	0.048	-0.538	-0.392
	(0.212)***	(0.883)	(0.872)	(0.893)	(0.885)	(1.095)	(1.098)
import	0.004	0.007		0.006		0.003	0.002
	(0.004)	(0.005)		(0.005)		(0.008)	(0.008)
polity IV	0.014	0.012	0.012	0.007	0.007	0.038	0.027
	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.021)*	(0.020)
political rights	0.000	-0.002	-0.004	-0.012	-0.014	0.055	0.032
	(0.054)	(0.062)	(0.062)	(0.060)	(0.060)	(0.074)	(0.069)
female participation rate	0.036	0.036	0.038	0.015	0.017	0.027	-0.006
	(0.007)***	(0.023)	(0.023)*	(0.034)	(0.034)	(0.027)	(0.046)
trade			0.003		0.003		
			(0.003)		(0.003)		
Period fixed effects	No	No	No	Yes	Yes	No	Yes
	99	99	99	99	99	64	64
N	445	445	445	445	445	287	287
r2_w	0.060	0.071	0.069	0.096	0.095	0.081	0.115
r2_o	0.553	0.144	0.128	0.228	0.207	0.041	0.002
Hausman chi2(8)	6.37						
Prob>chi2	0.6063						

NOTE: Dependent variable is 3 years average of CORRUPTION IN GOVERNMENT". Fixed effects (FE) and random effects (RE). All independent and control variables are 3 year averages. A constant term is included in all specifications (not reported). Huber robust standard errors are in parentheses. Regression disturbance terms are clustered at the country level. The symbols ***, ** , and * denote significant at the 1%, 5%, and 10%, respectively.

References

Acemoglu, D., S. Johnson, and J.A. Robinson. (2001), “The Colonial Origins of Comparative Development: Am Empirical Investigation.” *American Economic Review* 91(5): 1369-1401.

Acemoglu, D., S. Johnson, and J.A. Robinson. (2002), “Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution.” *Quaterly Journal of Economics* 117(4):1231-1294.

Acemoglu, D., S. Johnson, and J.A. Robinson. (2003), “ An African Success Story: Botswana.” in Dani Rodrik ed. *Analytic Development Narratives*, Princeton; Princeton University Press

Acemoglu, D., J.A. Robinson and T. Verdier (2004), “Kleptocracy and divide-and-rule: a theory of personal rule.” *Journal of the European Economic Association* 2: 162-192.

Ades, A. and R. Di Tella (1999), “Rents, Competition and Corruption” *American Economic Review* 89(4): 982-993.

Auty, R. M. (1997), Natural resource endowment, the state and development strategy, *Journal of International Development* 9 (4): 651-663.

Auty, R. M. (2001), "The political economy of resource-driven growth", *European Economic Review* 45, 839-846.

Auty, R.M., and A.H. Gelb (2001). “Political Economy of Resource-Abundant States”, in R.M. Auty (ed.) *Resource Abundance and Economic Development*, 126-145, Oxford University Press.

Barro, R. J. and J-W. Lee (2000), "International Data on Educational Attainment: Updates and Implications". CID Working Paper No. 42.

Besley, T. and R. Burgess (2002), "The Political Economy of Government Responsiveness: Theory and Evidence From India", *Quaterly Journal of Economics* 117(4): 1415-1451.

Brunnschweiler, C. N. (2006), “Cursing the blessings? Natural resource abundance, institutions, and economic growth”, CER-ETH Working Paper 06/51.

Brunnschweiler, C. N. and E. H. Bulte (2006), “The Resource Curse Revisited and Revised: A Tale of Paradoxes and Red Herrings”, CER-ETH Working Paper 06/61.

Bulte, E. H. and R. Damania (2005), “Resource Intensity, Institutions, and Development” *World Development* 33(7): 1029-1044.

Collier, P. and A. Hoeffler (2002) “Greed and Grievance in Civil War”, Oxford University, Center for the Study of African Economies, Working Paper 2002-01.

Collier, P. and A. Hoeffler (2005), “Resource rents, governance, and conflict.” *Journal of Conflict Resolution* 49(4): 625-633.

Collis, G. and B. Lee (2001), “Meeting Report on Corruption Issues in the Mining and Mineral Sector”, Mining, Minerals and Sustainable Development Project no. 205. http://www.poptel.org.uk/iied//mmsd/mmsd_pdfs/corruption_issues_report.pdf

de Soysa, I., and E. Neumayer (2005), "Natural Resources and Civil War: Another Look with New Data", *Conflict Management and Peace Science* (forthcoming).

Djankov, S., R. La Porta, F. Lopez-de-Silanes and A. Shleifer (2002), "The Regulation of Entry", *Quaterly Journal of Economics*. 117(1): 1-37.

Easterly, W. and R. Levine (2002), “Tropics, Germs, and Crops: How Endowments Influence Economic Development.” *Journal of Monetary Economics* 50(1): 3-39.

The Economist (2003), “The Devil’s Excrement.” May 22.

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

Jensen, N. and L. Wantchekon (2004), “Resource Wealth and Political Regimes in Africa”, *Comparative Political Studies* 37(7): 816-841.

Kaufmann, D., A. Kray and M. Mastruzzi (2003) “Governance Matters III”, Policy Research Working Paper 3106, The World Bank.

Knack, S. and P. Keefer. (1995), “Institutions and Economic Performance: Cross-Country Tests Using Alternative Institutional Measures”, *Economics and Politics* 7(3): 207-27.

Leite, C. and J. Weidmann (1999), “Does mother nature corrupt? Natural resources, corruption, and economic growth”, IMF Working Paper No. 99/85.

Marshall, M. G. and K. Jaggers (2002a). “Polity IV Dataset”. [Computer file; version p4v2002] College Park, MD: Center for International Development and Conflict Management, University of Maryland.

Marshall, M. G. and K. Jaggers (2002b). “Polity IV Project. Dataset Users‘Manual”. Center for International Development and Conflict Management, University of Maryland.

Mauro, P. “Corruption and growth”. *Quarterly Journal of Economics* 110: 681-712.

Murshed, M. (2003), “When does natural resource abundance lead to a resource curse?” Mimeo, Institute of Social Studies, The Hague

Neumayer, E. (2005), "Inequality and Violent Crime: Evidence from Data on Robbery and Violent Theft", *Journal of Peace Research* 42(1): 101-112.

Persson, T.and G. Tabellini (2003), *The Economic Effect of Constitutions: What Do the Data Say?*, MIT Press.

Persson, T., G. Tabellini, and F.Trebbi (2003), “Electoral Rules and Corruption”. *Journal of European Economic Association* 1: 95-88.

Ross, M. L. (2001), "Does oil hinder democracy?", *World Politics* 53: 325-361.

Sachs, J. D. and A. M. Warner (1995), “Natural Resource Abundance and Economic Growth” NBER Working Paper No. W5398.

Sala-i-Martin, X. and A. Subramanian (2003) "Addressing the Natural Resource Curse: An Illustration from Nigeria," NBER Working Paper 9804 (June).

Svensson, J. (2005), "Eight Questions about Corruption," *Journal of Economic Perspective* 19(3): 19-42.

Swamy, A., St. Knack, Y. Lee and O. Azfar (2001), "Gender and Corruption," *Journal of Development Economics* 64(1): 25-55.

A.1 Variable Description

agriculture
Represent agriculture, value added (% of GDP). Agriculture value added corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3.
Source: World Development Indicators.

ceiling allocation
Crude oil ceiling allocations for OPEC members, in hundred thousand barrels per day. If there is more than one observation of ceiling allocation per year, I use the ceiling allocation that has applied for the longest time during that year.
Source: OPEC Annual Statistical Bulleting 2005.

corruption in government
Corruption index. The index is based on the opinion of a pool of country analysts. Corruption in Government range in value from 0-6, with higher values indicating "better" ratings. Lower scores indicate "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".
Source: International Country Risk Guide.

days to obtain legal status
A measure of the time it takes to obtain legal status to operate a firm, in business days (a week has five business days and a month has 22).
Source: Djankov et al., 2002

dem
Democracy variable. The democracy variable is a binary variable equal to one if the country was considered democratic in 1982, and zero otherwise. Countries are considered democratic if the Polity score of democracy was strictly positive in 1982.

energy rent
The value of oil, gas and coal extraction as percentage of Gross National Income (GNI). The value of natural resource extraction is generally computed as unit rent, that is price minus average extraction cost, times the amount of resource extracted. For oil, gas and coal, the unit rent is the world price minus lifting costs. For some resources, such as natural gas, where, strictly speaking, there is no single world price, a shadow world price is computed as the average free-on-board price from several points of export.
Source: World Development Indicators.

female participation rate
Female labour force participation rate.
Source: Neumayer (2005).

import
*T*he value of all goods and other market services received from the rest of the world, measured as percentage of GDP.
Source: World Development Indicators.

lgdp
The logarithm of GDP per capita. GDP per capita is gross domestic product divided by midyear population. Data are in constant 2000 U.S. dollars.
Source: World Development Indicators.

mineral rent
The value of bauxite, copper, iron ore, lead, nickel, phosphate rock, tin, zinc, gold and silver extraction as percentage of Gross National Income (GNI). The value of natural resource extraction is generally computed as unit rent, that is price minus average extraction cost, times the amount of resource extracted. For minerals, the unit rent is computed as the world price of the resource minus mining, milling, benefication, melting and transportation to port costs minus a normal return to capital.
Source: World Development Indicators.

oil production
Crude oil production, in hundred thousand Barrels per day.
Source: OPEC Annual Statistical Bulleting 2005.
http://www.opec.org/library/Annual%20Statistical%20Bulletin/interactive/FileZ/Main.htm

oil quantity
Oil production volume (in metric tons) per capita. Missing values have been replace with zero, if the *energy rent* variable is non missing. By definition the *energy rent* variable consists of oil, gas and coal, and if this variable is non missing, then I interpret that *oil quantity* also is non missing but zero.
Source: Oil production volume is from World Bank's data set on genuine savings (adjusted net savings), population is from World Development Indicators.

political rights
Index of political rights. The index measures the respect for political rights that facilitate the functioning of independent political parties. Political rights enable people to participate freely in the political process, including through the right to vote, compete for public office, and elect representatives who have a decisive impact on public policies and are accountable to the electorate. The index varies from 1 to 7, with low values associated with more political rights.
Source: Freedom House.

polityIV
Score of democracy. The score of democracy is computed by subtracting the institutional autocracy score from the institutional democracy score.
Source: The Polity IV Project.

press freedom
Freedom of media index. The freedom of media index is the score of four criteria "Laws and regulations that influence media content," "Political pressures and controls on media content," "Economic influence over media content," "Repressive actions" for print and broadcast media. Higher scores indicate less press freedom.
Source: Freedom House.

schooling
Average years of schooling of the total population aged over 25 in 1985.
Source: Barro and Lee (2000).

trade
The sum of exports and imports, measured as percentage of GDP.
Source: World Development Indicators.

Table A.1 Summary Statistics, Cross-Country Data

Variable	Obs	Mean	Std. Dev.	Min	Max
corruption in government	128	3.386	1.308	0.119	6
mineral rent	100	1.221	3.292	0	18.532
energy rent	100	2.200	7.458	0	52.269
agriculture	89	21.756	15.097	0.260	62.460
import	95	27.588	17.335	2.603	95.764
trade	95	53.794	33.698	5.022	169.366
female participation rate	125	31.523	12.171	5.033	52.200
schooling	94	5.004	2.784	0.423	11.711
press freedom	124	45.282	23.810	7	99
days to obtain legal status	76	47.987	32.219	2	152
lgdp	96	7.590	1.538	4.785	10.620
dem	115	0.391	0.490	0	1

Table A.2 Summary Statistics, Countries at different levels of democracy

Variable		Non democratic		Medium level of democracy		High level of democracy	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
corruption in government	overall	2.759462	1.168298	3.239193	1.135511	5.045055	1.076446
	between		.9597079		1.039466		1.019842
	within		.6714007		.4913865		.4260659
energy rent	overall	7.265168	12.58893	6.203563	10.65055	.9664333	2.194001
	between		12.023		10.46843		1.531602
	within		4.201772		2.92052		1.60116
oil quantity	overall	3.375056	9.460532	.8031342	1.777603	1.248179	4.331102
	between		9.273853		1.79604		3.89113
	within		2.017275		.2682673		2.058248
mineral rent	overall	1.2238	3.981921	.8793171	1.870141	1.147386	3.744066
	between		4.727796		1.261559		3.688856
	within		1.447883		1.404959		.9831296
agriculture	overall	23.81971	15.26212	17.59819	12.22314	6.49375	6.56388
	between		15.42435		12.14964		6.448122
	within		4.110156		2.898426		1.715468
lgdp	overall	6.898381	1.360218	7.377876	1.225479	9.467074	.9034701
	between		1.359916		1.245935		.9153865
	within		.1939025		.125634		.1121326
import	overall	34.02913	20.2666	32.26515	16.20438	34.3208	15.17018
	between		17.84162		15.05422		15.10677
	within		9.393645		6.755538		3.353741
trade	overall	62.60083	38.20857	61.77684	31.47435	68.72549	30.07334
	between		34.182		29.54303		30.02088
	within		15.57118		12.45562		6.323677
polityIV	overall	-3.314108	6.162743	5.460227	4.744601	9.986413	.1159261
	between		4.3293		4.238102		.0651608
	within		4.408549		2.305929		.0967806
political rights	overall	5.132246	1.673399	2.803977	1.595466	1.105978	.3082289
	between		1.253283		1.329509		.2903727
	within		1.118439		.923826		.1188902

Chapter 5
Oil, Democracy and Country Fixed Effects

Oil, Democracy and Country Fixed Effects[1]

Silje Aslaksen
Norwegian University of Science and Technology, N-7491, Trondheim, Norway
silje.aslaksen@svt.ntnu.no

Abstract

This paper revisits the empirical finding of a correlation between oil and democracy. Existing studies establish a strong negative cross-country correlation between oil and democracy, but typically do not control for country fixed effects that simultaneously affect oil abundance and democracy. In this paper, we empirically analyze the influence of oil on democracy by controlling for unobservable heterogeneity and by taking into account the persistence of some of the variables. We show that controlling for such factors does not change the insight that oil hinders democracy.

Keywords: Oil, Democracy

1. Introduction

Understanding the determinants of democracy is important. The modernization theory (e.g. Lipset, 1959) emphasizes the role of education as well as economic development in promoting democracy. Empirical work, for example by Barro (1999), provides evidence consistent with this view. Two of the most robust determinants of democracy, per capita GDP and schooling, found by Barro (1999), have recently been put into doubt. Acemoglu *et al.* (2004) find little support for the hypothesis that income causes democracy when country fixed effects are included, and Acemoglu *et al.* (2005) find no evidence indicating that a given country (with its other characteristics held constant) is more likely to become

[1]Helpful comments from Ragnar Torvik and Jørgen Juel Andersen are gratefully acknowledged.

more democratic as its population becomes more educated.[2] Their argument is that the earlier literature looks at the cross-sectional correlation between income and democracy and education and democracy rather than the within-country variation. Hence existing inference may be driven by omitted factors.

It is widely thought that resource wealth, especially oil, is a curse for democracy (Ross, 2001; Jensen and Wantechekon, 2004; Tsui, 2005). Existing literature looks mainly at the cross-sectional correlation between resource income and democracy rather than at the within country variation. Hence existing inference may be driven by omitted factors influencing both the oil abundance measure and democracy in the long run. If insights regarding income level and education have been found to change when country fixed effects are included, perhaps it is necessary to put the insights regarding oil and democracy to a similar test. A causal link between oil income and democracy suggests that we should also see a relationship between changes in oil income and changes in democracy. In other words, we should ask whether a given country (with its other characteristics held constant) is more likely to become less democratic as it becomes richer in oil. We show that the answer to this question is yes. We show that the cross-sectional relationship between oil and democracy persists when country and time effects are included using a dynamic panel model.

There are several reasons why the existing literature on oil and democracy may be problematic. Oil, for obvious reasons, is not measured in absolute terms in cross-country regressions. What is of relevance, is the value of the oil sector compared with the rest of the economy, that is, the relative importance of oil. Therefore, in cross-country regressions (whether we rely on the stock or the flow of oil), when oil is measured as a share of GDP or as a share of exports, it will be subject to the same concerns as those addressed by Acemoglu *et al.* (2004) and Acemoglu *et al.* (2005). Also, over the past decade, a distinguished body of empirical literature has emerged in support of arguments that institutional form and quality are deeply embedded in history and geography (Acemoglu *et al.* 2001, 2002, 2003; Easterly and Levine 2002). Acemoglu *et al.* (2001, 2002) have documented that mortality rates faced by Europeans and population density at the time of colonization were major determinants of European colonization strategies, and subsequent institutional and economic development paths. Thus, in countries with extractive institutions, the only profitable economic activity will be resource extraction. If there is a natural resource to be exploited, it will be, even though other sectors suffer from a lack of secure property rights and bad infrastructure. Therefore, omitted factors that determine the quality of institutions could also determine the level of oil dependency. Because of initial conditions, countries are both heavily dependent on their resource sector and nondemocratic. If this is so, oil does not hinder democracy, but the two are correlated because of omitted variables and a correct approach is to control for country fixed effects.

Perhaps the most celebrated explanation for why oil hinders democracy is

[2] Castellò-Climent (2006) and Bobba and Coviello (2006) argue that education systematically predicts democracy also when country fixed effects are included, and explain the results in Acemoglu *et al.* (2005) with weak instruments.

the rentier effect. The mechanisms underlying the claim that rentierism harms democracy are of three main types (for a more extensive discussion, see Ross, 2001). The first mechanism is concerned with how the state collects revenue. When government derives sufficient revenue from the sale of oil, they are likely to tax their population less, and the public in turn will be less likely to demand accountability from and representation in their government. The second mechanism is concerned with how the state spends revenues. Oil wealth may lead to greater spending on patronage, which in turn dampens latent pressure for democratization. The third mechanism focuses on society. When oil revenues provide the government with enough money, the government will use its wealth to prevent the formation of social groups that are independent of the state and hence that may demand political rights.

There are several models in the economic literature linking resource income to democracy and institutional quality. Acemoglu and Robinson (2006) model underdevelopment as the result of political elites blocking technological and institutional development because such development may erode the elites' incumbency advantage. Such blocking is more likely to arise when the rents from maintaining power are high, such as where public income is derived from natural resources. In addition, and as discussed in Acemoglu, Robinson and Verdiers (2004) personal rule model, greater resource rents make it easier for dictators to buy off political challengers. Damania and Bulte (2003) show that when politicians maximize the surplus from a lobbying game, resource abundance may increase the income from lobbying, but divert the economy from its optimal path. Ades and Di Tella (1999) discuss how natural resource rents may stimulate corruption, and Robinson and Torvik (2005) show how increased resource rents may make it politically efficient to win votes by building white elephants, rather than efficient investment projects, even when voters are fully rational. Aslaksen and Torvik (2006) develop a model in which where the institutional outcome is endogenous, and show that resource income might change the political equilibrium away from democracy to conflict.

Many earlier studies have documented a negative statistical association between the share of fuel exports in GDP and democracy. For example, analyzing panel data across 113 countries from 1971 to 1997, Ross (2001) finds that oil revenues, measured by mineral based fuel export values as a fraction of GDP, have a statistically significant negative correlation with a country's political institutions. Similarly, Wantechekon (2004) finds that a crucial determinant of political regimes in many third world countries is their dependence on natural resources. Along similar lines, Jensen and Wantechekon (2004) find empirical evidence suggesting a robust and negative correlation between the presence of a sizable natural resource sector and the level of democracy in Africa.[3]

This paper advocates that the negative relationship between oil and democracy persists when country fixed effects are included. In this paper, we rely on

[3]However, considerable disagreement exists over whether this relationship is causal (e.g. Alexeev and Conrad, 2005; Herb 2005). One argument is that earlier studies, when controlling for initial income level in their regressions, create a problem because income is usually measured after oil discovery. It has been found that, when the oil component is removed from the initial income level, the oil curse disappears (see e.g. Alexeev and Conrad, 2005; Herb 2005).

the system GMM estimator, which has been proven to perform better than the first-difference estimator in Monte Carlo simulations when variables are highly persistent (see Blundell and Bond, 1998). Although fixed effect and first difference GMM estimators exploit the within country variation in the data, they might not be appropriate when variables are highly persistent over time, as is the case with democracy and oil income. Therefore, an econometric technique that exploits the bulk of the variation in the data would be preferable to improve the precision of the estimated coefficient. By adding the original equation in levels to a system of equations that also include equations in first differences, the system GMM estimator is particularly useful in this context because, in addition to controlling for country-specific effects, it preserves the cross-country dimension of the data that is lost when only the first differenced equation is estimated (Castellò-Climent, 2006).

The paper proceeds as follows. In Section 2 we describe the data. Section 3 presents some basic regressions similar to the pooled cross-sectional approach of the existing literature, documenting a negative correlation between oil and democracy. Section 4 shows the results when country fixed effects are included. Section 5 discuss the robustness of the results and Section 6 concludes.

2. Data

There has been a great deal of controversy over the issue of how to measure democracy in the political science literature. The main disagreement is over what actually constitutes a democracy. We follow much of the existing research in this area in adopting a definition based on a number of institutional conditions. Our main measure of democracy is the Freedom House Political Rights Index. This index ranges from 1 to 7, with 7 representing the least amount of political freedom and 1 the most freedom. A country gets a score of 1 if political rights come closest to the ideal suggested by a checklist of questions regarding the electoral process, the political pluralism and participation and the functioning of government.[4] We transform the index so that it lie between 0 and 1, with 1 corresponding to the most democratic institutions.

As a check of our main measure of democracy, we also look at the widely used composite Polity Index. The composite Polity Index is the difference between the Polity's Democracy and Autocracy Indexes.[5] The Polity Democracy Index ranges from 0 to 10 and is derived from coding the competitiveness of political participation, the openness and competitiveness of executive recruitment and constraint on the chief executive. The Polity Autocracy Index also ranges from 0 to 10 and is constructed based on scoring countries according to competitiveness of political participation, the regulation of participation, the openness and competitiveness

[4] The checklist includes three questions on the electoral process, four questions on the extent of political pluralism, and participation and three questions on the functioning of government. For details see Freedom House (2006), http://www.freedomhouse.org/template.cfm?page=351&ana_page=298&year=2006

[5] See Marshall and Jaggers (2002a; 2002b).

of executive recruitment and constraints on the chief executive.[6] To facilitate a comparison with the Freedom House score, we also normalize the Polity index to lie between 0 and 1.

Using the Freedom House and the Polity data, we construct five-yearly panels. We follow Acemoglu *et al.* (2004), Acemoglu *et al.* (2005), Bobba and Coviello (2006) and Castellò-Climent (2006) and take the observation every fifth year instead of averaging the five-yearly data, because averaging introduces additional serial correlation, making inference more difficult. The Freedom House data are five-yearly panels for the period 1972-2002, whereas the composite Polity data are five-yearly panels for the period 1970-2000.[7]

The oil variables are from the World Bank Adjusted Net Savings dataset (also called the Genuine Savings dataset). Our main oil measure, *oil share*, is the value of oil extraction as percentage of GDP. The oil extraction variable, in its original form, only contains values for oil extracting countries. Countries that do not produce oil have missing values for this variables. Therefore, for some countries it is unclear whether oil extraction is zero or actually missing. Therefore, missing values are replaced with zero if there is no onshore or offshore oil production for that country according to the PETRODATA dataset (see Lujala *et al.*, 2007). Our alternative measure of oil, *oil value per capita*, is the value of oil per capita (in thousands of 2005 USD), and this alternative measure is independent of GDP. Covariates include coastline as a share of total boundaries, education, latitude, log of real GDP per capita, log of population, number of Muslims as a percentage of the countries population, an openness measure, and number of years since independence. See Variable Description for a detailed description of variables and their sources. Table 1 contains descriptive statistics for the variables included in the analysis.

3. Results with Pooled Cross Sections

We first replicate some of the basic results in the literature using a pooled cross-sectional approach. Table 2 reports estimates of the following model:

$$d_{it} = \alpha d_{it-1} + \beta oil_{it-1} + \boldsymbol{x}'_{it-1} + \gamma_t + u_{it} \tag{1}$$

where $d_{it}$is the democracy score of country i in period t. The lagged value of this variable on the right hand side is included to capture persistence in democracy and also potentially mean-reverting dynamics, i.e., the tendency of the democracy score to return to some equilibrium value for the country (Acemoglu *et al.*, 2004). The main variable of interest is oil_{it-1}, the lagged value of oil income in GDP. The parameterβ therefore measures whether oil has an effect on democracy. All other potential covariates are included in the vector $\mathbf{x_{it-1}}$. γ_t denotes a full set of time effects, which capture common shocks to the democracy score of all countries, and $u_{it}$is an error term, capturing all other omitted factors. The sample period

[6]For details see Marshall and Jaggers (2002).

[7]The Freedom House dataset begins in 1972.

in columns 1-5 is 1972-2002 and in columns 6-10 the sample period is 1970-2000, with all columns at with five-year intervals.

It is useful to note that equation (1) does not include any country fixed effects. Therefore, the only source of long-run differences in democracy across countries is the right hand side variables. In other words, the only cross-country differences in the long-run democracy score will be because of differences in oil or other covariates across countries. The estimates of the relationship between democracy and oil from equation (1) will reveal the cross-sectional relationship between these two variables (i.e., they will capture the fact that oil rich countries are less democratic). Columns 1-5 uses the Freedom House data and columns 6-10 uses the Polity data to present pooled cross-sectional regressions of democracy and oil. All columns include a full set of time effects, and standard errors are clustered at the country level.[8]

Columns 1 and 6 are the most parsimonious specifications, including only lagged democracy, the oil variable and time effects. Lagged democracy is highly significant, and shows a considerable degree of persistence in democracy. More precisely, the estimate of about 0.8 in columns 1 and 6, implies that a 10 percent higher score of democracy five years ago is typically associated with a 8 percent higher score of democracy today. The oil variable is also significant and illustrates the well documented negative relationship between oil and democracy. Though statistically highly significant, the effect of oil is quantitatively small. A coefficient of 0.002 (as in columns 1 and 6) implies that an increase in the oil value in GDP of 10 percentage point is associated with a 2 percent lower score of democracy.

Columns 2 and 7 add the log of real GDP per capita to the basic specification. The oil variable is now larger (-0.004 with the Freedom House measure and -0.003 with the Polity measure) and still highly significant. Log of GDP per capita itself is significant, and shows a positive association between income and democracy. Columns 3, 4, 8 and 9 add average years of schooling and log population. The coefficients of the oil variable are about the same and still statistically significant at the 1 percent level. Educational attainment itself is significant in column 4, and indicates a positive association between education and democracy. The log of population is insignificant when average years of schooling is included. The oil variable remains in the same range and is highly significant when additional controls are included (columns 5 and 10). The Muslim percentage of the country's population is negatively related to democracy,[9] and the absolute value of latitude (distance from the equator), a popular proxy for geographic effects on economic development, is marginally significant (at 10 percent) in column 5 and the fraction of a country's border that is coastal is associated with better democracy. The magnitude of the oil variable, when the full set of covariates is included, is within the same range as in Ross (2001). Overall, the regressions in Table 2 confirm the main finding of the existing literature of a negative association between oil and democracy.[10]

[8]Clustering is a simple strategy to correct the standard errors for potential correlation across observations both over time and within the same period (Acemoglu *et al.*, 2004).

[9]This is in accordance with Ross (2001) and Barro (1999).

[10]The democracy variable in Ross (2001) is rescaled as a 0-10 variable, while we have rescaled

4. Results with Fixed Effects

We now revisit the basic results of the last section in the panel set up with fixed effects. In terms of equation (1), the presence of fixed effects implies that the error term can be represented as $u_{it} = \delta_i + \varepsilon_{it}$, which differs from the specification in (1) because it includes a full set of country dummies. These country dummies capture any time-invariant country characteristics that affect the equilibrium democracy level (Acemoglu *et al.*, 2004). Consequently, even if two countries have the same values of the covariates, they can have different long-run equilibrium values of democracy.

If the error term takes the form $u_{it} = \delta_i + \varepsilon_{it}$, with the δ_i's correlated with oil_{it-1}or x_{it-1}, then pooled OLS estimates are biased and inconsistent. Underlying political and social forces shaping both equilibrium political institutions and the potential for export diversity and economic development will be controlled for in the fixed effects specification. However, there should be no presumption that fixed effects regressions will necessarily estimate the causal effect of oil on democracy. In the presence of factors that affect the joint evolution of democracy and oil abundance, there is no reason to expect that the fixed effects estimates will be consistent. Nevertheless, under plausible assumptions, the inclusion of fixed effects will lead to estimates that are less biased than the pooled OLS estimates. In addition, there is an econometric problem involved in the estimation of the fixed effect specification. The regressor $d_{it-1}$is mechanically correlated with ε_{is} for $s < t$, so the standard fixed effects estimation is inconsistent.

The so-called difference GMM estimator relies upon the following orthogonality conditions:

$$E(d_{it-s}\Delta\varepsilon_{it}) = 0 \quad t = 3, ...T \tag{2}$$

where d_{it-s} represents the instruments set used in this GMM estimator. In this setting, it is well known that the higher the persistence of the series used as instruments, the lower the correlation between levels and subsequent differences.[11] The characteristic of persistency in the explanatory variables may cause several biases in the first difference GMM estimator. Both democracy, oil income and education are highly persistent, so lagged levels are weak instruments and it is possible to gain precision in terms of point estimates bias by exploiting some additional moment restrictions. The so-called system GMM estimator stacks together the equation in first differences and the equation in levels in a system of equations and uses both lagged levels and differences as instruments (Bobba and Coviello, 2006). In order to consider the additional moments as valid instruments, the following additional linear moment conditions must be satisfied.

$$E(\Delta d_{it-1}(\delta_i + \varepsilon_{it})) = 0 \quad t = 4, ...T \tag{3}$$

Equation (3) implies that changes in democracy are orthogonal to the country

democracy as a 0-1 variable.

[11] Simulation results show that the difference GMM may be subject to a large downward finite sample bias, particularly when T is small. See Blundell and Bond (1998).

fixed effects. We test the validity of this assumption. We also control for a weak form of exogeneity in the oil variable (and other covariates) by assuming that our explanatory variables can be affected by current and past realizations of democracy but are uncorrelated with future unpredictable innovations in democracy (the error term).

Table 3 reports the results across various estimators using the Freedom House measure of democracy. Columns 1 and 2 show the results of Pooled OLS and Within Groups estimators that provide the upper and lower bounds for the autoregressive coefficient of democracy.[12] Columns 3 and 4 use the one- and two-step difference GMM estimators.[13] As seen from columns 3 and 4, the oil variable is not statistically significant, and the education variable is negative. The negative coefficient of education on democracy, with this specification, has been found in related research (e.g. Acemoglu *et al.*, 2005; Bobba and Coviello, 2006). Acemoglu *et al.* (2005) interpreted the result that the positive association between education and democracy disappears once we control for country-specific effects as the cross-sectional relationship between education and democracy being driven by omitted factors influencing both education and democracy rater than a causal relationship. Bobba and Coviello (2006) and Castello-Climent (2006) disagree in this interpretation, and argue that because of the high persistence in democracy and education, the findings of Acemoglu *et al.* (2005) are subject to weak instruments problems. To address these weak instruments problems, they argue in favor of using an alternative estimator that reduces the potential biases and imprecision associated with the first difference estimator. They show that education systematically predict both levels and changes in democracy by considering a different identification assumption by using additional and more informative moment conditions to instrument the regressors. In light of this discussion, we conclude that the estimators in columns 3 and 4 are biased, and the consequent finding that oil has no effect on democracy and that education has a negative effect may not be instructive.

Columns 5 and 6 report the system GMM estimates, one- and two-step, respectively, and the results are striking: the lagged oil share now has a negative and significant effect on democracy at the 1 percent significance level, and the lagged level of education now has a positive and significant effect. The coefficient of the oil variable in the system GMM specifications are similar to the pooled OLS specification. In fact, when we control for country- and time-specific effects and take into account the cross-country variation in the data, the results are similar to those obtained by Ross (2001). Columns 7 and 8 repeat the system GMM estimates, including only non-OPEC countries and the results are similar.

The reliability of the results depend on the validity of the instruments. We report tests at the bottom of the table. The p-value of the AR(2) test gives the probability of correctly rejecting the null hypothesis of no second order serial correlation. The Hansen test validates the adequacy of the instruments, the failure to reject the null hypothesis of the validity of the instruments indicate that the specification is correct. The Diff Hansen test evaluates the validity of the addi-

[12]See Bond (2002) for details on the bias of the two bounds.

[13]The two-step GMM is implemented using the Windmeijer (2005) correction using xtabond2.

tional orthogonality condition in the system GMM. As displayed at the bottom of Table 3, the values of the tests suggest that the instruments are valid.

5. Robustness of the Results

The results in the previous section reveal one main finding: even when controlling for fixed omitted variables, oil is related to democracy. In this section, we study the robustness of this result. In Table 4 we control for some additional potential determinants of democracy that have been suggested in the literature. In columns 1 and 2, democracy is measured through the Freedom House political rights index, and we check the robustness of the results in columns 3 and 4 using the alternative Policy Democracy Index. The additional controls include the log of per capita income; a measure of country size such as population (in logs), and a measure of openness such as the sum of imports and exports in GDP.

The results suggest that controlling for these potential determinants of democracy does not change our main finding. In all cases, the coefficient of the oil share remains negative and statistically significant. The education variable is insignificant when the Polity Democracy Index is used, a result also found by Castello-Climent (2006). Log of per capita income is insignificant in all specifications and hence supports the results found by Acemoglu *et al.* (2004), who argue that controlling for factors that simultaneously affect income and democracy (country fixed effects) removes the statistical association between income per capita and democracy.

In the last table, we check the robustness of the results to an alternative measure of oil abundance, oil income per capita. In the previous tables, there is the concern that changes in the oil variable are because of changes in the denominator, and not actually in oil income. Table 5 indicate that this is not the case. When oil revenues per capita (in thousands of 2005 USD) are used instead of oil revenues in GDP the results are similar–more oil is associated with less democracy.

Finally, we check if the results are influenced by the presence of atypical observations. To control for outliers, we reestimate the regression in column 5 of Table 3 by removing one country at a time. In all regressions the oil coefficient is negative and within the same range as in column 5 of Table 3, and it is always statistically significant.

6. Conclusion

Some of the empirical findings of the determinants of democracy have recently been challenged. Acemoglu *et al.* (2004) and Acemoglu *et al.* (2005) argue that insights regarding income level and education change when country fixed effects are taken into account. These authors point out that previous empirical evidence could suffer from potential omitted variable bias. Our paper advocates that this is not the case for the relationship between oil and democracy. Although fixed effects and first-difference GMM estimators show no statistically significant relationship between oil and democracy, we have argued that these estimators may not be appropriate in the estimation of a dynamic panel data model with persistent variables. Improvements in the econometric techniques to estimate a dynamic panel data model with persistent variables has been made by Arrelano and Bover (1995) and Blundell and Bond (1998). When this more appropriate econometric technique is used, the results are in line with those of Ross (2001), who revealed a negative association between oil and democracy. This result holds for alternative measures of democracy and alternative measures of oil abundance, it is robust when including additional covariates and when removing major oil producers.

References

Acemoglu, D., S. Johnson and J. A. Robinson (2001), "The Colonial Origins of Comparative Development: An Empirical Investigation" *American Economic Review* 91, pp. 1369-1401.

Acemoglu, D., S. Johnson and J. A. Robinson (2002), "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution" *Quaterly Journal of Economics* 117, pp. 1231-1294.

Acemoglu, D., S. Johnson and J. A. Robinson (2003), "An African Success Story: Botswana" in Dani Rodrik ed. *Analytic Development Narratives*, Princeton University Press.

Acemoglu, D., S. Johnson, J.A. Robinson and P. Yared (2004), "Income and Democracy" Working Paper No. 05-05. MIT Department of Economics. Available at SSRN: http://ssrn.com/abstract=675066

Acemoglu, D., S. Johnson, J.A. Robinson and P. Yared (2005), "From Education to Democracy?" *American Economic Review Papers and Proceedings* 95, pp. 44-49.

Acemoglu, D. and J. A. Robinson (2006), "Economic Backwardness in Political Perspective" *American Political Science Review* 100, pp.115-131.

Acemoglu, D., J. A. Robinson, and T. and Verdier(2004), "Kleptocracy and Divide-and-Rule: A Theory of Personal Rule" *Journal of the European Economic Association* 2, pp. 162-192.

Ades, A. and R. Di Tella (1999), "Rents, Competition and Corruption" *American Economic Review* 89, pp. 982-993.

Alexeev, M. and R. Conrad (2005), "The Elusive Curse of Oil" Working Paper SAN 05-07. Terry Sanford Institute, Duke.

Arrelano, M. and O. Bover (1995), "Another look at the Instrument-Variable Estimation of Error-Component Models" *Journal of Econometrics* 68, pp. 29-52.

Aslaksen, S. and R. Torvik (2006), "A theory of civil conflict and democracy in rentier states" *Scandinavian Journal of Economics*, 108, pp. 571-581.

Barro, R. J. (1999), "Determinants of Democracy" *Journal of Political Economy* 107, pp. 158-183.

Barro, R. J. and J.W LEE (2009), "International Data on Educational Attainments: Updates and Implications" CID Working Paper 42.

Blundell, R. and S.R. Bond (1998), “Initial Conditions and Moment Restrictions in Dynamic Panel Data Models.” *Journal of Econometrics* 87, pp. 115-143.

Bobba, M. and D. Coviello (2006), “Weak Instruments and Weak Identification in estimating the effects of Education on Democracy” Inter-American Development Bank Working Paper 569.

Bond, S.R. (2002), “Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice.” *Portuguese Economic Journal* 1, pp. 141-162.

Castello-Climent, A. (2006), “On the Distribution of Education and Democracy”. Working Paper International Economics, University of Valencia

Damania, R. and E. Bulte (2003), “Resources for Sale: Corruption, Democracy and the Natural Resource Curse”, Mimeo, University of Adelaide.

Easterly, W. and R. Levine (2002),”Tropics, Germs, and Crops: How Endowments Influence Economic Development” *Journal of Monetary Economics* 50, pp. 3-39.

Freedom House (2006), *Freedom in the World*, Website. http://www.freedomhouse.org /template.cfm?page=15

Herb, M. (2005) “No Representation without Taxation? Rents, Development, and Democracy” *Comparative Politics* 37, pp. 297-316

Jensen, R. and L. Wantchekon (2004), “Resource Wealth and Political Regimes in Africa” *Comparative Political Studies* 37, pp. 816-841.

Lipset, S. M. (1959), “Some Social Requisites of Democracy: Economic Development and Political Legitimacy”.*American Political Science Review* 53, pp. 69-105.

Lujala, P., J. K. Rød and N. Thieme (2007), ”Fighting over Oil: Introducing a New Dataset” *Conflict Management and Peace Science* (forthcoming).

Marshall, M. G. and K. Jaggers (2002a). “Polity IV Dataset”. [Computer file; version p4v2002] College Park, MD: Center for International Development and Conflict Management, University of Maryland.

Marshall, M. G. and K. Jaggers (2002b). “Polity IV Project. Dataset Users‘Manual”. Center for International Development and Conflict Management, University of Maryland.

Robinson, J. A. and R. Torvik (2005), “White Elephants”, *Journal of Public Economics* 89, pp. 197-210.

Ross, M. L. (2001), "Does oil hinder democracy?", *World Politics* 53, pp. 325-361.

Tsui, K. K. (2005) “More Oil, Less Democracy?: Theory and Evidence from Crude Oil Discoveries”. University of Chicago Job Market Paper. Available at <http://home.uchicago.edu/~ktsui/OilDemocracy.pdf>

Wantchekon, L (2004) “Why do Resource Abundant Countries Have Authoritarian Governments?” Yale University Working Paper.

A.1 Variable Description

Coast
Coastline as share of total boundaries. $\frac{Coastline}{Coastline+Land\,boundaries}$.
Source: CIA. The World Factbook. https://www.cia.gov/cia/publications/factbook/

Democracy – Freedom House Political Rights Index
Freedom House Political Rights Index. Original range 1,2,...,7, normalized 0-1.
Source: Freedom House. http://www.freedomhouse.org/uploads/fiw/FIWAllScores.xls

Democracy – Polity Composite Democracy Index
The composite index is the democracy score minus the autocracy score. Original range -10, -9, ...,10, normalized 0-1.
Source: Polity IV Project. http://www.cidcm.umd.edu/polity/

Education
Average years of schooling in the population aged 25 and over.
Source: Barro and Lee (2000). http://www.cid.harvard.edu/ciddata/ciddata.html

Latitude
Absolute latitude.
Source: CIA. The World Factbook. https://www.cia.gov/cia/publications/factbook/

Log rgdpl
Log of real GDP per capita. Real GDP is obtained by adding up consumption, investment, government and exports, and subtracting imports in any given year. The given year components are obtained by extrapolating the 1996 values in international dollars from the Geary aggregation using national growth rates. It is a fixed base index where the reference year is 1996, hence the designation.
Source: PWT. http://pwt.econ.upenn.edu/

Log population.
Log of population.
Source: PWT. http://pwt.econ.upenn.edu/

Muslim
Number of Muslims as a percentage of the countries population in year 2005.
Source: World Christian Database.

Openness
Exports plus Imports divided by RGDPL.
Source: PWT. http://pwt.econ.upenn.edu/

Oil Share
The value of oil extraction as percentage of GDP.

$$\frac{Oil\,production\,volume\,(in\,metric\,tons){*}crude\,oil\,price\,(in\,current\,USD)}{GDP\,(current\,USD)} * 100.$$

Missing values have been replace with zero, if there is no onshore or offshore production for that country.
Source: Oil production volume and crude oil price are from the World Bank's data set on genuine savings (adjusted net savings), GDP (in current USD) are from the World Development Indicators, onshore and offshore production is from PETRODATA/Lujala et al. (2007).

Oil value per capita

Oil value per capita in thousand 2005 USD.

$$\frac{Oil\,production\,volume\,(in\,barrels){*}oil\,price\,per\,barrel(in\,onstant\,2005\,USD)}{Population} / 1000$$

Missing values have been replace with zero, if there is no onshore or offshore production for that country.
Source: Oil production volume is from the World Bank's data set on genuine savings (adjusted net savings), Oil price per barrel in constant 2005 UDS are from BP Statistical Review of World Energy June 2006. Population data from PWT, and onshore and offshore production is from PETRODATA/Lujala et al. (2007).

Years of indep.

Number of years since independence. Year of independence is the year a country enters the Polity IV dataset.

Table 1: Descriptive Statistics

		Freedom House Political Rights Dataset					*Polity Composite Democracy Dataset*				
Variable		Mean	Std.Dev	Min	Max	Obs.	Mean	Std.Dev	Min	Max	Obs.
democracy	overall	0.471	0.365	0	1	N = 1009	0.502	0.377	0	1	N = 965
	between		0.318			n = 160		0.322			n = 158
	within		0.183			T = 6.306		0.200			T= 6.108
Oil share	overall	5.472	13.621	0	101.56	N = 1016	6.316	15.712	0	101.74	N = 1008
	between		12.644			n = 157		14.540			n = 157
	within		5.918			T= 6.471		6.739			T = 6.420
Education	overall	4.868	2.955	0.040	12.25	N = 741	4.868	2.954	0.04	12.25	N = 741
	between		2.903			n = 121		2.903			n = 121
	within		0.956			T= 6.124		0.956			T = 6.124
Log rgdpl	overall	8.288	1.166	5.471	11.199	N = 975	8.262	1.161	5.139	11.119	N = 972
	between		1.104			n = 157		1.092			n = 160
	within		0.262			T = 6.210		0.268			T = 6.075
Log Population	overall	15.862	1.545	11.811	20.970	N = 1127	15.824	1.552	11.620	20.956	N = 1127
	between		1.532			n = 161		1.538			n = 161
	within		0.230			T = 7		0.237			T = 7
Openness	overall	69.475	46.191	2.02	383.55	N = 977	68.550	46.718	2.02	377.68	N = 974
	between		42.026			n = 157		45.784			n = 160
	within		21.875			T= 6.223		22.624			T = 6.088
Muslim	overall	26.661	35.790	0	99.13	N = 1120	26.661	35.790	0	99.13	N = 1120
	between		35.886			n = 160		35.886			n = 160
	within		0			T = 7		0			T = 7
Years of independence	overall	73.964	65.967	0	202	N = 1001	73.915	65.735	0	200	N = 975
	between		65.289			n = 159		64.923			n = 159
	within		9.625			T = 6.296		9.626			T = 6.132
latitude	overall	26.354	16.837	0	64	N = 1127	26.354	16.837	0	64	N = 1127
	between		16.882			n = 161		16.882			n = 161
	within		0			T = 7		0			T = 7
coast	overall	0.369	0.350	0	1	N = 1127	0.369	0.350	0	1	N = 1127
	between		0.351			n = 161		0.351			n = 161
	within		0			T = 7		0			T = 7
Oil value per capita	overall	0.648	2.993	0	44.422	N = 1073	0.841	4.258	0	64.048	N = 1062
	between		2.404			n = 161		3.162			n = 161
	within		1.712			T = 6.664		2.758			T = 6.596

Table 2: Pooled OLS

	Freedom House Measure of Democracy					*Polity Measure of Democracy*				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Democracy_{t-1}	0.828	0.714	0.712	0.635	0.602	0.816	0.739	0.736	0.681	0.640
	(0.021)***	(0.030)***	(0.029)***	(0.038)***	(0.037)***	(0.022)***	(0.035)***	(0.034)***	(0.044)***	(0.041)***
Oil share_{t-1}	-0.002	-0.004	-0.004	-0.003	-0.002	-0.002	-0.003	-0.003	-0.003	-0.002
	(0.000)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.000)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Log lrgdpl_{t-1}		0.057	0.057	0.034	0.030		0.045	0.046	0.048	0.047
		(0.008)***	(0.008)***	(0.016)**	(0.015)**		(0.009)***	(0.009)***	(0.016)***	(0.014)***
Log Pop_{t-1}			0.005	-0.002	-0.005			0.009	0.004	-0.006
			(0.004)	(0.006)	(0.008)			(0.004)**	(0.006)	(0.007)
Education_{t-1}				0.019	0.008				0.006	0.000
				(0.006)***	(0.006)				(0.005)	(0.005)
Openness_{t-1}					-0.000					-0.001
					(0.000)					(0.000)***
Muslim					-0.001					-0.001
					(0.000)***					(0.000)**
Years indep.					0.000					0.000
					(0.000)					(0.000)
Latitude					0.001					0.000
					(0.001)*					(0.001)
Coast					0.050					0.057
					(0.028)*					(0.026)**
r2	0.718	0.741	0.741	0.725	0.734	0.748	0.763	0.765	0.743	0.756
Countries	156	153	153	110	110	155	151	151	108	108
Observations	804	768	768	581	581	768	744	744	570	570

NOTE: Pooled cross-sectional OLS regressions, with robust standard errors clustered by country in parentheses. Year dummies and constant term in all regressions. Dependent variable in columns 1-5 is the Freedom House Political Rights Index. Dependent variable in columns 6-10 is the Polity Composite Democracy Index. The sample period columns 1-5 is an unbalanced panel, 1972 -2002, with data at 5-year intervals. The sample period columns 6-10 is an unbalanced panel, 1970 -2000, with data at 5-year intervals.

Table 3: Fixed Effects

	Pooled OLS	Within Group	Diff-1 GMM	Diff-2 GMM	Sys-1 GMM	Sys-2 GMM	Sys-1 GMM	Sys-2 GMM
	All countries	All countries	All countries	All countries	All countries	All countries	Non OPEC	Non OPEC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democracy_{t-1}	0.663	0.290	0.531	0.493	0.596	0.602	0.581	0.575
	(0.035)***	(0.044)***	(0.071)***	(0.078)***	(0.057)***	(0.058)***	(0.060)***	(0.064)***
Oil share_{t-1}	-0.003	-0.000	0.003	0.003	-0.003	-0.004	-0.003	-0.004
	(0.001)***	(0.001)	(0.003)	(0.002)	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Education_{t-1}	0.027	-0.032	-0.098	-0.112	0.031	0.026	0.029	0.027
	(0.004)***	(0.019)	(0.050)*	(0.046)**	(0.008)***	(0.008)***	(0.008)***	(0.009)**
Hansen			0.295	0.295	0.267	0.267	0.198	0.198
Diff Hansen					0.985	0.985	0.879	0.879
AR(1)			0.000	0.000	0.000	0.000	0.000	0.000
AR(2)			0.242	0.268	0.258	0.252	0.365	0.375
Observations	595	595	476	476	595	595	559	559
Countries	116	116	102	102	116	116	108	108

NOTE: Dependent variable is the Freedom House Political Rights Index. Diff-1 GMM and Diff-2 GMM are the one (two) step difference GMM estimation. Sys-1 GMM and Sys-2 GMM are the one (two) step system GMM estimation. Robust standard errors in parentheses. The values reported for the Hansen test are the p-values for the null hypothesis of instrument validity. The Diff Hansen reports the p-value for the validity of the additional moment restrictions required by the Sys-GMM. The values reported for AR(1) and AR(2) are the p-values for first and second order autocorrelated disturbances in the first differences equations. Five year panel. 1972-2002.

Table 4: Fixed Effects. Additional Covariates

	Freedom House Index		Polity Index	
	Sys-1 GMM	Sys-2 GMM	Sys-1 GMM	Sys-2 GMM
	(1)	(2)	(3)	(4)
Democracy$_{t-1}$	0.596	0.579	0.676	0.680
	(0.055)***	(0.057)***	(0.067)***	(0.067)***
Oil share$_{t-1}$	-0.003	-0.003	-0.003	-0.003
	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Education$_{t-1}$	0.029	0.028	0.012	0.011
	(0.010)***	(0.010)***	(0.011)	(0.012)
Log lrgdpl$_{t-1}$	0.007	0.018	0.036	0.038
	(0.027)	(0.028)	(0.027)	(0.027)
Log population$_{t-1}$	-0.008	-0.002	-0.009	-0.007
	(0.008)	(0.009)	(0.007)	(0.008)
Openness$_{t-1}$	-0.000	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.000)***	(0.000)***
Hansen	0.122	0.122	0.113	0.113
Diff Hansen	0.223	0.223	0.549	0.549
AR(1)	0.000	0.000	0.000	0.000
AR(2)	0.248	0.252	0.969	0.978
Observations	581	581	570	570
Countries	110	110	108	108

NOTE: Dependent variable in columns 1-2 is the Freedom House Political Rights Index. Dependent variable in columns 3-4 is the Polity Composite Democracy Index. The sample period columns 1- 2 is an unbalanced panel, 1972 -2002, with data at 5-year intervals. The sample period columns 2-3 is an unbalanced panel, 1970-2000, with data at 5-year intervals. Sys-1 GMM and Sys-2 GMM are the one (two) step system GMM estimation. Robust standard errors in parentheses. The values reported for the Hansen test are the p-values for the null hypothesis of instrument validity. The Diff Hansen reports the p-value for the validity of the additional moment restrictions required by the Sys-GMM. The values reported for AR(1) and AR(2) are the p-values for first and second order autocorrelated disturbances in the first differences equations.

Table 5: Alternative Oil Measure

	Sys-1 GMM	Sys-2 GMM
	(1)	(2)
Democracy$_{t-1}$	0.652	0.640
	(0.055)***	(0.057)***
Oil value per capita$_{t-1}$	-0.004	-0.004
	(0.001)***	(0.002)***
Education$_{t-1}$	0.019	0.021
	(0.007)***	(0.008)***
Hansen	0.123	0.123
Diff Hansen	0.323	0.323
AR(1)	0.000	0.000
AR(2)	0.340	0.343
Observations	628	528
Countries	120	120

NOTE: Sys-1 GMM and Sys-2 GMM are the one (two) step system GMM estimation. Robust standard errors in parentheses. The values reported for the Hansen test are the p-values for the null hypothesis of instrument validity. The Diff Hansen reports the p-value for the validity of the additional moment restrictions required by the Sys-GMM. The values reported for AR(1) and AR(2) are the p-values for first and second order autocorrelated disturbances in the first differences equations. Five year panel 1972-2002.