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NATURAL RESOURCES AND STATE FRAGILITY

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ABSTRACT

This paper provides an overview of the relationships between natural resources, governance, and economic performance. The relationships run in both directions, with re-sources potentially altering the quality of governance, and governance being particularly important for resource poor countries. Both these relationships have threshold effects; if governance quality is above a certain level, then natural resources can lead to further improvement, while, below the threshold, further deterioration may take place. Theoretical and empirical work is reviewed, the interactions between the relationships discussed, and policy implications outlined.

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1 Introduction¹

Natural resources are profoundly important for many developing countries. Restricting attention just to non-renewable resources (as we will throughout this paper), more than 250 million Africans live in countries where natural resources account for more than 80% of exports and, in some cases, more than 50% of government revenues. These countries have heterogeneous economic and political performances – ranging from the best (Botswana) to among the worst (Sierra Leone, DRC). Resource wealth is part of the story for both the successful countries and the failures. To understand why, we have to look at two broad relationships. The first is how resource wealth affects the various dimensions of governance, and the second is how resource wealth *and* governance interact to affect a country's economic performance and more general development progress. These relationships are dynamic and non-monotonic, so that above certain initial levels progress becomes self-reinforcing, while, below these levels, a vicious circle can cut in, increasing the fragility of the state.

This paper looks at each of these relationships in turn, before pulling them together and drawing out policy implications. The next section of the paper therefore deals with the question of how resource abundance affects the quality of governance. We argue that there are three main reasons why resource abundance can threaten the quality of governance and create increased risk of state fragility. The first is that it increases the opportunity to take resources away from the incumbent government, which we term *looting*; there are increased incentives for corruption, theft and insurgency, all of which undermine governance and can lead to state fragility. The second is that resource abundance can change the characteristics and behaviour of the incumbent government, primarily by reducing its *accountability*; resource revenue may reduce citizen scrutiny of government, and also allow government to buy its way out of trouble. The third is that resources may make for a more difficult *economic environment*; resource rich economies are subject to extreme volatility and may face particular difficulties in creating new jobs, both factors that pose threats to stable government. While these are negative effects of resource abundance on governance, it is important to recall that there is also positive potential. A resource rich state has the funds to build state capacity, to educate the populus, and to develop the infrastructure for economic development.

The following section of the paper turns to the question of whether good governance is particularly important for resource-rich economies. Some areas of economic and social activity can function even in countries with very low standards of governance. Resource extraction by a multinational enterprise is perhaps a good example of such an activity, capable of operating in an enclave. However, for resource abundance to translate into good overall economic performance and higher standards of living for the population at large, both *a priori* reasoning and the evidence suggest that good governance is important, perhaps more important than in resource scarce economies. The process of developing a natural resource deposit – from prospecting through extraction and revenue management – is *inherently to do with government*. Mineral rights are vested with the state, and securing a framework to encourage exploration, development and extraction requires that the state puts in place and enforces an appropriate legal and regulatory system. Rent from natural resources flows to the state, through different forms of taxation and contractual relationships with resource extraction companies. And the state is responsible for managing the spending of the revenues, and for stabilising their macro-economic impact. "Leave it the market" is simply not an option for resource management. Addressing these issues is technically complex, and also fraught with difficulties because resource management is inherently *long run* and involves large sunk costs. Any tendency of government to be short-termist is, therefore, particularly damaging. The

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short timescale of government decision-taking is likely to lead to excessive current spending and also to opportunistic behaviour with respect to resource companies. Short-termism is exacerbated by inability to commit, so even a government that is taking a long view may have its decisions influenced by the inability of the following governments to commit themselves.

We address each of these questions in turn, laying out the arguments and the evidence in Sections 2 and 3 of the paper. Clearly, there is a great deal of simultaneity between them, including some unpleasant positive feedback.² For example, countries with bad economic management may find their economies particularly destabilised by commodity price changes, which threatens political, as well as economic, stability. We set out a simple analytical framework to demonstrate the sort of development trajectories that these dynamics can create. The final section of the paper turns to policy issues, focusing on the particular issues of fragile states, and the way in which they can better harness resource wealth to break from a vicious to virtuous cycles of resource management and state capability.

2 How does resource abundance affect governance?

There is a good deal of evidence from case studies, cross-country regressions and panel data studies that natural resources, in particular, point-source resources (hydrocarbons rather than agricultural based) retard economic and institutional development (for example, Murshed, 2004; Mavrotas, *et al.*, 2006; Collier and Hoeffler, 2005). The main research questions are to do with the mechanisms through which this occurs, and the circumstances under which it happens.

2.1 Looting

The primary feature of resources is that they produce rent and hence are a target for rent-seeking, which can take the form of corruption, theft, or wholesale conflict for the control of the state. Theft can occur as the resource comes from the ground, by individuals or by mafias; alluvial diamonds (as in Sierra Leone) are hard to control compared to the centralised production of diamonds in kimberlite pipes (Botswana and South Africa), but even oil can be stolen at source, as indicated by the “bunkering” of Nigerian oil. It might occur through control of trade, as with high value minerals such as coltan coming from the DRC. And theft can occur as revenues enter or are spent by government, in the form of large-scale theft and petty corruption. Control of these sources of rent can be achieved by corruption, by organised mafias, or by insurgency and the take-over of the state. We discuss each of these in turn.

2.1.1 Corruption and criminality

The hypothesis that resource rents increase corruption has been modelled by various authors (for a recent example, see Bhattacharyya and Hodler 2009) and is confirmed by a number of empirical studies. Ades and Di Tella (1999) present evidence of a positive relationship between the proportion of total exports accounted by fuel, minerals and metals, and the level of corruption. These findings are confirmed in the broad cross-country study by Treisman (2000). Leite and Weidman (2002) find that natural resource exports (as shares of GNP) tend to increase corruption, and that this, in turn, lowers growth. Isham *et al.*, (2005) show that this effect is most pronounced for “point source”

² In simple form, the relationships are $\text{Governance}(t+1) = F(\text{Governance}(t), \text{Resource})$, and $\text{Performance}(t) = G(\text{Governance}(t), \text{Resource})$, where t denotes time. Resource wealth therefore affects performance directly and also by changing the quality of governance. We discuss these relationships further and illustrate their interaction later in the paper.

natural resources such as oil, minerals, and plantation crops, and Aslaksen (2007) also finds that oil and minerals increase corruption.

The recent study by Bhattacharyya and Hodler (2009) makes the interesting point that the result is driven by countries with poor democratic institutions. This is an example of the sort of result that crops up repeatedly in the literature. Variables of interest – be they corruption or economic growth – are negatively affected by natural resources only if governance measures are below a certain threshold. In the Bhattacharyya and Hodler paper, the threshold is a POLITY2 score of 8.6, above Mexico and Bolivia, below Botswana, and, of course, well above the value for fragile states.

2.1.2 Conflict

Incentives to grab a share of resource rents not only weaken government, but may lead to its overthrow through insurgency at either a regional or national level. Natural resources can provide both the motive and the means for insurgency, although, at the same time, they provide funds for the government (or those with access to government funds) to equip themselves to retain power. The links between natural resources and conflict have been studied in the theoretical and the empirical literature.

The fundamental point made by the theoretical literature is that the threat of conflict matters in many situations in which conflict does not actually occur. For example, Caselli and Cunningham (2009) demonstrate the importance of understanding exactly how resource rents alter the leader's probability of staying in power, and hence the economic, political and military strategies that are followed by the leader.

The empirical literature focuses, naturally, on observed conflicts rather than the threat of conflict. The increased risk coming from natural resources has long been discussed in the case study literature (Klare, 2001), but the first statistical analyses were by Fearon and Laitin (2003) and Collier and Hoeffler (2004). These initial statistical analyses suffered various limitations such as a sample subject to potential bias from missing data, and potential endogeneity because the explanatory variable was the export of natural resources as a share of GDP. If GDP were to grow slowly for other reasons, this ratio might be high and so the apparent causal relationship might be spurious. Hence, the results were controversial: see, for example, the special issue of the *Journal of Conflict Research* devoted to the topic. One alternative approach, which claimed to resolve the exogeneity problem was to measure natural endowments not as a share of GDP, but from a global snapshot valuation of sub-soil assets for the year 2000 made by the World Bank. On this basis, a high value of sub-soil assets appeared to *reduce* the risk of civil war. Bulte and Brunnschweiler (2009) argue that the main effect is that historical conflict increases the dependence on resource extraction, as the fallback sector for the economy.

The debate continues, with some now claiming much stronger statistical evidence for the original proposition. First, the 2000 snapshot of sub-soil assets is, itself, subject to severe endogeneity problems: as discussed below, the value of sub-soil assets is dependent upon the amount invested in prospecting and so developed countries have far larger discovered endowments than the poorest countries. Second, Collier, Hoeffler and Rohner (2009) re-estimate the Collier-Hoeffler model on a much larger sample, and address the remaining problem of missing data. Third, Besley and Persson (2008c) and Collier, Hoeffler and Soderbom (2004) both use international commodity prices as exogenous sources of change in resource revenues for commodity exporting countries. Their results are consistent and complementary. Besley and Persson investigate how changes in prices affect the incidence of civil war. They find that an increase in prices significantly increases the incidence. Collier, Hoeffler and Soderbom investigate the duration of civil wars once they have started. They find that a price increase of the commodities that a country exports significantly reduces the chance that a war will be settled. Work by Dube and Vargas (2007) adds an interesting twist to this: using regional data for Colombia, they find that increased oil prices increased conflict (a looting or ra-

capacity effect) while increases in coffee prices have the opposite effect, possibly by increasing the value of devoting labour time to coffee production.

The issue now is to establish the routes by which these adverse effects occur. The channels by which primary commodities might relate to the risk of conflict have come under intense scrutiny and debate (Ross, 2004a; Humphreys, 2005; Rohner, 2006). One is that primary commodity exports provide opportunities for rebel predation during conflict, and so can finance the escalation and sustainability of rebellion. The most celebrated cases are the diamond-financed rebellions in Sierra Leone and Angola. Oil also provides ample opportunities for rebel finance, whether through “bunkering” (tapping of pipelines and theft of oil), kidnapping and ransoming of oil workers, or extortion rackets against oil companies (often disguised as “community support”).

A second channel is that rebellions may actually be motivated, as opposed to merely being made feasible, by the desire to capture the rents, either during or after the conflict. Weinstein (2005) provides a convincing argument for this channel by endogenising the motivation of the rebel group. He argues that, in countries with valuable natural resources, many of the recruits will be motivated by loot-seeking, rather than by any political cause. The rebel organisation will not be able to screen out such recruits so that, even if the rebellion starts out with a political agenda, over time, it is likely to become loot-seeking. The evolution of the FARC from a rural protest movement to a multi-million dollar drug producer and trafficker may be an illustration. Combined with the financial feasibility effect, this implies that the rebellions which are most feasible, and, thus, are most common, are also those most likely to become motivated by loot-seeking. Natural resources can make rebellion attractive even if there is no realistic prospect of capturing the state itself. Indeed, loot-seeking may be easier during the lawless conditions that prevail during conflict than during peacetime.

An intermediate position between the objective of wartime looting and the capture of the state is the secession of the resource-rich region. There is some statistical evidence that natural resources specifically increase secessionist wars (Collier and Hoeffler, 2006a). These two channels need not be alternatives. A study by Lujala, Gleditsch and Gilmore (2005) provides support for both of them. It finds that conflicts are more likely to be located in the areas of a country in which natural resources are extracted.

2.2 Accountability

We turn now from the incentives to take resource wealth away from the state, to the ways in which resources change the behaviour of the state, looking, in particular, at the extent to which government is accountable to its citizens. To understand the effect of resource revenues on accountability requires first a broader discussion of the conditions under which the objectives of élites are reasonably congruent with those of ordinary citizens. Broadly, these are either that both happen to share overarching goals, or because élites have no choice but to deliver what ordinary citizens want.

One dimension of importance for congruence is the size of the élite relative to the population. Adam and O’Connell (1999) develop a simple model in which the ruling élite has a choice between a national public good and redistribution towards itself. The smaller the size of the élite, the stronger the incentive to opt for redistribution is. This is one reason why democratic accountability should improve government performance: attracting support by means of public goods, instead of redistribution, becomes more cost effective because democracy radically expands the required support base. However, public goods may become more cost-effective than patronage with a support base considerably smaller than that implied by universal suffrage, and, thus some governments that are *de jure* autocratic may approximate the priorities of a democracy.

Since the 1990s, many failing states have democratised. If elections achieve accountability to a rational electorate, then it should be expected to improve government performance. Chauvet and Collier (2009) test whether this is the case, using two measures

of performance, the Country Policy and Institutional Assessment (CPIA), which is a rating undertaken annually for all developing countries by the World Bank, and the International Country Risk Guide (ICRG), which is commercial rating service. They find that, on both measures, elections have both cyclical and structural effects. The cyclical effect is consistent with political economy models. For example, if some good policies incur initial costs with benefits accruing later, and some bad policies have converse characteristics, then as the election approaches, the government has an increasing incentive to adopt bad policies, which is what they find. The structural effect of elections is, however, normally consistent with the accountability model: the greater the frequency of elections, the better policies and governance are, except for extremely high frequencies when the adverse effect of short horizons dominates.

Electoral accountability might go wrong if voters might have limited information and politicians are thereby able to embezzle the public purse with little fear of prosecution. Besley (2006) analyses the implications of these characteristics. He shows that there is a point at which elections fail to discipline those politicians whose interests are divergent from those of the voters. Beyond this point, this type of politician finds power very attractive and this alters the pool of candidates facing voters. This selection effect may powerfully gear up the adverse consequence of poor incentives: in the extreme, voters may face no real choice because the entire pool of candidates consists of people who will abuse power.

In failing states, elections are also flawed by basic abuses of the electoral system. Three techniques are vote-buying, voter intimidation and ballot fraud. In research currently underway, Collier and Hoeffler find that, in conditions of poor governance, incumbents are far more likely to win elections than in conditions of good governance. One reasonable interpretation is that these illegitimate techniques are considerably more effective than the strategy of trying to be a good government. Chauvet and Collier (2009) introduce a measure of the quality of elections into their analysis of whether elections improve government performance. They find that, where elections are of low quality, their normal structural effects cease to hold: elections fail to improve government performance measured both in terms of economic policy (CPIA) and economic governance (ICRG). This result is, of course, entirely consistent with economic reasoning: if governments can win elections by other means then, as implied by Besley, politics will attract crooks and democracy will become impotent.

2.2.1 How Natural Endowments Deepen the Political Problem

These generic governance problems are compounded by valuable natural assets. Potentially, governance might deteriorate in three distinct ways. First, in a democracy, resource rents might reduce the efficacy of electoral accountability by, for example, allowing governments to buy off opposition. Second, in an autocracy, resource rents might reduce scrutiny, thereby reducing the pressure on government to meet its citizens' needs. Third, resource rents might alter the likelihood of democracy relative to autocracy. There is some support for all three of these possibilities.

The overall impact of natural resource rents on the economic performance of democracies is studied by Collier and Hoeffler (2009). Measuring performance by medium-term economic growth, they find that, in the absence of resource rents, democracies significantly out-perform autocracies, whereas, if rents are large relative to GDP, autocracies outperform democracies. The critical point at which the two have equivalent effects is when resource rents are around 8 percent of GDP: many resource-rich economies have a share well above this level. Hence, in a certain sense, resource rents appear to undermine the normal functioning of democracies.

One way in which democracy might be undermined by resource rents is if governments use some of the money to maintain power by means of patronage. Not only does this waste the money, but, more importantly, it reduces the accountability of govern-

ment to the electorate. Patronage might range from jobs in public employment for supporters, through to direct vote buying. There is reason to think that both are effective.

Robinson, Torvik and Verdier (2006) build a rational choice model of democratic politics to show how public sector employment is liable to be effective as a means of patronage. Supporters know that their jobs are dependent upon their patron retaining political power. Resource rents provide the incumbent with the means to finance a large public payroll and so entrench unaccountable power. Vicente (2007) has studied the effect of resource rents on political corruption in a unique natural experiment. The two West African democracies of São Tomé and Cape Verde are both islands and former Portuguese colonies with similar histories. However, São Tomé recently discovered oil. Vicente investigated whether the onset of oil revenues in São Tomé increased political corruption relative to Cape Verde. His measure of corruption was the allocation of international scholarships. He found that oil did, indeed, significantly increase the relative political corruption of São Tomé.

Vote-buying is a more direct form of divorcing elections from accountability. Vicente (2007) and Collier and Vicente (2008) have investigated vote-buying in two resource-rich democracies and show that it is both prevalent and effective. Again, resource rents expand the finance for such behaviour.

Not only do resource rents make it more feasible to undermine elections, they also make it more desirable for the government to do so since they increase the financial rewards to the retention of power. However, the ability to benefit financially from resource revenues depends upon the ability of politicians to embezzle them. The barriers to such behaviour are the checks and balances that financial bureaucracies conventionally incorporate as part of their constituting rules, and the consequent scrutiny that governments face. Collier and Hoeffler (2009) develop a simple model in which resource rents facilitate the erosion of checks and balances. A crooked politician embezzles public revenues to fund vote-buying unless he or she is restrained by public scrutiny: expenditure on public goods is thus the residual that remains once the politician has embezzled. The key component of the model is that it endogenises scrutiny. They assume that scrutiny is a public good that is only supplied to the extent that citizens are provoked into it by the taxation of private incomes. The crooked politician thus faces a constrained maximisation problem. In the absence of natural resources, if he does not tax, he has more freedom to embezzle, but there is no revenue. If he taxes heavily, there is plenty of revenue but little scope to embezzle it. Hence, there is a Laffer curve in embezzled revenue with an optimising rate of taxation. Resource rents change this optimisation problem: the politician does not want to provoke scrutiny because, although higher taxes would raise more revenue, the embezzlement of the resource rents themselves would be curtailed. They show that, within this framework, resource rents always lead to worse governance and can easily lead to a reduced supply of public goods. They then test the model, investigating whether the number of checks and balances that a society has are affected by resource rents. They find that both in the short-term and with lags as long as three decades, resource rents systematically erode checks and balances.

Now, let us consider the effect of resource rents in autocracy. Robinson *et al.*, (2006) show that the implications of their model for democracy readily extend to autocracy. Within the model of Adam and O'Connell, resource rents would increase the value of transfers and thus make the interests of the élite more divergent from those of ordinary citizens. Hence, even if the élite can hold the ruler to account, performance need not improve for the ordinary citizen.

The third route by which resource rents might deteriorate the polity is if they change the likelihood of democracy relative to dictatorship. Ross (2001) shows that this is, indeed, the case: resource-rich countries are more likely to be autocratic. He shows that this is not simply due to the high incidence of autocracy in the Middle East: on the contrary, the autocratic nature of politics in the region is likely to be due in part to its resource abundance.

Finally, resource rents might delay fundamental change of seriously dysfunctional policies. Normally, if a government embarks upon an economic strategy which destroys the economy, change will eventually be forced upon it by the decline of revenue. However, resource rents are robust and thus may weaken the impetus for decisive reform. Chauvet and Collier (2008) tested this and found that resource rents significantly reduce the speed of exit from highly dysfunctional policies. A doubling of resource rents as a share of GDP approximately doubles the time taken.

2.3 Economic environment

The third way in which resource rents can undermine governance is by creating a more challenging economic environment in which it is harder to deliver stable economic progress, and hence more vulnerable to social and political unrest. There are several mechanisms.

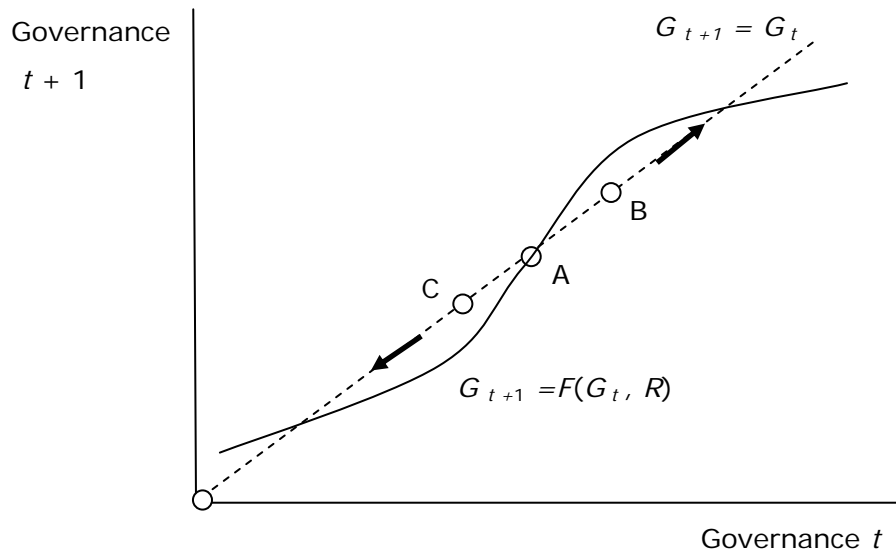
The first is that resource dependence creates economic instability, which, in turn, translates into political instability. Van der Ploeg and Poelhekke (2009) have presented evidence that the detrimental effect of resources on economic performance is largely due to high levels of volatility. Once again, there are threshold effects, as the effect is particularly strong in countries with weak financial institutions. This economic volatility, in turn, impacts adversely on political stability.

The second argument is to do with the extent to which resource wealth is spread throughout society, particularly through the medium of job creation. Resource abundance is correlated with a higher Gini index of inequality (see, for example, Gylfason and Zoega, 2003), which is likely to pose a threat to political stability. The Dutch disease argument posits that economies with foreign exchange windfalls will find it difficult to develop export sectors, including the sort of labour intensive manufacturing that has driven job creation in many Asian economies. Evidence for the impact of the Dutch disease is mixed, but rates of non-resource job creation in resource rich economies have been low. For example, Ross (2008) has shown that resource rich countries have low female labour force participation, and argues that this is a mechanism that has reduced female political participation, including in Islamic societies.

2.4 Summary

Recurring messages from the survey above are that resources can destabilise a political equilibrium, and that there are threshold effects. Below a certain level of institutional development, resources have a negative effect, while above it effects are absent or may be positive. The summary is in Figure 1. In the initial situation, countries have a range of governance qualities, summarised by points A, B, C on the figure. The situation is stable, in the sense that a governance quality at date t , G_t (measured on the horizontal axis) maps into the same quality at date $t+1$ (measured on the vertical), so the points lie on the dashed 45° line on the figure. A resource discovery perturbs this relationship, potentially setting off some divergent dynamics. This is illustrated by the solid line $G_{t+1} = F(G_t, R)$. For countries with governance below threshold level A, this sets off a negative dynamic. Country C's governance in period t is now associated with a lower level of governance in $t + 1$, and so on, thus giving the downwards path. Countries with good governance (such as B, above the threshold level A) are better able to afford the human development and institution building expenditures that move them onto an upward path. Unfortunately, such evidence as we have, indicates that point A is quite high up the country distribution of governance quality. The majority of developing countries are well below this level, and thus bear the risk that resource wealth will set off a process of deteriorating quality of governance.

Figure 1: Destabilising resources



3 Is good governance particularly important for resource-rich economies?

Security, accountability, and good governance are of intrinsic value and are important in facilitating economic development in all countries. The consensus from the empirical work on natural resources and economic performance is that they are particularly important in resource rich economies. This point has emerged from work on the resource-curse (Mehlum, Moene and Torvik, 2006) which shows that resource wealth has a positive effect on growth in countries with good institutions, and a negative effect on those with poor institutions. Once again, the turning point in this relationship is high, in the top quartile of the country distribution, and well above the level of fragile states. Table 1, based upon Boschini *et al.*, (2003) indicates how the quality of governance matters for different sorts of resources. The calculations are based upon cross-country regressions and control for trade openness, the share of investment in GDP and initial income *per capita*. We see that an increase in the share of primary exports in GDP has a negative effect on growth for all institutional qualities, but that the effect is smaller the better is institutional quality. For ores, metals, precious metals and gems, there is a turning point, with the negative effects more pronounced at low institutional quality, but large positive growth effects for countries with the best institutions.

Table 1: Marginal effects of different types of natural resources on growth for different levels of institutional quality

	Primary exports share of GDP	Ores and metals exports as share of GDP	Mineral production as share of GNP	Production of gold, silver and diamonds as share of GDP
Worst institutions	-0.548	-0.946	-1.127	-1.145
Average institutions	-0.378	0.425	0.304	0.279
Average + one s.d. institutions	-0.288	1.152	1.062	1.183
Best institutions	-0.228	1.629	1.560	1.776

Note: Based upon Boschini *et al.*, 2003. Impact on annual % rate of growth of one standard deviation change in resource abundance. Institutional quality is an average of the indices for bureaucracy, corruption, rule of law, risk of expropriation and repudiation of contracts by government.

There are several reasons for this relationship. The first is a corollary of our discussion in Section 2. If resources undermine governance (particularly for governance levels below a certain threshold) and governance matters for economic performance, then this will create the relationship seen in the empirical literature. In addition, there are a number of arguments that suggest that the role of the state is particularly important in resource rich economies, and hence state failure is particularly damaging. This section reviews the arguments.

3.1 The role of government in resource management

It is unsurprising that governance should be particularly important in resource rich economies because government is central in many of the key stages of resource management, ranging from the upstream (exploration, production licensing, fiscal regime) to the downstream (revenue receipt and spending). What is the role of government, and what happens if government gets it wrong?

3.1.1 Prospecting and project development

At the upstream end, the centrality of government stems from the fact that, in virtually all countries (the US being the major exception), ownership of sub-soil assets is vested with the state. And in all countries it is the state which, in principle, sets the legal framework of the exploration and production licences within which resource development and extraction take place. What happens if the state is unable to implement or enforce such policies?

One extreme is a lawless society that lacks any capacity for making or enforcing property rights over natural assets: physical control of the asset is all that matters. This gives rise to three problems: mal-distribution, rent-seeking, and inefficiency. Mal-distribution comes about partly because the strong are advantaged over the weak and this is compounded by uneven spatial distribution of natural resources. Thus, the strong, and those who happen to live in the right place, will acquire a disproportionate share of the resources. Rent-seeking comes about because, if ownership is conferred by physical control of territory, people will divert their effort into violence. Since violence can be off-

set by counter-violence, in equilibrium, the value of the rents from the natural assets will be dissipated by the costs incurred by the violence. Inefficiency comes about because of the uncertainty as to whether control can be maintained in the future. If control is perceived as likely to be temporary, the private incentive is to deplete assets quickly, even if this is socially more costly than necessary. One further consequence is that the absence of property rights interacts with the problem of information. As with inventions, unless discoveries of natural assets are protected, there is no incentive to undertake search. It is more efficient to wait for others to find natural assets and then wrest control of them through superior violence. Hence, they remain undiscovered. Indeed, since the process of losing control of them is likely to be costly, there is even an incentive for suppressing discovery. To summarise, in the absence of government, the exploitation of natural assets is markedly socially dysfunctional. Few assets are discovered and those that are trigger violent and costly contests. Compounding these gross inefficiencies, outcomes are highly unequal, and favour those who are strong and/or lucky.

A second possibility is "Finders-Keepers", or a sort of "Wild West" outcome. Here, the government is not sufficiently powerful to prevent the extraction of natural assets from its territory, but is able to manage the process by conferring prospecting rights to private actors and to protect these rights from other private actors. Specifically, it is able to enforce the rule of "Finders-Keepers". In the American West, the government licensed plots to prospectors who then owned what they found. The "Finders-Keepers" rule is an improvement upon lawlessness, but it is far from ideal in terms of distribution and rent-seeking. The distributional disadvantage is that the rents are captured by prospectors, instead of being spread more widely. The rent-seeking problem arises from the fact that the chances of striking lucky on a plot are increased if neighbouring plots have had lucky strikes. Hence, the profit-maximising strategy is to acquire many plots and leave them idle until discoveries are made, free-riding upon the prospecting efforts of others. This produces the economics of a gold rush: whole territories may be neglected for many years, and then prospected in a surge following the first discovery. Both the period of neglect and the surge are inefficient. The period of neglect arises from a standard public goods problem: knowledge is a public good and thus the outcome is a stalemate in which no one incurs the costs of acquiring knowledge. Eventually, a lucky strike occurs and this sharply increases the returns to search. In response, people crowd into search activities, lowering the chance of discovery for each other and driving down the expected returns to search. Entry may be limited if the size of the plots is set by government, but, if plots are very small, the standard rent-seeking outcome is that the value of the rents to be acquired through search is precisely offset by the costs that people incur. The rents from natural assets are thus dissipated. The "Finders-Keepers" rule thus produces a long period during which private returns to search are below their social value, followed by a short period in which they exceed their social value.

Artisanal mining is, in some respects, analogous to the "Wild West". As many prospectors crowd in to search, the size of plot is reduced, either in response to political pressure to accommodate more people, or through the sheer physical inability of individuals to retain exclusive control over a large area. This creates an externality: each additional prospector reduces the chance that other prospectors will strike lucky. Hence, the private return exceeds the social return. A second respect in which artisanal mining is inefficient is technological: artisanal mining is not able to reap the scale economies involved in mining, such as pumping out water.³ Since large scale technology involves fixed capital investment, artisanal mining gives rise to a third form of inefficiency: plundering the future. With substantial fixed investment the appropriate pace of exploitation is gradual, so that the installed capital can remain employed for a prolonged period. This

³ Before consolidation the big-hole in Kimberly was worked by 430 separate claims each 9 metres square, although some subdivided to two metres square. Independent working of these claims went to a depth of several hundred metres. See <http://www.hsrc.ac.za/Document-1481.phtml>.

implies that some areas will initially be left unprospected. In contrast, artisanal mining prospects all areas at once, so that, what would otherwise be future rents are dissipated in high current costs. The social inefficiency inherent in artisanal exploitation is demonstrated by the successful growth of De Beers. The company was able to buy out the claims of artisanal producers at their full value under artisanal exploitation and generate a large profit by internalising these externalities.

These alternatives make clear the role of a properly implemented and enforced regulatory framework for prospecting and mineral development. On the distributional side, if resources are to benefit the country as a whole, then production should be subject to an ownership and fiscal regime which transfers a substantial portion of the resource rent to the state (regardless of formal public ownership of the sub-soil assets). On the efficiency side, such a regime can reduce inefficient (and possibly violent) rent-seeking, and can increase the incentives for efficient prospecting and exploitation of resources.

3.1.2 Revenue capture

Even if government has implemented a regulatory system for resource exploration and production, the next step is to ensure that a substantial share of rents is captured by government, both in the terms of its contracts with resource extraction companies, and in its overall fiscal framework for the sector. Once again, it is easy to see what can go wrong.

The design of fiscal regimes is complex, as a balance has to be struck between ensuring that excess rents are not left with private producers, while, at the same time, creating incentives for efficient levels and implementation of exploration and production. The context is one in which projects are long-lived, there are high degrees of uncertainty both about geology and future market prices, and the government may be at an informational disadvantage. There are many points at which mistakes have been made. Some contractual-fiscal regimes have left the state with few benefits, even during periods of high prices. Zambia's recent copper regime, with a royalty rate of 0.8% and low corporate taxation in the copper sector is a prime example. Others have handed rights to inefficient producers, sometimes in the form of national oil companies that may lack the capacity to undertake or to manage production effectively. Regulatory regimes – including environmental regulation – have been inadequate.

At the same time, as it transfers revenues to government, the fiscal regime also needs to leave the incentives – and the security – to encourage investment. The fact is that many developing regions are under-prospected. As of the year 2000, the average square kilometre of the African landmass had beneath it only around \$25,000 of known sub-soil assets, whereas the corresponding figure for the landmass of the OECD was \$125,000. Since the sub-soil assets of the OECD have been heavily exploited for a far longer period than those of Africa, it is likely that the true average value of Africa's sub-soil assets exceeds that of the OECD. The contrast in known assets, therefore, points to the sensitivity of prospecting to property rights. From Africa's perspective, the good news is that there is huge remaining potential for discovery. Africa has not had the concentrated effort of prospecting by government that has been carried out in most developed countries. And nor has the private sector seen the likely rewards from prospecting commensurate with the risk, at least until very recently.

And if a fiscal regime is in place, a mechanism is needed to enforce it and ensure tax collection. The state is central, too, at the downstream stages of revenue collection and spending. The problem of theft of revenues has been acute in fragile states. It has been estimated that up to \$200 billion of Nigeria's oil revenues have been stolen. By 2006 royalty payments to the Treasury of the DRC were generating only \$86,000 per year despite several hundred million dollars of commodity exports.

3.1.3 Revenue management and spending

And for the revenues that do make it into government funds, there remain complex choices to do with spending and saving. The central choices are between investing and consuming resource revenues, and then to do with the actual channels through which investment and consumption are undertaken. Should investment be in foreign assets or in the domestic economy? Should domestic spending be achieved by citizen dividends, conditional cash transfers, tax cuts, or public projects? How should spending be divided between different regions of the country?

One mistake that has been repeatedly made is that too little liquidity has been set aside to manage the volatility of resource revenue streams. Because commodity prices are volatile, there is a strong case for accumulating liquid international assets during periods of high prices so that spending can be smoothed during the onset of downturns. However, if governments borrow against natural assets, they amplify shocks, instead of cushioning them: the ability to borrow fluctuates pro-cyclically with commodity prices.

Another mistake is that there has been too little investment in national public goods. Natural assets are one form of national public good. The above argument not only induces the government to plunder these natural assets in order to invest in group-specific and private capital, but also to under-invest in other forms of national public good. The plunder of natural assets can be accelerated by means of international borrowing against the natural assets as collateral. More generally, spending ministers will ally to oppose the national public good of saving. Profligate spending ministers and a weak minister of finance thus give rise to a common-pool problem. This leads to an upward bias in public spending claims, a tilt of the government spending profile from the future towards the present, and thus insufficient saving for future generations. When the financial return on the common asset is higher than that on private assets, voracious natural resource depletion cannot merely waste the natural assets, but can also reduce overall growth.

3.1.4 Environmental management

Finally, there may be externalities associated with resource extraction, the most apparent of which is environmental damage. Management of this requires both regulatory framework and the enforcement capacity. It is also subject to time-consistency concerns, since clean-up costs might fall mainly at the end of the useful life of the project, at which a resource extraction company has no incentive to maintain operations in the country.

3.2 Timescales and time-consistency

The previous sub-section made the case for the role of state, and highlighted some of the things that can go wrong. But why have they gone wrong, and how should this inform policy? Part of the answer is state capability in designing policy. Complex technical issues are involved (how many countries could cope with export volatility of oil exporters?), although there is now a large stock of experience to draw on, and plenty of technical assistance is also available. Another part is state capability in the implementation and enforcement. Even point sources of resource wealth have often proved difficult to police, as illustrated by the experience of Nigeria. Dispersed sources of wealth – artisanal mining or the remote mineral deposits of the DRC – are harder. And hardest of all are the dispersed assets of fisheries and forests, the latter being an issue of growing concern due to the premium on forests and the need to avoid de-forestation created by climate concerns.

But in addition to capability, there is a fundamental issue running through natural resource management, and relating to the inter-temporal trade-offs involved. Natural resources offer income now, but at the cost of lower future wealth as non-renewable assets are depleted, or renewable assets are over-exploited. Their efficient management therefore requires a long time horizon. This point runs through all the examples that we

gave above. Regulatory and fiscal regimes need to extract current rents, but must also be designed to leave incentives for prospecting. Depletion rates should not be inefficiently high, reducing the overall output of the field. A significant part of revenues should be saved, so that countries have a cushion of liquidity to cushion downturns. And environmental management requires setting aside some share of the revenues against the future costs of de-commissioning projects.

It is difficult for any government, in particular weak ones, to implement policy in the presence of these trade-offs. This is partly because of the pressure of immediate spending needs, but also because of time-consistency constraints. Governments do not control the behaviour of their successors, so they might reasonably fear that a successor government is likely to be less well-motivated. In this case, policies that postpone benefits to the future – for example, the accumulation of financial assets as a liquidity buffer – may merely transfer spending power to the future ill-motivated government. In the worst case, by saving the windfall not only does the current government fail to raise future consumption sustainably, but it also transfers public spending from a period when it is of high quality to one when it is low quality. As a result, the constrained optimal decision even for the current well-motivated government may be to act in an apparently short-termist way; better to spend now than to hand funds to a government that will spend badly in future.

Another example is in the relationship of a government with resource companies. A time inconsistency problem arises when governments have to attract mineral companies to invest in prospecting or in the development of a mine or oil field. The companies face a “hold-up” problem. Regardless of what governments promise companies, once the companies have made their investment, they have lost their bargaining power: governments have an incentive to appropriate the resource rents. The commitment problem is, in one sense, standard to all investment. However, it is more acute in respect of natural resource exploitation. The capital investment required for resource extraction is typically far higher than for other activities and thus more is at stake. Furthermore, the investment is typically lumpy and cannot be moved: a country has one particular exploitable asset which requires investment of a particular scale. Once this is made, opportunities for further investment may be limited. This contrasts with most other investment in which opportunities gradually increase over time so that an initial deal is implicitly enforced by the prospects of further deals. Crucially, this is a problem not for the company but for the government. Since companies can anticipate that this will happen, they hold back investments in exploration. As a result, countries with large unexploited potential reserves lose out. For example, for many years, the major resource extraction company ALCOA mined bauxite in Guinea. The company knew that it would be far cheaper to process the bauxite into aluminium prior to shipping, but this would have required a huge fixed investment of around \$1 billion. The company’s board recognised the time-consistency problem: the government of Guinea had no means of pre-committing them to refrain from capturing the profits generated by this investment once it had become irreversible. Hence, Guinea lost the opportunity for what would have been its single largest investment because of a lack of commitment technology.

The time-consistency problem applies in reverse if there are end-costs to resource extraction. In particular, there are likely to be costs of cleaning up the environment once the natural asset has been removed. The company has an incentive to make promises on which it subsequently reneges. Now, it is the company which needs a commitment technology for its promises to be credible. For example, the company could pay a proportion of its profits into an escrow account which could only be accessed once all liabilities had been settled.

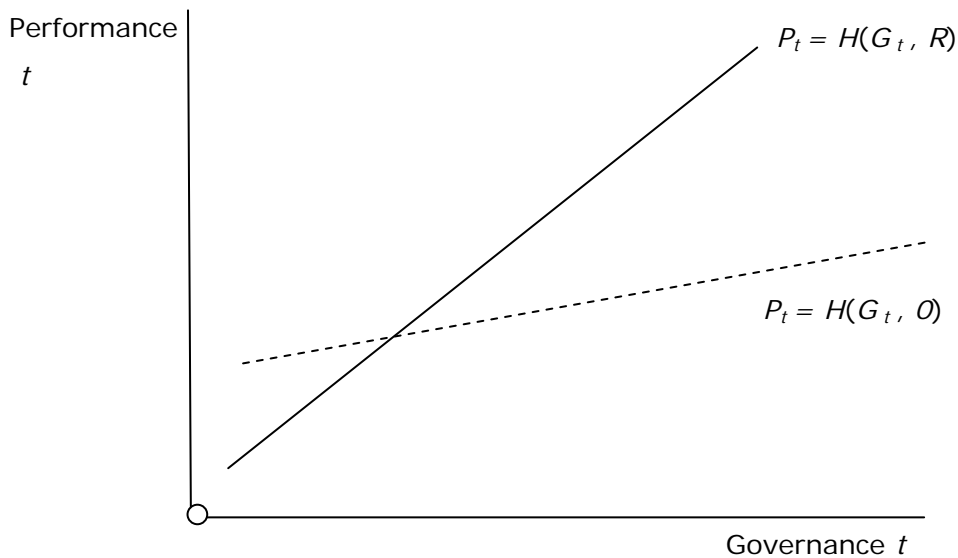
3.3 Summary

Resource revenues can improve economic performance, but good governance is even more important in resource management than in other areas of economic management,

because of the central role of the state; because of the technical complexity of some of the issues; and because of the difficulties associated with long lead times and the time-consistency of decision-taking.

Figure 2 is the schematic summary of the discussion of this section. It illustrates the relationship between governance and “performance” (economic or human development). This relationship is initially the dashed line, $P_t = H(G_t, 0)$, but is rotated by a resource discovery, becoming the steeper solid line $P_t = H(G_t, R)$. The steeper slope captures the idea that governance is more important in resource rich countries than others. The change in the slope means that the lines intersect, and to the right of the intersection additional resource revenues bring better performance, for example, via higher spending. Below the intersection performance (conditional on governance) deteriorates, for example, due to increased instability in the economy.

Figure 2: Governance and economic performance

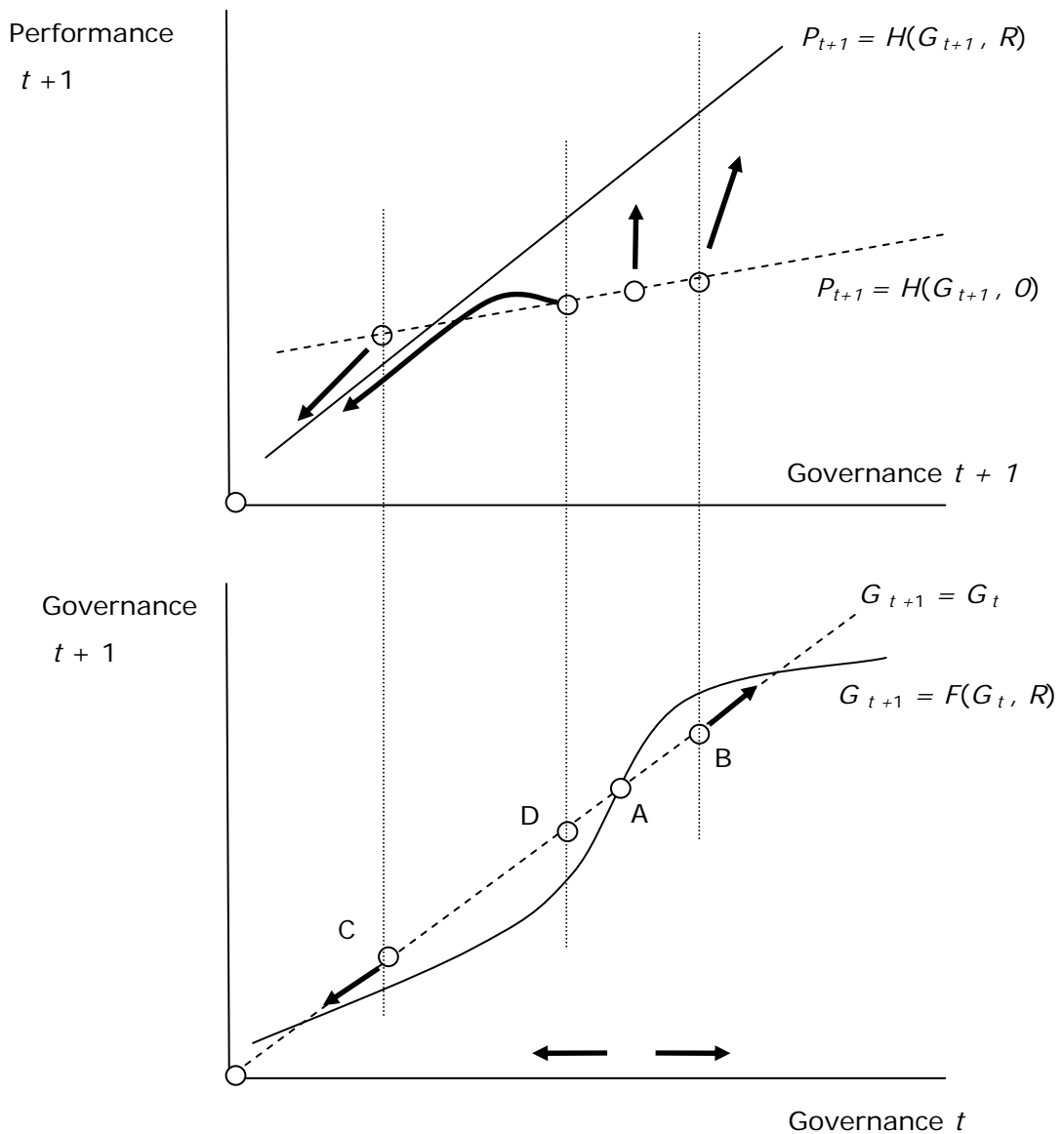


4 Synthesis and Policy

Figures 1 and 2 provide the summary of the discussion, and combining them gives a simple dynamic story and shows that a number of qualitatively different outcomes are possible. The combination is given in Figure 3, which has Figure 2 stacked above Figure 1, in order to trace the full effect of resources on both governance and economic performance. We see three qualitatively different possibilities.

Country B has good quality initial governance and thus has performance gains directly from the resource revenue; additionally, it benefits from a dynamic process of improved governance which, in turn, amplify the performance gains, moving the country up and to the right on the upper panel. For country C, the converse is true. Weak governance means that a resource discovery has a negative impact on performance *and* sets off a process of institutional deterioration, so both performance and governance decline. The third case is country D which (in the configuration illustrated) receives initial benefits from the resource windfall. But, at the same time, the resource is corroding its governance quality, so initial improvements in performance are followed by a turning point and decline. The work of Collier and Goderis (2008) suggests that this is a commonly followed path, in which an initial resource boom is followed by poor long-term performance with overall negative net effect.

Figure 3: Governance and performance dynamics



Policy needs to operate on both the relationships that we have outlined. Better outcomes can be delivered given the underlying quality of governance, (*i.e.*, the $H(G_{t+1}, R)$ could be shifted upwards). And policy is needed to prevent resources from setting off a decline in governance (*i.e.*, to shift to the governance relationship $F(G_t, R)$ upwards and flatten the S shape). There are three main types of instruments that can shift these relationships in the right direction.

The first is to provide informational and technical support about what works. As we have seen, many of the policy issues are complex and difficult for governments to get right, and this is particularly the case for weak and fragile states. Technical assistance and codes of practice are important both for government itself, and to inform civil society, so that debate and scrutiny can be more effective.

The second set of instruments concern incentives for government action. International commitments through codes of practice or treaty obligations can be important, the most obvious examples being the Extractive Industries Transparency Initiative (EITI)

and the Kimberly process (under which diamonds traded have to be certified as not originating from areas of conflict). Domestically, it is possible to create – imperfect – commitment mechanisms by entering long-term contracts and building reputation. It may also be possible to design fiscal constitutions under which a share of revenues is put aside for long-term use.

The third set of instruments surrounds the role of agents outside the country. The international environment has often played a role in undermining the good governance of natural resources. Governments of countries in which resource extraction companies are based have sometimes acted directly to undermine the good governance of resource extraction. For example, some governments have used their diplomatic power to lobby for special deals for their own companies, undermining the integrity of both the fiscal system and the process by which the extraction rights are awarded. This use of diplomatic power is in excess of the influence commonly employed in normal tax treaty negotiations and other trade negotiations. Countries in which companies are based also have a wider responsibility for the regulatory framework for companies operating in the natural resource and in the financial sector. Progress can be made by extending support for EITI and for an international accounting standard for reporting resource-related payments as well as production, costs and revenues country-by-country. The latter would make it easier for producing countries to administer resource taxes effectively. Similarly, governments which are home to international banks should require them to disclose all deposits, the source of which could reasonably be suspected of being the diversion of resource revenues from their proper uses. The reporting requirements should parallel those currently applying to international terrorism. Such initiatives need to be coordinated internationally, so that regulatory havens do not emerge.

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