

# Political Economy and Natural Resource Use

Robert T. Deacon  
Department of Economics, UCSB  
and Resources for the Future  
[deacon@econ.ucsb.edu](mailto:deacon@econ.ucsb.edu)

Bernardo Mueller  
Departamento de Economia, Universidade de Brasilia  
[bmuller@unb.br](mailto:bmuller@unb.br)

## 1. Introduction

Comparing how countries with diverse political systems use their natural resources suggests that systems of governance have important effects on resource use. Norway and Nigeria make for a stark comparison.<sup>1</sup> Both countries were endowed with extensive forests in prehistoric times, but the fractions of these forests that remain intact are far different. In Norway over 90% of the country's original forest cover remains today, while the figure for Nigeria is less than 11%. The forests that do remain are used in much different ways in the two nations. In Norway, 95% of timber harvested goes to industrial uses such as sawn wood and paper; only 5% is used for fuel. In Nigeria the shares are roughly reversed: 8% is destined for commercial uses, while 92% is used for fuel and

most of this is gathered from forests lacking firm ownership rights. In Norway, the acreage of land in legally protected natural areas represents about 20% of the country's original forestland. In Nigeria, the fraction is roughly 7%. Norway and Nigeria are both major oil producers and, as others have noted, there are marked differences in the ways they use their petroleum endowments.<sup>2</sup>

This is admittedly 'straw man' comparison. Norway and Nigeria differ radically in their non-political attributes, e.g., in their income levels, cultural heterogeneity, and religious beliefs, so their differences in natural resource use may stem from several sources. Still, the general pattern just sketched is broadly consistent with basic economic reasoning about how political economy affects the use of natural resources.

In what follows, we examine four ways in which a nation's political system is linked to the way its natural resources are used. First, when property rights to resources are weak, competition to acquire them can be wasteful and be characterized by rent-seeking and violent conflict. The link to political systems comes about because ownership claims are most likely to be weak or ambiguous in countries where the rule of law is not well-established. Second, when a country's political system is unstable or non-representative, the individual's claim to a resource stock's future return can be rendered insecure. This reduces the payoff to natural resource conservation, leading to more rapid depletion of resource stocks. When tenure insecurity is a general feature of an economy, however, it can have the secondary effect of raising the cost of resource extraction, rendering some stocks uneconomic and slowing rates of depletion. Third, when a country's natural resources are capable of generating significant rents, but institutions of

---

<sup>1</sup> The following data on forest use and forest cover are taken from World Resources Institute (1999) and generally refer to the year 1995.

democratic governance and the rule of law are not well-established, corruption by government officials responsible for resource management can encourage rent-seeking, dissipating the benefits those resources would otherwise confer. Fourth, the mix of private vs. public good outputs produced by a nation's natural resources may be affected by its political system. A resource such as a forest can provide either nonexclusive, public good outputs such as habitat and watershed, or appropriable, private good outputs such as salable timber. When a country's government does not represent the interests of the entire population, but rather acts on behalf of a select group, the use of resource stocks to provide public good amenities may be under-emphasized. In what follows we present evidence on each of the first three links from political systems to natural resource use. At present there is little evidence on the fourth link, hence this point is discussed only as a topic for future research in the conclusions.

We begin by examining how ownership institutions are created and how these institutions affect, and are affected by, the use of resources. A central point here is that property rights are created by economic agents in response to the costs and benefits of creating them. Creating property rights that provide incentives for efficient use of natural resources, and optimally adapting these rights as conditions change, requires that economic agents be able to cooperate and coordinate, and that the State be able to coerce in order to overcome market failures and opportunistic behavior. The ability to cooperate, coordinate and coerce, however, depend on the political institutions that determine who has a say and how they make decisions on natural resource use. Another essential ingredient is a commitment mechanism to facilitate these actions, for example an independent and well-functioning judiciary. Political institutions also determine whether

---

<sup>2</sup> Karl (1997, Chapter 4) provides comparisons.

the State's ability to coerce will be used to achieve efficient resource use, i.e., maximizing net benefits to the population at large, or to benefit specific groups while shifting costs to the rest of society. Absent appropriate political institutions, property rights may not provide incentives for efficient use and, as observed repeatedly throughout the world, this situation may persist despite the existence of obvious superior alternate arrangements. These themes, and empirical evidence on the associated resource allocation effects, are examined in Section 2.

Empirical evidence on the linkage between governance institutions and natural resource use is examined in Sections 3 and 4. The medium whereby governance affects resource use is property rights, so the hypothesized causal chain postulates that political institutions affect property rights, and property rights in turn affect resource use. Some of the work on this chain examines only the second link, testing for systematic relationships between property rights structures and resource use. Others approach the problem by testing for direct associations between political institutions and resource use, effectively skipping the middle step.<sup>3</sup>

Emerging evidence on a phenomenon called the 'natural resource curse' is examined in Section 5. This literature raises the novel possibility that a nation's natural resource endowment may influence the political system it adopts. Some observers conclude that the presence of abundant natural resource stocks, particularly at the time when a country's governance institutions are being formed, can lead to the adoption of autocratic, non-democratic, elitist political systems. Resource stocks that are concentrated in space, such as oil or minerals, appear most strongly associated with this unfortunate outcome. While this possibility is based on evidence that is still evolving, it brings the

analysis full circle in the sense that causal links between politics and natural resources may operate in both directions.

Finally, in Section 6 we review the phenomenon of ‘perverse subsidies,’ the prevalence in many countries of natural resource subsidies that have environmentally degrading effects. The discussion questions why governments wishing to effect transfers to specific groups choose to use such wasteful mechanisms. It is argued that making transfers through subsidies related to natural resources is attractive to governments because it reduces transparency and political transaction costs, leading to less opposition and confrontation to those transfers, which more than compensates the losses due to environmental degradation.

## **2. Property Rights to Natural Resources**

Property rights are key determinants of natural resource use (Alston and Mueller, 2003). When a natural resource is not scarce relative to the existing demand, rights to use it are generally irrelevant. If changes occur that render the resource economically scarce, however, e.g., shifts in preferences, technology or demographics, rights to use the resource begin to matter and a process whereby property rights evolve may be set in motion. It is useful to think of this process in terms of demand and supply forces.

The demand for property rights arises when groups or individuals realize that their welfare would be enhanced if the current property rights system were changed. Imagine a renewable natural resource used by a village under open access conditions, but where

---

<sup>3</sup> The rationale for taking this approach is discussed later.

demand is low relative to the yield the resource can sustain, so common pool losses are minimal. An exogenous change then occurs that dramatically increases demand, e.g., a technological innovation or trade liberalization that creates a demand for the resource as an input. If open access persists, each individual's increased use of the resource would now adversely affect use by others, causing welfare losses. Users now have an incentive to "demand" a change in the property rights system, to a form that avoids these losses (Demsetz, 1967). This observation applies more generally: most market failures, such as externalities, public goods and asymmetric information, afford the possibility to increase efficiency through changes in property rights.<sup>4</sup>

Nothing guarantees, however, that the demanded change in property rights will be automatically supplied. In fact, casual observation indicates that inefficient situations that could readily be improved by obvious changes in property rights are rife. An important reason for this is that property rights are created, or "supplied," by a political process. Political economy considerations are thus crucial for understanding the actual arrangements that emerge in any given situation. The groups that control the political process will not consider the costs and benefits to society as a whole that arise from a change in property rights, but only those relevant themselves (Deacon, 2003). The property rights that emerge in an ideal democracy, where the controlling group is the entire voting population, will therefore tend to be different than those that would emerge if policies were controlled by an elite minority.

To expand on this point, consider as a benchmark a world where the Coase Theorem applies to the political realm (Coase, 1960; Acemoglu, 2002). In this benchmark, political

---

<sup>4</sup> Demand for a change in property rights may also arise from purely redistributive motivations, where one group seeks to increase its welfare at the expense of other groups.

property rights are well defined, individuals are well-informed on the costs and benefits of alternative courses of action, and there are no political transaction costs. In such a world, natural resources would always be used efficiently, regardless of who owns them. If optimality requires a change in resource use that would harm the politically powerful, costless compensations could be arranged to allow the change to take place. That is, welfare enhancing property rights would always emerge.

The fact that societies routinely chose policies and institutions that lead to inefficient use of natural resources indicates that these benchmark conditions are not satisfied in the real world. Property rights that are conducive to better economic performance may fail to emerge because informational problems lead citizens to be unaware or to disagree as to which changes are optimal (Alston and Mueller, 2003). Even when losses under an existing arrangement are obvious, free-riding and other problems of collective action may prevent changes from being accomplished

More importantly, when political property rights are insecure it is difficult for politicians and citizens to make credible, long term commitments to compensate those who would lose from the change in resource use. It may be impossible to assure them that promised side-payments will actually be made and will not be altered or reversed in the future, or that the gains will not be eroded by corruption or incompetence. If the costs of carrying out such political transactions are prohibitively high, sub optimal property rights arrangements may persist even in the face of obviously superior alternatives.

The Landless Peasant Movement (MST) in Brazil is a case in point. The MST has practiced a successful strategy of land invasions to force the government to expropriate land in their favor (Alston, Libecap and Mueller, 1999a, 1999b, 2000). This strategy for

land reform has led to high levels of rural violence and has been shown to give incentives for both landowners and squatters to clear forests prematurely, so as to solidify property rights. Clearly, this property rights arrangement has been wasteful. The government has tried to persuade the MST to cease invading by promising in exchange to accelerate the pace of land reform. It has also tried to dissuade invasions by passing a law that invaded properties will not be the object of State expropriations. Neither of these policies have had the intended effect, however, because the government cannot credibly commit to continue land redistribution in the absence of invasions or to desist from intervening when an invasion attracts the electorate's attention. The MST is consequently unwilling to accept any form of compromise that involves ceasing invasions, and the waste continues (Alston, Libecap and Mueller, 2003).

While stable political conditions and a well-established rule of law are conducive to the creation of efficient ownership institutions, they by no means guarantee it. Libecap's (1989) analysis of bargaining for changing property rights over fisheries, crude oil, and federally owned range and timber land in the United States makes this point. In all four cases, initial property rights institutions led to common pool losses and attempts were made to change these to more efficient regimes. Attempts to mitigate these losses by forming new property rights arrangements generally met with little success, however. Although significant potential gains were widely acknowledged, issues of "the distribution of wealth and political power that are part of the transition to the proposed rights structure [remained] a source of dispute."<sup>5</sup>

In the case of oil, for example, the common-law rule of capture granted property rights to oil upon extraction. This created incentives for multiple owners of land over a

single reservoir to embark in a race to drill and drain, even though this led to excessive capital costs and increased extraction costs due to losses of pressure. Unitization, whereby a single firm operates the field in a profit maximizing fashion with the net returns divided among the claimants according to a pre-specified formula, would have avoided these losses. Although this seems a straightforward fix for rampant common pool losses, the fraction of oil reservoirs successfully unitized has been surprisingly low (Libecap and Wiggins, 1985). Reaching agreement over individual shares has proved difficult, particularly when the parties are heterogeneous with respect to location and the productive potential of their leases. Agreements often took several years to reach and frequently broke down when conditions changed. As these examples illustrate, the probability of reaching wealth-enhancing agreements to change property rights is crucially determined by transaction costs.<sup>6</sup>

Transactions costs are likely to be low in small, stable, homogeneous communities. Accordingly, prospects for achieving cooperation and coordination for more efficient use of natural resources are greatest in these circumstances. Ostrom's (1990) work on communal resource management systems implicitly makes this point. Ostrom (1990) criticizes the presumption in much of the policy literature that communal governance of natural resources is inefficient, as well as the resulting policy prescriptions that optimal use requires either government intervention or private property rights. She argues that the simple models that underlie this presumption, the "tragedy of the commons" (Hardin, 1968; Gordon, 1954), prisoner dilemma, and the logic of collective

---

<sup>5</sup> Libecap (1989:5).

<sup>6</sup> That is, agreement will be more likely (i) the greater the aggregate gains to be shared, (ii) the number and heterogeneity of the bargaining parties involved, (iii) the extent of limited and asymmetric information, and (iv) the greater the distributional issues involved, all of which depend as well on the physical nature of the

action (Olson, 1965), do not necessarily apply to all common property situations. She provides several examples of groups using natural resources under common property arrangements who create new rules that essentially change the game they face to avoid inefficiencies. The individuals in these cases overcame both the free-rider problems inherent in communal use and the second-order dilemma of supplying the institutions that enabled credible commitments and mutual monitoring.

It is worth reiterating that the groups examined in these case studies were generally small, stable, and relatively homogeneous, so the transaction costs of adapting institutions were relatively low. Also, the question remains as to how successful these arrangements were, in a quantitative sense, in overcoming common pool incentives to overuse communal resources. While a community may exercise a degree of control through customs, social penalties, and taboos, the penalties for inefficient use by an individual are arguably sharper under private ownership. Accordingly, the costs and benefits of individual resource use decisions are (arguably) more loosely linked under communal ownership than under private ownership. Studies of bush fallow and forest biomass use in Cote d'Ivoire and Ghana support this point (Lopez 1997, 1998.) At least in these communities, common ownership has apparently increased cultivation and reduced forest cover well beyond what strict profit maximization would dictate.

The discussion in this section is framed by a central proposition: a country's political institutions, by determining transaction costs, shape the pattern of property rights that emerge and the way natural resources are used.<sup>7</sup> Figure 1 provides a simple

---

resource (Libecap, 1989).

<sup>7</sup> There has been increasing interest in the effect of political institutions on economic outcomes. Several authors have been applying the notion of transaction costs economics (Williamson 1985, 1991) to politics, in what has been termed transaction cost politics (Dixit, 1996; North, 1990b; Levy and Spiller, 1996;

framework that relates institutions and policy mechanisms to property rights, and these in turn to economic performance. These two links represent the two major lines of research in the property rights literature (Alston and Mueller, 2003; Libecap, 2002).

Research that takes property rights as given and seeks to understand how their specific structure affects the allocation and use of resources is depicted by link (1). Insecure property rights lead to rent dissipation by providing incentives to usurp, defend and lobby for more secure rights. More importantly, insecure rights prompt claimants to excessive or premature investment in the hopes of strengthening their claims (Anderson and Hill, 1990), they prevent the holder from using a resource as collateral, and they reduce potential gains from exchanging assets.<sup>8</sup> In Section 4 we qualify this point by noting that insecure property rights discourage investment in produced capital, and explain how this can have countervailing effects on both the depletion of natural resource stocks and the production of natural resource outputs.

An illustration of this effect in action is provided by research indicating that the use of forests is affected by whether or not the user has an adjudicated land claim. Ownership of cleared land is generally more secure than forested land, which has the effect of rendering forest biomass highly insecure. Adjudicating a land claim is an alternative way to secure ownership rights, hence one should expect forest clearing to be less extensive on adjudicated lands, and forest stocks more plentiful. This has been shown in Ecuador, where the relative frequency of land claim adjudication across cantons

---

Spiller and Tommasi, 2003).

<sup>8</sup> Sub-optimal use of forested land due to property right insecurity has been analyzed by Alston, Libecap and Mueller (1999a, 1999b, 2000), Beseley (1995), Deacon (1999), Feder and Feeney (1991), Place and Hazell (1993) and Migot-Adholla et al. (1991), Southgate et al (1991).

is negatively correlated with rates of land clearing.<sup>9</sup> In Brazil applicable property laws, land reform policies, and conservation programs have a similar effect, rendering rights to forest biomass highly insecure, and this is cited as an important cause of deforestation.<sup>10</sup>

Research depicted by links labeled (2) and (3) in Figure 1 examines how property rights evolve and investigates why inefficient arrangements can persist when more efficient alternatives are readily available. This line of inquiry has been the main topic of this section, and has been described in terms of the demand and supply of property rights.<sup>11</sup> Both institutional endowments and policy mechanisms form the “rules of the game” that restrict agents’ behavior (North, 1990a). The difference between the two is that institutional endowments change very slowly over time so that they can be taken as exogenous, whereas political or policy mechanisms can be altered in a shorter time frame and can thus be considered as choice variables of the political actors. Institutional endowments include the type of government, e.g. parliamentary or presidential, democratic or dictatorial, legislative-executive relations, the independence of the judiciary, the level of bureaucratic capabilities, electoral rules, etc. These institutions determine who are the players, what are their payoffs for cooperating or deviating, what are their horizons, where and how frequently they interact, who initiates legislation, who has a vote, who can veto, and in what sequence these decisions are made.

Policy mechanisms are rules, regulation and restrictions that policy imposes on resource users. They can come in the form of a law or a program devised by policy makers. A program for implementing individual tradable quotas (ITQs) for solving the

---

<sup>9</sup> Southgate, Sierra, and Brown (1991) p. 1146. In Ecuador, individuals seeking to acquire land in tree covered areas must clear those lands in order to acquire formal property rights.

<sup>10</sup> Alston, Libecap, and Mueller, 2000, pp. 169-172.

<sup>11</sup> The work by Libecap (1989) and Ostrom (1990) cited above are examples of this literature.

common pool problem in a fishery is an example of a policy mechanism that affects property rights. Other examples are Pigouvian taxes, conservation areas and eco-labeling. Institutional endowments partially determine the success of any given policy mechanism in promoting more efficient property rights. The use of ITQs, for example, has led to disappointing results in some circumstances, despite elegant theoretical underpinnings (Johnson, 1999). Where failure occurs, it is often due to a mismatch between the extant institutional endowments and those required to resolve distributional issues, provide credible commitments against expropriation, and assure effective monitoring.

Although we assumed above that institutional endowments are fixed, Figure 1 suggests that economic performance and other factors such as history, geography, religion and resource endowments do in fact determine those institutions and lead to change over time. The arrows linking economic performance (5) and these other factors (4) to institutional endowments are dashed to indicate that these effects work slowly over time. In Section 5 we review research on one of these links, a connection between resource endowments, economic growth, and governance, which is attracting increasing attention in the literature.

### **3. Political systems, ownership risk, and natural resource stocks**

One aspect of property rights that has been studied in the empirical literature on political economy and natural resource use is the link between insecure tenure and incentives to conserve resource stocks. This intuition that underlies this connection is straightforward. If the current owner of a resource stock faces a risk that his or her claim to the stock or its

future return may be lost, the effect on the choice between consuming vs. conserving the resource is similar to the effect of discounting.<sup>12</sup> The necessary ingredients for this choice are:  $R_0$ , the return from immediate consumption,  $R_1$ , the return from consuming the asset one year hence,  $r$ , the rate of interest, and  $p$ , the probability that the owner's claim to the resource is lost before  $R_1$  is received. The expected present value of the owner's claim on next year's return is  $R_1(1-p)/(1+r)$ . Comparing this to  $R_0$  captures the current owner's consumption vs. conservation decision. An increase in  $r$  will tilt the comparison in favor of immediate consumption; an increase in  $p$ , the probability of ownership loss, has the same effect.

The free access fishery is an extreme example. Any fish purposely left uncaught by an individual fisher to grow to a larger size during the coming year will, with virtual certainty, be caught by someone else, so  $p=1$  in this case. Whatever  $R_1$  may be, the expected present value return from conserving the stock is essentially zero to the individual fisher. By this reasoning, the incentive to conserve stocks of fish, groundwater, game, and forests is diminished by insecurity in the owner's claim on their future returns.<sup>13</sup> Similar reasoning implies that insecure ownership diminishes the incentive to conserve nonrenewable resource stocks for future consumption. In some of these cases insecure ownership is partly due to the resource's fugitive or hidden nature, which makes monitoring and enforcement more difficult.

---

<sup>12</sup> Besley (1995) calls this the 'security argument' for why property rights affect asset conservation and investment decisions. He also presents two other arguments for why property rights and conservation and investment decisions could be linked. One is based on the using an asset's collateral for a loan to obtain investment funds; the other emphasizes the importance of transfer rights to exploiting an asset's complete productive potential.

<sup>13</sup> For  $p$  near zero the expected present value approximately equals  $R_1$  discounted by  $r+p$ , which reinforces the point that ownership risk affects natural resource use in much the same way as a higher interest rate.

Of particular relevance here is the fact that a country's political system can induce ownership risk. When a country's government is either unstable or authoritarian, incentives to conserve natural resource stocks are likely to be weak. For example, conserving biomass in a forest rather than consuming it immediately is an act of investment, and the investor's return might be an enhanced stock of nutrients to support agriculture or a larger biomass for commercial timber to be harvested later. The user will not sacrifice current consumption without an assurance that he or she will receive the future benefit. Such assurances are normally provided by legal title, a third party enforcement mechanism, and an impartial judiciary to resolve disputes.

When government lacks the power, stability, and popular support needed to enforce legal claims, enforcement will fail. Even resource stocks that are nominally owned by government may be subject to free access use if government cannot control what goes on in the countryside or if the political system does not provide incentives for government officials to monitor and enforce the State's claims.<sup>14</sup> Evidence on illegal logging and forest clearing in forest land nominally owned by government is illustrative. Illegal logging can involve logging inside national parks or outside concession areas and cutting of restricted species. According to widely cited estimates, the percentage of wood harvested illegally exceeds 80% in Bolivia, Cambodia, Myanmar, and Brazil (Smith 2002). Each of these countries ranks relatively low on standard 'rule of law' indexes.

Even when the government's enforcement powers are adequate, the individual's claim to a resource will be insecure if the country's legal system cannot be relied upon to

---

<sup>14</sup> In Colombia more than 35% of land designated as national parks is actually held by private owners, 20% is occupied by untitled squatters, and another 10% is disputed by other parties. Enforcement of land ownership claims is hindered more generally by drug smuggling, the actions of revolutionary bands, and conflicts among native groups (Deacon and Murphy, 1997, p.6.)

provide predictable interpretations of property laws. In countries ruled by autocrats and dominant elites, rather than by anonymous laws and institutions, the individual's claim to an asset can depend crucially on remaining in favor with those in power. Being in compliance with the written law may be of little consequence. Even those in favor with the political elite face ownership risk because the elite might be deposed, and the structure of ownership claims realigned as a consequence. Accordingly, incentives to conserve natural resource stocks are likely to be weak in countries subject to the rule of individuals rather than the rule of law.

Instability in a country's policies can affect incentives to conserve resource stocks in similar ways. Consider the effect of a hypothetical trade liberalization policy, one that would shift the terms of trade in favor of agriculture, on a nation's agricultural soil. In a country where policies tend to be stable and government promises are kept, some farmers will rationally invest in greater soil conservation, reasoning that enhanced agricultural output in the future will more than repay the initial outlay. In a country where government policies change frequently, the opposite might occur. Farmers might rationally conclude that the best course is to farm intensively in the short run, while the policy is in force, anticipating that it will be dismantled in the future. The net effect could be accelerated soil depletion in this case and the driving force is not the policy itself, but rather the fact that it is unstable.

The preceding discussion suggests a simple, intuitive proposition: insecure ownership diminishes the conservation of resource stocks for future use. This simple aphorism does not apply universally, however. When ownership insecurity is induced by a country's political system, ownership claims to all assets, natural resource stocks and

ordinary goods alike, may be rendered uncertain. This can have the secondary effect of increasing the cost of, or diminishing the return from, appropriating natural resources. Stripping biomass from a forest again provides a convenient illustration. One reason for removing a forest's biomass is to gain access to the land it occupies, possibly for farming or ranching. If forest biomass cannot be owned with any degree of certainty, the incentive to maintain it, let alone nurture it, clearly is diminished. If rights to the agricultural land one would obtain by clearing the forest are also uncertain, however, then the incentive to incur the cost of land clearing is similarly diminished. This is a case where insecure ownership, as a general feature of an economy, diminishes the return from consuming the natural resource stock. If this secondary effect is sufficiently strong, the net effect could be larger stocks of standing forest biomass under insecure ownership.

The same net result can occur in cases where the act of harvesting or accessing a natural resource requires produced capital, e.g., where a road, truck, or specialized logging equipment is required to remove forest biomass. Generalized insecure ownership, by creating uncertainty in claims to harvesting capital, effectively makes harvesting more costly. Again, the net result can be diminished forest use if this effect is strong enough to outweigh the diminished incentive to conserve forest stocks. This point is pursued in more detail later

In cases where these secondary effects are deemed to be small, a simple, testable hypothesis suggests itself: renewable resource stocks will tend to be low in countries with political systems that induce insecure ownership, e.g., where government is ineffective, unstable, or autocratic, and the rule of law is not well-established. One empirical strategy is to test for direct relationships between political conditions and resource use, without

examining the intermediate link in the causal chain—property rights institutions. One advantage of this approach is the availability of well-documented data sets on governance institutions, sources that cover virtually all independent states in the world over long time frames. Data on property rights institutions are not available at anything close to this level of detail and coverage. A second advantage is the importance of knowing which aspects of governance matter to the formation of property rights and to the use of natural resources.

This strategy has been applied to cross-country data on political attributes and changes in forest cover (Deacon 1994, 1999.) The presence of the secondary effects just described means that the existence and direction of a relationship between the two is an empirical question. In parts of the world where deforestation is most pronounced the deforestation process most often involves little capital, so it is reasonable to expect that the direct effect dominates. Political instability is indicated by frequencies of events that signal potential political change, e.g., guerrilla warfare, revolutions, coups d'etat, and major constitutional shifts. Rule by elites rather than by impersonal laws and elected representatives is indicated by whether or not the chief executive was elected, whether or not a legislature exists and has significant powers, and whether political competition is tolerated. Overall, the results on deforestation broadly support the hypothesis: forest stocks tend to be relatively depleted in countries with unstable, non-representative systems of governance. The estimated effects are large: a one standard deviation change in an index of ownership security, described later, accounts for about three-fourth of the mean reduction in forest stocks observed in a sample of 62 countries.

The fact that insecure ownership due to political conditions applies to produced capital as well as natural resource stocks suggests a related hypothesis: the political factors affecting natural resource stocks should also affect stocks of produced capital. A similar cross-country empirical procedure found that the specific political variables that are associated with depleted levels of forest cover also affect country-wide investment rates (Deacon 1994, 1996.) This adds corroboration to the claim that ownership risk is what drives the correlations between deforestation and the political attributes of countries.

#### **4. Interactions between produced capital and resource stocks**

In a country that suffers from generalized ownership risk, the cost of capital, including capital used for natural resource extraction, will be relatively high. As noted earlier, this diminishes the incentive to exploit natural resource stocks that require significant extraction capital, such as petroleum, natural gas and metallic minerals.<sup>15</sup> This effect can partially or completely offset the direct ‘discounting’ effect that ownership risk has on a resource’s future return, an effect that tends to hasten consumption.

Ownership risk diminishes the return from both immediate and future consumption of a resource and this can render uneconomic some stocks that would be profitable to exploit if ownership were secure. Mineral deposits that would otherwise be profitable might be left unexploited where ownership is uncertain because extraction

---

<sup>15</sup> The primary source for the following discussion and empirical results on capital intensive resource stocks is Bohn and Deacon (2000).

requires an up-front investment and ownership of the capital created might be lost.<sup>16</sup> A higher extraction cost also changes the payoff to immediate versus future consumption for stocks that remain profitable to extract. For a nonrenewable resource the effect is generally to slow the rate of extraction, increasing the amount conserved for the future.<sup>17</sup> Recall that the effect of ownership risk on a resource with fixed returns is to hasten extraction. Thus the two effects work against one another, and the effect of ownership risk on the timing of extraction for a capital-intensive nonrenewable resource becomes an empirical question.

These hypotheses have been examined empirically using a two step procedure. The first step is identifying the political factors that affect ownership security and their relative contributions. One way to do this is to estimate a model of economy-wide investment, controlling for economic variables such as the openness of the economy, education levels, and business cycle terms. Including political variables believed to be correlated with ownership risk enables one to identify the political determinants of investment. Regarding these political effects as resulting from ownership risk, one can then use the estimated coefficients to form an index of politically induced ownership risk, an index that varies across countries and over time (Bohn and Deacon 2000.) This index can then be used to test for associations between politically induced ownership risk and natural resource use.

Petroleum provides a natural context for examining the effect of generalized ownership risk on capital intensive natural resources. Up-front outlays for exploration,

---

<sup>16</sup> If one regards abandoned stocks as being ‘conserved’, then economy-wide ownership risk can cause more conservation of capital intensive resource stocks.

<sup>17</sup> Intuitively, this occurs because pushing the higher extraction costs toward the future reduces their present value.

production wells, processing equipment, and transportation infrastructure are typically large relative to revenues, and are generally incurred many years before production begins. Both of the effects postulated above—the tendency for ownership risk to render marginal resources uneconomic and to affect the rate of production for stocks that are exploited—were found to be important.<sup>18</sup> Higher ownership risk reduces exploration activity and the effect is statistically significant and large. A one standard deviation increase in the ownership risk index is associated with a 68% decrease in drilling. There is also a strong empirical relationship between the ownership risk index and production rates, measured as the ratio of annual production to the current reserve.<sup>19</sup> Production from a given reserve was found to be systematically *slower* in countries with relatively high ownership risk, indicating that the tendency for ownership risk to raise extraction costs swamps the effect of applying a higher effective discount rate to future returns. Again, the effect is large: a one standard deviation increase in the risk index is associated with a 28% decrease in the extraction rate.

Additional evidence on this general question comes from examinations of forest products production. Forestland can be used for shifting cultivation, fuel wood gathering, and commercial timber harvesting, and the last of these is clearly more capital intensive than the others. Production of industrial timber requires up-front expenditures for roads, logging camps, equipment, and port or rail facilities in some cases. If the current owner's claim to future income from logging is uncertain, the incentive to use a marginal tract of forest for commercial logging is diminished, rendering other less capital intensive uses

---

<sup>18</sup> Empirical analysis used a cross-country panel of observations on petroleum drilling activity, production rates, and current reserves. Drilling rates were specified to depend on price, the physical attributes and geologic abundance of a country's oil resources, OPEC membership, and ownership risk.

<sup>19</sup> Conditioning variables included price, the physical attributes of oil reserves and OPEC membership.

more attractive. In this fashion, insecure ownership can potentially shift forest use away from capital intensive activities such as commercial logging.

Ferreria and Vincent (2003) examine a model of forest allocation decisions made by a 'leader', a possibly autocratic ruler who is able to appropriate the rents from the forest, but faces the possibility of being deposed. The model thus includes elements of insecure ownership, but also entertains the possibility of corruption in the appropriation of forest rents. The leader can enhance his probability of surviving in office, and thus receiving the forest's future return, by sharing forest income with the citizenry. Harvesting the forest requires an initial outlay of capital and is less attractive the lower is the probability of surviving to reap the return.

With this motivation, Ferreira and Vincent (2003) examine relationships between timber *harvests* and indices of corruption, the rule of law, and other indicators of governance.<sup>20</sup> When their governance indicators are aggregated into a single variable, 'lower quality' governance is strongly associated with *smaller* timber harvests. This mirrors the finding for petroleum. The individual governance indicators are found to have different effects, however. In keeping with expectations, forest harvests are consistently *smaller* when the risk of expropriation is high and the quality of the bureaucracy is low. (A low quality bureaucracy is highly politicized and inefficient in providing public services.) Surprisingly, however, forest harvests tend to be *higher* where there is greater corruption and the rule of law is absent.<sup>21</sup> In a counterfactual simulation aimed at seeing how harvests would change if governance institutions for countries in the sample were

---

<sup>20</sup> They control for factors such as forest area, the stock density of forests, and relevant prices.

<sup>21</sup> The authors provide no explanation for the difference in results for different aspects of governance.

changed to levels prevailing in the U.S., they found that ‘better’ institutions would *increase* harvests by 10-20 percent.

The evidence reviewed in the preceding three sections demonstrates a causal link from a country’s political and governance institutions to its pattern of natural resource use. This politics-to-resource link operates through the ability (or inability) of a country’s government to form an efficient system of property rights. In simple situations, insecure tenure for resource stocks leads to premature and excessive depletion. When resource extraction is capital intensive, however, insecure ownership can raise extraction costs and diminish or eliminate the incentive to deplete resource stocks. While there is ample evidence showing that governance and property rights affect natural resource use, no simple ‘tag line’ adequately describes how the effect works—in some cases weak property rights hasten resource exploitation and in other contexts they hinder it. The presence of a politics-to-resources link seems evident, however, even if its form is not simple. The following section reviews exploratory evidence that an effect may operate in the opposite direction, evidence that a country’s natural resource endowment may affect the political institutions it adopts.

## **5. Politics and the Natural Resource Curse**

It is not uncommon to find a population that is poor, unhealthy, and politically oppressed inhabiting a country that is rich in natural resources. This seems paradoxical: as a matter of common sense and basic economic reasoning, natural resource abundance should

confer prosperity. Yet examples of slow growth accompanying resource abundance abound. Nigeria's per capita GDP in 2000 was actually 30% lower than in 1965, despite oil revenue receipts of roughly \$350 billion over that period.<sup>22</sup> Venezuela's performance was only slightly better. Saudi Arabia's GDP per capita was lower in 1999 than it was in 1970, before the jump in oil prices. Gylfason (2001, p. 848) reports that OPEC as a whole experienced per capita GNP *decreases* of 1.3% per year during 1965-1998, while income increased at an average rate of 2.2% per year in all lower- and middle-income countries. Many resource rich countries have avoided the curse of slow growth, of course, including Botswana, Chile (after Pinochet), Malaysia and Norway. Overall, however, recent research indicates that resource abundance is systematically associated with slow growth, hence the term 'natural resource curse'.

Recently, preliminary evidence has come to light that the effect of natural resources on growth may operate through political institutions, i.e., resource endowments may affect governance. The factors that determine a country's political institutions presumably are numerous and diverse, and none seem to be well-understood at present. In what follows we examine evidence suggesting that resource abundance is one of these determinants.

Formal empirical evidence on the resource curse first emerged from the empirical literature on economic growth. Sachs and Warner (1997, 2001) examined cross-country data on growth in per capita income between 1970 and 1990 and related these growth rates to initial (1970) income, openness to trade, the share of investment in GDP, and other variables. They included the 'primary products' share of a country's exports in

---

<sup>22</sup> Oil revenues, after payments to foreign companies, are reported by Sala-i-Martin and Subramanian (2003, p. 4). Information on income is from Summers and Heston, 2002.

1970 as a measure of natural resource abundance and found that subsequent growth was slow in countries where this export share is large. Primary products include food, agricultural products, fuels, and minerals; hence their export variable clearly is a flow measure and represents a mixture of heterogeneous resource products. Sachs and Warner (1997, 2001) tried including additional explanatory variables and experimented with alternative measures of resource abundance, but concluded the basic resource curse result is robust. The magnitude of this effect is substantial: according to Sachs and Warner (1997) a one standard deviation increase in a country's primary products export share reduces the growth rate of per capita GDP by 0.6 to 1.5 percentage points.

Early explanations for this phenomenon were followed conventional economic arguments—stressing the role of markets rather than processes that operate through political institutions. One such explanation is the ‘Dutch disease,’ a theory offered to explain the poor economic performance of the Netherlands following the discovery of North Sea oil.<sup>23</sup> According to this theory, a natural resource boom causes a country's exchange rate to appreciate, reducing its manufacturing exports. The predicted effect is slow growth if, as Dutch disease proponents argue, manufacturing is more conducive to economic growth than resource extraction due to learning-by-doing and other external effects.<sup>24</sup> Others postulate that natural resource development diverts a country's attention away from activities that have higher long-term payoffs. Gylfason (2001) argues that resource rich countries tend to neglect education, essentially because they see their natural resource wealth, not human capital, as the key to the future.<sup>25</sup> Another market-

---

<sup>23</sup> This explanation is stressed by Sachs and Warner (1997, 2001).

<sup>24</sup> The assumption that manufacturing is an engine of growth, whereas resource extraction is not, is largely untested.

<sup>25</sup> Gylfason shows that investment in education is systematically lower for countries with capital

based explanation stresses volatility in natural resource prices, which leads to frequent boom-bust cycles and exchange rate fluctuations. This is said to impair economic performance by hindering investment planning and effective government policy (Stevens 2003 p. 12.) Others argue that a volatile exchange rate directly hinders exports and prospects for export-led growth (Gylfasson et al, 1999.)

Significantly, it appears that the curse operates in some political contexts, but is absent in others. Moreover, the curse plagues some types of natural resources, while other resources seem largely immune. Neoclassical explanations, such as the Dutch disease, do not predict these regularities. Perhaps for this reason, theories stressing political economy considerations such as rent-seeking and forms of governance have gained prominence.<sup>26</sup>

There is substantial case study evidence that the availability of rents from abundant natural resources can lead to rent-seeking and corruption in government, particularly in countries where the rule of law is not well-established. Some observers argue that natural resource rents impair growth by attracting a country's entrepreneurial talent away from its productive sectors, e.g., manufacturing, and into socially non-productive attempts to enhance one's share of the large resource pie (Torvik 2002.) This is particularly likely if resource rents are nominally captured by government, but are subject to private appropriation by those willing to engage in lobbying, corruption, and the like. In equilibrium the returns to both lines of work will be equalized, hence a boom in the resource sector will draw talent away from the economy's productive sector.

---

concentrated in natural resource stocks. The resource measure does not capture abundance, however, but rather the degree to which total capital is concentrated in resources. Birdsall, Pinckney, and Sabot (2001) also draw a link with education, but argue that the effect operates through a country's political system.

<sup>26</sup> Stevens (2003, pp. 17-24) surveys several strands of this literature. Bulte and Damania (2003, pp. 3-6) review this literature and related work on economic growth, emphasizing theoretical contributions.

This theory does not explain why some resource rich economies fall prey to the curse while others seem to escape it, however. Botswana, Chile, Malaysia and Norway are all resource rich, and all achieved very attractive growth rates during 1965-2000, based significantly on natural resource industries. Over the same period Bolivia, Nigeria, Saudi Arabia and Venezuela, also resource rich, all languished. One possibility is that institutional differences across countries cause variations in the efficacy of rent-seeking, and therefore differences in the degree to which resource rents hinder growth (Mehlum, Moene and Torvik 2002.) According to this theory, resource abundance will be a curse in a country whose political institutions are receptive to rent seeking, because the diversion of entrepreneurial energy away from productive activities will be severe. The diversion of entrepreneurship will be modest and natural resource wealth will be a blessing, however, where government is immune to rent-seeking.

Recently available indicators of institutional quality, including measures of the rule of law, bureaucratic quality, expropriation risk, and other governance attributes allow straightforward tests of these predictions. In one recent study the results are remarkably clear: natural resource abundance retards growth when institutional quality is low, i.e., government is prone to rent seeking, confiscation, and corruption.<sup>27</sup> For a country with good institutions, however, resource abundance has a mildly positive (though statistically insignificant) effect on growth.<sup>28</sup>

---

<sup>27</sup> See Mehlum et al (2002). They estimate an empirical model of economic growth that includes both a resource abundance measure and an interaction between resource abundance and institutional quality. This allows for different economic growth responses to resource abundance under different governance regimes. Bulte and Damania (2003) pursue a similar empirical strategy and find that the curse holds for autocratic regimes, but not for democracies.

<sup>28</sup> A somewhat different theory, based on the composition of political power in a country, reaches a similar conclusion. Where a number of groups vie for political power, a resource windfall is predicted to set off a feeding frenzy. This is said to cause inefficiency in the allocation of capital because intensified rent-seeking causes government to raise revenues, which are supported in part by taxes on the more productive sectors.

If resource abundance and weak governance both tend to be found in the same countries, countries typically suffering poor economic performance, might resource abundance and governance be somehow causally linked? There is considerable anecdotal evidence for such a link. Civil wars in Angola, Nigeria, Sierra Leone, and Zaire have been attributed to struggles to control resources, particularly resources that are spatially concentrated such as diamonds, oil, and metallic minerals. Sales of diamonds, cocaine, and timber can provide rebel groups with the financial resources necessary to pursue their aims, whether ideological or mercenary. This suggests that resource abundance might contribute to the determination of at least one political attribute, political instability. Indeed, systematic study of available evidence has demonstrated that the probability and duration of civil wars in a cross section of countries is strongly correlated with resource abundance, measured as the share of primary products in a nation's total exports (Collier and Hoeffler 1998, 2002.)

One can also find anecdotal evidence of resource wealth affecting the distribution of power between central and regional governments.<sup>29</sup> In Nigeria a concentration of resource wealth in one region, and attempts by other regions to gain a share of it, contributed to the breakup and eventual re-establishment of centralized political power. In post-Soviet Russia, resource-rich regions have sought to enhance their own political power vis a vis the center in order to obtain more complete control of resource wealth.

The notion that resource abundance might influence governance gains plausibility from an empirical regularity in the resource curse literature: the curse seems most

---

The result can be a slow-down in economic growth, however the size and direction of the effect depends on the number of groups competing for government largesse. See Tornell and Lane (1999), who provide evidence on the economic growth consequences of natural resource booms in Venezuela, Nigeria, Mexico, Costa Rica, Cote d'Ivoire, and Kenya.

prevalent when the resources involved naturally occur in dense concentrations. Such ‘point’ resources can arguably be controlled by a strong State mechanism, while resources that are ‘diffuse,’ or evenly distributed over the landscape, cannot. From this observation, it does not take a heroic leap to hypothesize that countries with abundant point resources will tend to evolve governance structures based on centralized agglomeration of power, power directed at controlling those resources, and that their histories will be replete with struggles to retain that control.<sup>30</sup>

This reasoning suggests that the effect of resource abundance on economic growth is indirect: resource abundance leads to ‘bad’ or unproductive governance institutions, and these institutions in turn lead to poor economic performance. This chain is illustrated in Fig. 2. It recognizes that factors such as history, religion and geography may well contribute to a nation’s governance system, as indicated by the upper left solid link. The empirical literature on economic growth has established the solid link from repressive, corrupt, or unstable government to slow economic growth to the satisfaction of most observers. Hence those seeking to evaluate political economy explanations for the resource curse must address two questions: Does resource abundance systematically lead to unproductive governance institutions, i.e., does the lower left solid link exist? If so, does resource abundance have an additional direct effect on economic growth, e.g., due to Dutch disease effects, terms of trade effects, etc.? The latter possibility is illustrated by the dotted link in Fig. 2.

---

<sup>29</sup> We are indebted to Joseph Stiglitz for these examples.

<sup>30</sup> Woolcock, et al (2001) reach the same general conclusion by a different path of reasoning. They argue that point source resources, including such plantation crops as sugar, cotton, and tobacco, are associated with highly concentrated ownership and, consequently, wealth inequality. They see this inequality as a source of political conflict that hinders the adoption of productive public policies.

Motivated by these questions, recent research on the resource curse has distinguished ‘point’ resources, such as fuels and minerals, from ‘diffuse’ resources such as food and agricultural products. Empirical models have also begun to allow for the possibility that resource abundance influences governance institutions.<sup>31</sup> One way to combine these considerations is to specify a two-part empirical model. In the first part, institutional quality is hypothesized to be a function of natural resource abundance, with a distinction drawn between ‘point’ and ‘diffuse’ resources. Here, the consistent finding is that an abundance of point resources in an initial period is associated with bad institutions later on, while diffuse resources show no such effect. Additional variables that may exert separate influences on institutions are included as controls, however the association between point resource abundance and undesirable governance appears robust.<sup>32</sup>

The second step involves determining whether or not resource abundance exerts a separate, direct effect on economic growth, once the effect of governance institutions is controlled. This involves specifying a model of GDP growth that includes, as determinants, governance, income in an initial period (to allow for convergence in growth rates) and additional economic variables thought to determine economic growth. A strong link between governance and economic growth rates, familiar from the empirical growth literature, is confirmed here. This establishes an indirect link between natural resource abundance and economic growth, where the resource effect is conveyed through an

---

<sup>31</sup> Leite and Weidmann (1999), Bulte et al (2003), Isham, et al (2003), and Sala-i-Martin and Subramanian (2003) are examples of this work. See also Woolcock et al, (2001) for a less formal empirical exercise that has the same flavor.

<sup>32</sup> The controls examined include: language fractionalization to allow for difficulty in attaining consensus on public policy questions, settler mortality rates in former colonies to allow for differences in the form of governments set up by the former colonial powers (Acemoglu et al, 2001), school enrollment rates and per capita incomes at an historic date to allow for differences in attitudes toward governance, regional dummy variables, latitude or location in the tropics, openness to trade, and life expectancy at birth in an historic year.

influence on institutions. One can then test for an additional direct link between resource abundance and growth by adding resource abundance as a separate determinant of growth rates (Sala-i-Martin and Subramanian 2003.) Evidence reported to date indicates that no additional direct effect is present, implying that the entire natural resource curse arises from the impact of resource abundance on governance.

Standard econometric approaches to testing the direction of causation between resources and institutions with cross country panel data can be unconvincing because governance institutions tend to be highly persistent. This fact enhances the value of case studies of individual resource rich countries as a supplement to formal statistical analysis. The available case study evidence generally supports the proposition that point resource abundance leads to weak political systems and consequent economic disadvantage, but there are important exceptions.

At first glance Bolivia seems to fit the model well.<sup>33</sup> Bolivia is rich in hard minerals and petroleum, with mineral rents equaling 16-25% of GDP and minerals accounting for roughly 90% of exports during the 1970s and early 1980s. During most of this period Bolivia suffered from political instability, factional strife, autocratic rule, and a lack of social and political freedoms.<sup>34</sup> Economic growth during this period was negative. Potential economic advantages were squandered on unproductive social investments and on protection for inefficient manufacturing enterprises—all seemingly consistent with the theory linking concentrated resource stocks to bad governance and

---

<sup>33</sup> See Auty and Evia (2001).

<sup>34</sup> Political factionalization and instability characterized governance in Bolivia in the years after the 1952 revolution. Instability was particularly acute after the mid 1970s, with nine changes of government occurring between 1978 and 1982 (Auty and Evia, 2001, 182-184.) Regarding social and political capital, Bolivia had a decidedly low rating on political and civil freedoms and a low rating for democratic governance during the same period (Freedom House 2003 and the Polity IV data base.)

economic demise. The full story is more nuanced, however. A severe economic crisis occurred in the early 1980s, with inflation reaching 20,000% at one point and private investment collapsing to 3% of GDP. This event precipitated an abrupt political transition. The earlier political factionalization gave way to a more consensual democracy and improvements in the quality of governance. These gains have largely persisted to the present, despite Bolivia's resource wealth.<sup>35</sup>

According to Abidin (2001), a similar crisis allowed Malaysia to escape, or at least mitigate, the resource curse. Malaysia is rich in rubber, tin, petroleum, and natural gas. Through the 1950s and 1960s it suffered from factionalized politics and civil strife. In 1969, race riots between the numerically dominant ethnic Malays and economically dominant Chinese fed fears that the country would descend into chaos. This is broadly consistent with predictions that natural resource abundance leads to strife and poor governance. In Malaysia's case, however, the crisis that resulted led to a political compromise and a restructuring of the nation's economic policy. In the new order, emphasis was placed on improving the position of ethnic Malays through education and investments in rural infrastructure. Since 1970 Malaysia's governance system has received higher rankings for governance than other resource rich states, although they are certainly not distinguished when compared to non-resource rich states. During the 1990s, Malaysia has enjoyed relatively rapid growth.

Saudi Arabia is perhaps *the* model for a State rich in point resources, and its political and economic history are much more in conformance with the curse hypothesis. Outwardly it is a benevolent monarchy, yet inequalities in the distribution of income,

---

<sup>35</sup> After 1983, Bolivia's political and economic freedoms ratings and democracy score improved dramatically.

education, and human development are clearly radical. At a deeper level Saudi Arabia might be better described as a predatory autocracy in which the elite transfer a small share of natural wealth to the masses to prevent them from rebelling. Saudi Arabia's political institutions have been 'perfectly autocratic' since the country was formed.<sup>36</sup> Over the last three decades it has suffered the curse of slow growth. Per capita income was actually lower in 1999 than it was in 1971, before the major oil price shocks occurred.

Given the numerous and diverse set of factors that presumably determine the economic and political development paths of individual countries, any theory that attempts to explain events on such a grand scale clearly will have a large error term. Such a theory will remain valuable, however, if it can predict broad regularities in political and economic development patterns. Here, the comparative case study evidence compiled by Karl (1997) is illuminating. She studied the history of economic and political development in Algeria, Indonesia, Iran, Nigeria, Venezuela, and, for purposes of comparison, Norway. While the historical record is filled with nuances and idiosyncrasies, the central themes Karl identifies resonate with the stylized theories linking resource abundance to unproductive governance. When minerals are a nation's key source of wealth and mineral rents accrue directly to the State, the framework for decision-making in government is altered, including goal formation, the locus of authority, and the types of institutions adopted (Karl 1997, pp. 44, 45.) Because minerals tend to be concentrated in space, the European colonists (or western commercial interests, if colonization never formally occurred) who first exploited them could extract rents by

---

<sup>36</sup> As judged from the Polity IV data base, Saudi Arabia has received a 'perfect' 10 out of 10 score on the index for autocratic governance.

controlling only specific mining and export sites. There was no need to set up a governing apparatus to collect taxes, extract rents, and control populations throughout the country. In other words, it was not necessary to extend civil authority and the rule of law to the countryside (Karl 1997, pp. 60-61.) In Venezuela, the dominance of oil in the economy led to a blurring of the worlds of commerce and State policy, an outcome that promoted a rent-seeking culture and a patron-client system of governance. With this legacy and the ongoing importance of concentrated mineral stocks in the country's economy, the persistence of autocratic, strong man rule, and the tendency for entrepreneurial talent to be directed toward rent-seeking, is unsurprising.

A hardwood timber boom in Southeast Asia had a similar effect on the governments of the Philippines, Indonesia, and the Malay states of Sarawak and Sabah. (Ross, 2001.) Two of the three countries inherited strong, professional forestry management institutions upon independence. A boom in timber prices caused timber to become a dominant force in the economies of all three countries. In each case, though most strongly in the Philippines and Malaysia, the jump in timber prices led to a change in the structure of governance (Ross 2001, p. 32ff.) Political elites altered institutions to acquire a greater control over resource rents—a process Ross (2001) terms 'rent-seizing.' Once the control of resource rents was secured, the political elite allocated this wealth to political supporters, family, friends and campaign donors. The overall effect was a general increase in corruption and a concentration of political power among the elite.

## 6. Natural Resources and Perverse Subsidies

Natural resources generate substantial rents. World Bank data cited by Auty and Gelb (2001) for 1994 put the average share of natural resource rents in GDP at 15%.<sup>37</sup> In most cases access to these rents is directly or indirectly determined the government. This implies that in general, but especially in resource rich countries, there will be plentiful opportunities for rent-seeking related to natural resources. In this section we describe one of the main mechanisms through which this rent-seeking manifests itself, a phenomenon known as ‘perverse subsidies.’ In this literature the term ‘perverse subsidies’ refers specifically to a subsidy that has unintended, harmful effects on the environment.<sup>38</sup> This is an important topic for this chapter as perverse subsidies illustrate particularly well the political and institutional determinants of natural resource use.

Perverse subsidies come in a variety of forms, and are often linked to policy that is not directly related to the environment.<sup>39</sup> A direct transfer to producers or consumers of a good or service that uses environmental inputs can lead to increased degradation. The same effect can result from a tax exemption. But perverse subsidies are not only budgetary. They can involve provision by government of complementary goods and services, such as infrastructure and technology. Other forms taken by perverse subsidies are price controls, import and export tariffs and other non-tariff barriers, all of which can

---

<sup>37</sup> These numbers consider only pasture, cropland and minerals so that actual natural resource rents must be even higher. The shares varied from 9.86% for small resource-poor countries to 21.22% for small oil-exporters.

<sup>38</sup> Subsidies may also have other harmful side effects, for example on trade, competition and equity. Subsidies can also have beneficial effects, correcting market failures. A more precise term that focuses on the environmental effect of the subsidies is ‘environmentally damaging subsidies’ (EDS) as used by Beers and Bergh (2001). We will stick with ‘perverse subsidies,’ nevertheless, as this is the term that predominates in the literature.

<sup>39</sup> For different typologies and classifications see Beers and Bergh (2001), Moor (1997) and Myers (1998).

protect consumers and producers of goods and services that degrade the environment. In addition, the government can provide subsidized credit for activities that have important environmental consequences, such as subsidized agriculture leading to increased deforestation, erosion and pesticide use. A more covert form of perverse subsidy comes about through the non-internalization of environmental externalities in regular economic activities. Because the private costs of the activity diverge from the social costs, too much of that activity will be undertaken in terms of social welfare. Any form of production or consumption that generates an environmental externality is in effect being under-priced and is consequently implicitly subsidized. It is as if the government is making a transfer by not charging externality generator for these social costs. Finally, a common type of perverse subsidy occurs when the government charges less than the full economic rent for the right to use or extract a given natural resource. This is revenue that the government could bring to its own coffers but opts to grant to certain groups and individuals.

The distortions brought about by all these forms of subsidies are perverse (environmentally degrading) for several reasons (Porter, 1998). They can lead to an overcapitalization of natural resource sectors, bringing resources into production or consumption that would not otherwise be used. Related to this, subsidies often encourage the use of technologies that use environmental inputs more intensively and less efficiently. In addition they encourage over-consumption of natural resources as prices are brought below levels that would prevail in the absence of the subsidies. Finally, subsidies generally come at a cost to the government, which is deprived of resources that could be used for monitoring and enforcing more sustainable resource use.

Given the various forms taken by perverse subsidies, as well as their often hidden nature, it is difficult to quantify how pervasive they actually are. Some studies have nevertheless attempted to do so. De Moor and Calamai (1997) put the total cost of subsidies per year in the mid-1990s at \$950 billion, with the main effects coming through agriculture and fisheries (36.3%), transport (23.7%), energy (21.5%), water (6.3%). These subsidies affect the environment by contributing to soil erosion, acid rain, depletion of fish stocks, water and air pollution, emission of greenhouse gases, among others (Beers and Bergh, 2001). Myers (1998) estimates the total value of subsidies for the whole world at \$1,110 billion per year, considering only agriculture, fossil fuels, nuclear energy, road transport, water and fisheries. He identifies a further \$785 billion of implicit subsidies derived from environmental externalities whose costs are not borne by those who generate them, thus leading to a total of \$1,895 billion per year. Of this total he estimates that \$1,450 billion are perverse subsidies, that is, they have negative environmental consequences. Clearly these calculations are debatable and can be contested on many levels, from definitions of what should actually be counted as a subsidy, to the non-inclusion of countervailing effects, to the credibility of the various data used.<sup>40</sup> Whatever one may think of this estimate, however, the important point is that subsidies are pervasive and sometimes have environmentally damaging consequences.

If subsidies often have such deleterious environmental effects, why do governments implement them in the first place and then allow them to persist? According to Ascher (1999) one misleading answer to this question is that government officials are

---

<sup>40</sup> Deacon (1995) develops a general equilibrium model to analyze the relationship between government policy, characterized as taxes and subsidies on an economy's inputs and outputs, and deforestation. In some instances, predictions from that model disagree with some of the more popular claims in the case study literature on the deforestation effects of government policies.

often unaware of their consequences or are unable to devise more sensible policies. Another is that policy is often initially sound, but when conditions change governments are unable to make the necessary adjustments. The problem with both of these explanations is that the rents involved are typically very large and it is hard to believe that governments would systematically allow them to be dissipated instead of trying to appropriate them. Instead, Ascher (1999) suggests that environmentally damaging natural resource policies are often adopted purposefully, and not for reasons related to natural resource use, but rather as a tool for sustaining or increasing their political power. The aim of these policies is to capture part of those resources directly, or to grant them to groups who will reciprocate with political support and contributions. They can also be used to finance development programs that are important to the government.

In Indonesia, for example, President Suharto, subsidized private commercial loggers through low stumpage fees, leading to over-harvesting and deforestation.<sup>41</sup> While on the surface the government appeared to be relinquishing an important source of revenues, private loggers were actually channeling much of those funds back to the President by financing a petrochemical industry and the state aircraft industry. Both of these were pet projects of the President, but were highly contested within government. The use of perverse logging subsidies was thus purposefully chosen by the President to get round institutional restrictions within his own government.

Another example is the subsidies given by the Brazilian government for private ranching and other development projects in the Amazon. The military government's intent with these subsidies in the 1970s was to promote the occupation of the Amazon so

---

<sup>41</sup> This case is detailed in Ascher (1999), who examines 16 cases where resource policy in developing countries led to a squandering of natural resources.

as to assert Brazilian sovereignty. These subsidies were maintained after the return to civilian government in 1985, despite the fact that practically none of the projects ever became productive. Each subsequent administration has maintained the program despite irrefutable evidence of corruption, environmental degradation and waste of public resources. At first sight this persistence of faulty government policy seems to be simply incompetence, malfeasance and inertia, however consideration of the working of Brazilian politics reveals other motivations. Alston and Mueller (2003) argue that the process of economic reform and policy making in Brazil is based on a strong President who provides patronage (jobs in government and budgetary transfers) to members of Congress in exchange for support. The President, who has a stronger incentive than members of Congress to pursue sound economic policy for the nation as a whole, uses resource subsidies to accomplish the political exchanges necessary to enact those policies. The persistence of perverse subsidies for projects in the Amazon can be traced to the fact that this is an effective mechanism to realize transfers to local politicians, as they are given the power to determine which projects will be approved and therefore are the ones who ultimately receive those rents. As long as Brazil's political institutions remain unchanged, that is a strong Presidency and coalition based government, all Presidents will have an incentive to use this established mechanism to garner support.

Although it is intuitive that governments will want to transfer resources to supporting groups, it is not obvious why this is so often done through subsidies related to natural resources when there are always more direct and less wasteful instruments for affecting these transfers. The two examples above illustrate the importance of considering a country's political and institutional context when seeking to understand perverse

subsidies. In both cases it would be less costly to make direct transfers that would not have the collateral effect of degrading the environment. Becker (1983) argued that when governments decide on transfers between interest groups they take into consideration not only the support and opposition the transfers will generate but also the cost of these policies in terms of the inefficiencies they engender. Given that these inefficiencies are large in the case of natural resource subsidies, one would not expect this to be a common method of making transfers. However, natural resources have several countervailing advantages for a government confronted with political transaction costs involved in redistributing income. The efficiency losses involved in natural resource-related subsidies tend to be inconspicuous, as they are usually far from the electorate and difficult to apprehend and quantify, many times because the losses will only be incurred by future generations or by the poor (Ascher, 1999). In addition, natural resource subsidies can often be portrayed as being good for the economy, growth and employment as well as being patriotic. Thus the lack of transparency that pervades perverse subsidies may make it rational for governments to choose wasteful methods of transfers so as to economize on the political confrontation that would be involved in a direct and explicit transfer.

The discussion of perverse subsidies in this section can be put into the context of Figure 1. What has been argued here is that a country's institutional endowment plays an important role in the existence of perverse subsidies. Political institutions determine both the government's motivation to redistribute wealth among different groups as well as the restrictions it faces in doing so. The subsidies themselves are choices made by government (policy mechanisms) that are conditioned by those motivations and restrictions. The subsidies in turn affect how the natural resources are ultimately used.

What this discussion highlights is that recommendations to correct the inefficient use of natural resources brought about by perverse subsidies must not concentrate exclusively on the particular subsidies themselves, such as suggesting an increase in stumpage fees. They should also focus on the institutional factors that motivate governments to adopt those policies in the first place and to persist with them despite environmental losses.

## **7. Conclusions**

The economic literature on natural resource use in developing countries has now explored a number of ways in which a country's political system interacts with its use of natural resource. At a fundamental level, a nation's system of governance forms the institutional context within which property rights to natural resources evolve. The ability *and inclination* of those in political power to facilitate the cooperation and coordination needed to overcome opportunistic behavior by individuals is a key factor in forming property rights systems that encourage incentives to use natural resources efficiently. Where the State's power resides with individuals, rather than in impersonal laws and institutions, resources will be used to benefit specific groups and costs will be borne the rest of society.

The stability or instability of a country's political system is a specific political attribute that has been shown to have significant effects on natural resource use. Where political systems are volatile, individual ownership claims to the future returns to resource conservation actions tend to be uncertain. This uncertainty dilutes the

individual's incentive to undertake resource conservation actions and encourages depletion of resource stocks. Resource exploitation sometimes requires the individual to incur up-front costs, e.g., for extraction capital or access to resource stocks, however. If uncertainty over claims to future returns is a general feature of an economy, affecting ordinary investment as well as resource conservation, it can deter resource exploitation by weakening incentives to make the up-front investments necessary to exploit resource stocks. On balance, then, the effect of generalized ownership risk on the depletion of resource stocks is an empirical question.

Research aimed at understanding why countries rich in natural resources tend to suffer from slow economic growth has provided preliminary evidence indicating that natural resource abundance may affect political institutions. Countries that are rich in concentrated, point resources have been observed to suffer from political systems wherein power is similarly concentrated, among small groups of political elites who use the returns from resource wealth to accomplish their own ends.

While progress on the link between political economy and resource use is evident, the research agenda is still evolving and there are clear needs for further empirical and theoretical work. Research on the 'natural resource curse' is in a particularly early stage and additional research may uncover flaws in the methods or alternative explanations for the empirical relationships now in evidence. Better measures of natural resource *abundance* clearly would be desirable. The most common measures used are flow measures of production net of domestic consumption. Stock measures of oil, gas, coal, forests, water, etc., aggregated by value, would better capture what is generally meant by abundance. A related issue is that the 'non-renewability' of the resources involved, a

feature that clearly should affect their impact on economic growth, typically has been ignored in this research. An additional concern is that the data examined to date vary primarily across countries, rather than within countries over time. This fact, combined with the strong persistence of governance institutions over time, makes it difficult to test statistically the direction of causation between resources and institutions.

One resource use/political economy link that arguably deserves further examination concerns the way a country's political system affects the mix of private vs. public good outputs its natural resources produce. As mentioned in the introduction, a forest can be used to provide habitat, watershed, and scenic amenities, all of which are public goods that benefit society at large. A forest can also provide living space for forest dwellers, who typically lack political power.<sup>42</sup> Alternatively, a forest can be managed to produce private goods that have market value that can be appropriated, such as timber or agricultural land. When the State's policy decisions are dominated by a small group of political insiders, it is likely that natural resources will be used primarily to provide salable private goods that can be captured by the politically powerful. Using resources to provide either non-excludable public goods, or to benefit the politically disenfranchised, is likely to occur only when a country's system of governance is based on the rule of law and represents the broad interests of society in general. This general phenomenon, under-provision of public goods under non-democratic systems of government, has been observed in the provision of ordinary public goods (Deacon 2003.) It has not, however, been incorporated into the study of how natural resources are allocated.<sup>43</sup>

---

<sup>42</sup> Ross (2001) points out that the rights of forest dwellers and swidden farmers were nullified in the political scramble to acquire timber rents during the hardwood timber boom in Southeast Asia.

<sup>43</sup> A related but more far-reaching observation is that property rights systems are themselves public goods. Accordingly, they may also be under-provided by autocratic, or non-representative political systems, or if

The ways in which detailed attributes of governance structures affect natural resource use is not well-understood at present, and arguably deserves greater attention. Corruption, rule by elites, political instability and other political attributes are often lumped together and described collectively as ‘bad’ or unproductive governance institutions. There is no reason to believe, however, that these different aspects of political life will have similar effects on natural resource use.<sup>44</sup> At this juncture the task of ‘unbundling’ political institutions, and developing theoretical models and empirical tests of their separate effects on natural resource use, deserves to be high on the research agenda.

Finally, we draw a novel policy message from evidence that natural resource abundance can lead to breakdowns in governance: the *method* whereby the State establishes property rights to natural resources can have important, unrecognized, efficiency effects.<sup>45</sup> Simply giving resources away to private interests in order to enable their exploitation and enhance economic growth tends to encourage rent-seeking as a general form of political activity. Less directly, but of possibly greater importance, the precedent of giving away resources to private interests encourages the political elite to modify governance structures in ways that enhance their ability to bestow such gifts on political allies, i.e, to adopt more corrupt political systems. Advising resource rich developing countries simply to establish secure property rights to resource stocks could be counter-productive if the method of assignment is seen to be illegitimate, serving only the interests of those in power.

---

they are provided, they may be made available primarily to those who hold political power.

<sup>44</sup> See Ferriera and Vincent (2003) for evidence that the effects can be diverse.

<sup>45</sup> We are indebted to Joseph Stiglitz for this point.

## References

- Abidin, Mahani Zainal, 2001. "Competitive industrialization with natural resource abundance: Malaysia," in Auty, R.M., ed., *Resource Abundance and Economic Development*, Oxford: Oxford University Press.
- Alston, L., Libecap, G. and Mueller B., 1999a, "A model of rural conflict: Violence and land reform policy in Brazil", *Environment and Development Economics*, 4:135-160.
- Alston, L., Libecap, G. and Mueller B., 1999b, *Titles, conflict and land use: The development of property rights and land reform on the Brazilian Amazon frontier*, Ann Arbor: The University of Michigan Press.
- Alston, L., Libecap, G. and Mueller B., 2000, "Property rights to land and land reform: Legal inconsistencies and the sources of violent conflict in the Brazilian Amazon" *Journal of Environmental Economics and Management*, 39(2):162-188.
- Alston, Lee J. and Bernardo Mueller. 2003. "Democratization and Exploiting the Gains from Trade: Executive and Legislative Exchange in Brazil," Working Paper Universidade de Brasilia.
- Anderson, Terry L., and Peter J. Hill, 1990. "The Race for Property Rights," *Journal of Law and Economics*, 22 (April).
- Acemoglu, Daron. 2002. "Why not a Political Coase Theorem? Social Conflict, Commitment and Politics." Working Paper 02-44, MIT.
- Acemoglu, Daron, Simon Johnson, and James A. Robinson, 2001. "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review*, 91, 5, 1369-1401.
- Ascher, William. 1999. *Why Governments Waste Natural Resources: Policy Failures in Developing Countries*. John Hopkins University Press.
- Auty, R.M., and J. L. Evia, 2001. "A growth collapse with point resources: Bolivia," in Auty, R.M., ed., *Resource Abundance and Economic Development*, Oxford: Oxford University Press.
- Becker, Gary S. 1983. "A Theory of Competition among Pressure Groups for Political Influence," *Quarterly Journal of Economics*. 98(3):371-400.
- Besley, Timothy, 1995. "Property Rights and Investment Incentives: Theory and Evidence from Ghana." *Journal of Political Economy*, 103, 903-37.
- Birdsall, Nancy, Thomas Pinckney, and Richard Sabot, 2001. "Natural Resources, Human Capital, and Growth." In R. M. Auty, ed., *Resource Abundance and Economic Development*, Oxford: Oxford University Press.
- Bohn, H., and R. T. Deacon, "Ownership risk, investment, and the use of natural resources." *American Economic Review*, Vol. 90, No. 3, (June 2000) 526-550.
- Bulte, Erwin H., Richard Damania, and Robert T. Deacon, 2003. "Resource Abundance, Poverty and Development." Working Paper, Department of Economics, University of California, Santa Barbara, CA.

- Bulte, Erwin H., Richard Damania, 2003. "Resources for Sale: Corruption, Democracy and the Natural Resource Curse. Working Paper, School of Economics, University of Adelaide, Adelaide Australia.
- Coase, R., "The Problem of Social Cost," 3 *Journal of Law and Economics*, October 1960: 1-44.
- Collier, P., and A. E. Hoeffler, 1998. On the Economic Causes of Civil War." *Oxford Economic Papers* Vol. 50:563-73.
- Collier, P., and A. E. Hoeffler, 2002. On the Incidence of Civil War in Africa." *Journal of Conflict Resolution*, Vol. 46 No. 1 13-28.
- de Moor, André P.G. 1997. *Perverse Incentives, Subsidies and Sustainable Development: Key Issues and Reform Strategies*, Hague, Institute for Research in Public Expenditure.
- de Moor, André P.G. and P. Calamai. 1997. *Subsidizing Unsustainable Development: Undermining the Earth with Public Funds*. Ioo/the Earth Council.
- Deacon, Robert T., 1994. "Deforestation and the rule of law in a cross section of countries." *Land Economics*, Vol. 70 , No. 4 (November 1994): 414-430.
- Deacon, Robert. 1995. "Assessing the Relationship between Government Policy and Deforestation," *Journal of Environmental Economics and Management* 28:1-18.
- Deacon, Robert T., 1996. "Deforestation, Investment, and Political Stability", 1996. In Michelle R. Garfinkel and Stergios Skaperdis, eds., *The Economics of Conflict and Appropriation*, Cambridge University Press, 131-157.
- Deacon, Robert T. and P. Murphy, 1997. "The Structure of an Environmental Transaction: The Debt-for-Nature Swap," *Land Economics* 73(1) (February 1997): 1-24.
- Deacon, R. T., 1999. "Deforestation and ownership: Evidence from historical accounts and contemporary data," *Land Economics*, 71(3) (August 1999): 526-549.
- Deacon, R. T., 2003. "Dictatorship, Democracy, and the Provision of Public Goods," Working Paper, Department of Economics, UCSB.
- Demsetz, Harold. 1967. "Towards a Theory of Property Rights." *American Economic Review*, 57 (May, No.2): 347-359.
- Dixit, Avinash K. (1996). *The Making of Economic Policy: a Transaction-Cost Politics Perspective*. Cambridge, Mass, MIT Press.
- Feder, Gershon and David Feeny. 1991. "Land Tenure and Property Rights: Theory and Implications for Development Policy" *World Bank Economic Review*. 3:135-53.
- Ferriera, Susana, and Jeffrey R. Vincent, 2003. "Corruption and Global Timber Supply," Mimeo, Department of Economics, University of California, San Diego.
- Freedom House, 2003. *Freedom in the World*. Data available at: [www.freedomhouse.org/ratings/index.htm](http://www.freedomhouse.org/ratings/index.htm).
- Gordon, H. S. 1954. "The Economic Theory of a Common Property Resource: The Fishery." *Journal of Political Economy* 62:124-42.

- Gylfason, T., 2001. "Natural resources, education, and economic development." *European Economic Review* 45 847-59.
- Gylfason, T., T. T. Heberson, and G. Zoega. 1999. "A Mixed Blessing: Natural Resources and Economic Growth," *Macroeconomic Dynamics* 3:204-225.
- Hardin, G. 1968. "The Tragedy of the Commons." *Science* 162:1243-8.
- Isham, Jonathan, Michael Wookcock, Lant Pritchett, and Gwen Busby, 2003. "The Varieties of Resource Experience: How Natural Resource Export Structures Affect the Political Economy of Economic Growth," Middlebury College Discussion Paper 03-08, Middlebury, Vt.
- Johnson, R. N. (1999). Rents and Taxes in an ITQ Fishery. Individual Transferable Quotas in Theory and Practice. R. Arnason and H. H. Gissurason. Reykjavik, Iceland, The University of Iceland Press: 205-213.
- Karl, Terry Lynn, 1997. *The Paradox of Plenty: Oil Booms and Petro-States*. Berkeley, University of California Press.
- Leite, C and J. Weidmann, 1999. *Does Mother Nature Corrupt? Natural Resources, Corruption and Economic Growth*, Working Paper of the International Monetary Fund, IMF Working Paper WP/99/85.
- Levy, B. and Spiller, P.T., 1995. *The Institutional Foundations of Regulatory Commitment: A Comparative Analysis of Telecommunications Regulation*, Cambridge University Press.
- Libecap, Gary D., 1989. *Contracting for Property Rights*, New York: Cambridge University Press.
- Libecap, Gary D. and Steve N. Wiggins. 1985. "The Influence of Private Contractual Failure on Regulation: The Case of Oil Field Unitization," *Journal of Political Economy*, 93:690-714.
- Lopez, Ramon. 1997. "Environmental Externalities in Traditional Agriculture and the Impact of Trade Liberalization: The Case of Ghana," *Journal of Development Economics* 53 17-39.
- Lopez, Ramon. 1998. "The Tragedy of the commons in Cote d'Ivoire agriculture: Empirical evidence and implications for evaluating trade policies." *World Bank Economic Review*, 12(1) (January) 105-31.
- Mehlum, H., K. Moene and R. Torvik, 2002. *Institutions and the Resource Curse*, University of Oslo, Department of Economics, Mimeo.
- Migot-Adholla, Shem, Peter Hazell, Benoit Blarel and Frank Place. 1991. "Indigenous Land Rights System in Sub-Saharan Africa: A Constraint on Productivity?" *World Bank Economic Review*. 5:155-75.
- Myers, Norman. 1998. "Lifting the Veil on Perverse Subsidies," *Nature*, 392: 327-328.
- North, D.C. 1990a. *Institutions, Institutional Change and Economic Performance*, New York: Cambridge University Press.

- North, D. C. 1990b. "A transaction cost theory of politics." *Journal of Theoretical Politics* 2(4): 355-367.
- Olson, Mancur. 1965. *The Logic of Collective Action. Public Goods and the Theory of Groups*, Cambridge, Mass.: Harvard University Press.
- Ostrom, Elinor. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*, New York: Cambridge University Press.
- Place, Frank and Peter Hazell. 1993. "Productivity Effects of Indigenous Land Tenure Systems in Sub-Saharan Africa" *American Journal of Agricultural Economics* 75:10-19.
- Porter, Gareth. 1998. "Natural Resource Subsidies, Trade and Environment: The Cases of Forests and Fisheries," APEC  
<http://www.nautilus.org/papers/enviro/tepp/porterTEPP.html>.
- Ross, Michael L., 2001. *Timber Booms and Institutional Breakdown in Southeast Asia*. Cambridge: Cambridge University Press.
- Sachs, J. D. and A. M. Warner 1997 *Natural Resource Abundance and Economic Growth*, Working paper, Center for International Development and Harvard Institute for International Development, November 1997.
- Sachs, J. D. and A. M. Warner. 2001. "The curse of natural resources" *European Economic Review* 45 827-38.
- Sala -i-Martin, Xavier, and Arvind Subramanian, 2003. "Addressing the Natural Resource Curse: An Illustration from Nigeria," Cambridge Mass., National Bureau of Economic Research, Working Paper 9804.
- Smith, Wynet, 2002. "The global problem of illegal logging," *Tropical Forest Update*, Vol. 12, No. 1, pp. 3-6.
- Southgate, Douglas, R. Sierra, and L. Brown, 1991. "The causes of tropical deforestation in Ecuador: A statistical analysis," *World Development* 19(9):1145-1151. 1145-51.
- Spiller, Pablo T. and Mariano Tommasi. 2003. "The Institutional Foundations of Public Policy: A Transactions Approach with Application to Argentina," *The Journal of Law Economics and Organization*, Forthcoming.
- Stevens, Paul, 2003. "Resource Impact: Curse or Blessing?—A Literature Survey." *Journal of Energy Literature*, Vol. IX (1) (June 2003) 3-42.
- Summers, Robert, Alan Heston, and Bettina Aten, 2002. *The Penn World Table Version 6.1*. Center for International Comparisons, University of Pennsylvania (CICUP) October 2002 .
- Tornell, Aaron, and Philip R. Lane, 1999. "The Voracity Effect" *American Economic Review* Vol. 89(1) (March 1999) 22-46.
- Torvick, R. 2002 "Natural Resources Rent Seeking and Welfare" *Journal of Development Economics*, 67, 455-70.
- van Beers and C.J.M. van den Bergh. 2001. "Perseverance of Perverse Subsidies and their Impact on Trade and Environment," *Ecological Economics* 36: 475-486.

Williamson, Oliver. 1979. "Transaction Costs Economics: The Governance of Contractual Relations," *The Journal of Law and Economics*, 22 (October):233-61.

Williamson, Oliver. 1985. *The Economic Institutions of Capitalism*. New York: Free Press.

Woolcock, Michael, Lant Pritchett, and Jonathan Isham, 2001. "The Social Foundations of Poor Economic Growth in Resource-Rich Countries," in R. M. Auty, ed., *Resource Abundance and Economic Development*, Oxford: Oxford University Press, 76-94.

World Resources Institute, 1999. *World Resources: A Guide to the Global Environment*, New York: Oxford University Press, 1999.

World Resources Institute. 2003. *World Resources 2002-2004: Decisions for the Earth: Balance, Voice and Power*. World Resources Institute.

Figure 1 – Political Institutions, Policy Mechanisms and Property Rights

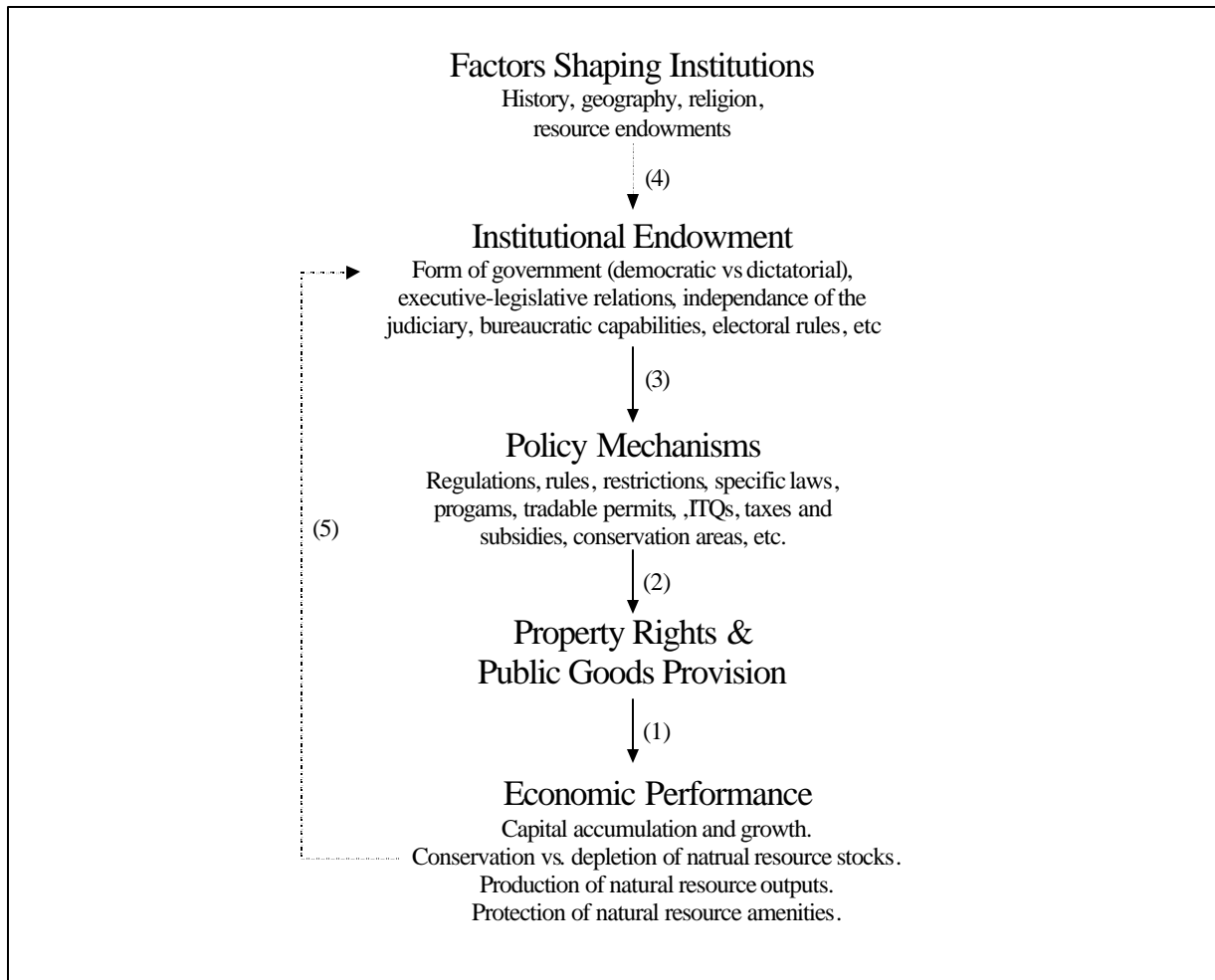


Figure 2. Resource Abundance, Governance, and Growth

