

INSTITUTIONS, THE RESOURCE CURSE AND THE *COLLAPSE* HYPOTHESIS

Robert T. Deacon

University of California, Santa Barbara

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Introduction

In his influential and highly readable book *Collapse*, Jared Diamond claims that human-induced ecological and environmental degradation and the over-use of natural resources have caused civilizations to collapse. The term ‘collapse’ means “... a drastic decrease in human population size, and/or political/economic/social complexity over a considerable area, for an extended time” (Diamond, p. 3). Adjectives such as ‘drastic’, ‘considerable’ and ‘extended’ are sufficiently imprecise to allow latitude in deciding whether or not a particular historical or contemporary episode qualifies as a collapse. Few would argue, however, that the iconic cases of Easter Island, the Maya empire and the Angkor civilization, which are among the Diamond’s focal cases, represent instances of collapse. Diamond also offers contemporary examples that are less compelling or at least less evocative. These include Rwanda, Haiti and modern day Australia and Montana; the latter two are judged to be vulnerable to collapse from environmental and resource degradation, if not yet on the brink.

Diamond largely bases his claim on interpretations of historical accounts and archaeological evidence suggesting that collapse is correlated with resource depletion or scarcity:

This paper examines the *collapse* thesis in light of recent research on the way natural resource abundance is linked to the economic and political paths societies follow—research on a phenomenon known as the *natural resource curse*. The term ‘curse’ refers to the paradoxical finding that populations that are rich in resources often are uncommonly poor, unhealthy and politically oppressed. This is paradoxical in that larger endowments of *any* resource should confer benefits, and the curse hypothesis is somewhat controversial. The resource curse hypothesis stands in contrast to the collapse hypothesis. While the two are not polar opposites, they are sufficiently antithetical that examining the arguments and evidence that support one should shed light on the tenability of other.

Before addressing the resource curse in detail, it is useful to review certain aspects of Diamond’s thesis: its causal nature, the factors said to enhance the likelihood of resource-induced collapse and the nature of the evidence offered in support.

Causation

The causal nature of the ‘collapse’ hypothesis deserves emphasis: human-induced resource depletion and environmental degradation is identified as a key mechanism that led to the demise of well-known civilizations:

“It has long been suspected that many of these mysterious abandonments [e.g., of the monuments, cities, and infrastructure of Easter Island, the Maya and Angkor civilizations, and Norse Greenland settlements] were at least partly triggered by ecological problems: people inadvertently destroying the environmental resources on which their societies depended. This ... has been confirmed by discoveries made in recent decades by archaeologists, climatologists, historians, paleontologists, and palynologists (pollen scientists)”. (Diamond, p. 6).

Specific processes of resource and ecological depletion are noted as particularly important: deforestation, habitat loss, soil depletion, water mismanagement, overhunting, overfishing, introduction of invasive species and the growth of population and population's impact.

Further refining the causal links, depletion-induced collapse is said to result in food shortages, starvation, wars over resources and the overthrow of political elites and established political institutions (Diamond p. 6). According to Diamond (p. 516): "The best predictors of modern 'state failures', i.e., revolution, violent regime change, collapse of authority, and genocide [are] measures of environmental and population pressure These pressures create conflicts over shortages of land, water, forests, fish, oil and minerals."

Notably, the collapse phenomenon Diamond describes has both economic dimensions, e.g., food shortages, starvation, poverty, as well as political or institutional dimensions, e.g., war, revolution, regime change and the breakdown of authority.

Factors contributing to collapse and options for avoiding it

If the degradation leading to collapse is human-caused, one must ask why societies would choose such self-destructive practices. Diamond (p. 9-10) offers several reasons. Three of these amount to ignorance: a belief that resources are limitless, a failure to see signs of impending depletion due to the confounding effects of natural fluctuations in abundance, an inability to identify and predict the link from human action to resource outcomes. The obvious remedy for ignorance, better science, is not stressed. Instead, Diamond stresses a more systemic behavioral problem: an inability of societies to agree collectively on restraint in exploiting its resources and environment. This key point, the inability to solve collective action problems, is explored further momentarily.

Recognizing that some civilizations persist and prosper while others collapse, Diamond (pp. 11-15) develops a set of five factors that tilt a society's odds for suffering human-induced, environmentally-transmitted collapse. Given any prior history of resource depletion, these factors place a society on especially precarious ground. Ecological fragility is one such factor; some resource

and ecological systems can flourish despite abuse from their human inhabitants, while others cannot. Second, an unlucky change in climate, e.g., that affects the viability of farming, can threaten a society's survival; if a society's past practices have pushed it near an ecological precipice, climate change could provide the final nudge. Third, a civilization may collapse due to the actions of hostile neighbors; Diamond argues that a society is more likely to suffer this fate if it has been weakened by past over-use of its resource base. Fourth, a society may suffer decline if it depends on an unreliable trading partner for key resources; clearly, this is most problematic if the society's past practices led to depletion of its own resource base.

Diamond's fifth factor is "the ubiquitous question of the society's responses to its problems, whether those problems are environmental or not". Here he notes that political, social and economic institutions as well as cultural values are key factors in the effectiveness of collective action, but is silent on specifics. He provides no substantive discussion of the prisoner's dilemma, free rider problems and the role of property rights.

Diamond (pp. 428-30, 480) does explain the 'tragedy of the commons', acknowledges it as a reason for environmental destruction and lists a menu of solutions. One proposed solution is intervention by an 'outside force' to impose limits on use; he doesn't explain how this force arises or why it would act benignly, however. Privatization is a second potential solution, but this is largely dismissed by noting that some resources such as migratory animals and fish are difficult to subdivide into property. His third option is for communities of users to design institutions that limit their individual actions in order to promote the common interest, an outcome he finds likely only if a long set of enabling conditions is met. These include an ability to form homogeneous groups, mutual trust and communication, belief that they and their heirs share a common future, a capability to organize and police themselves and clear delineation of the resource's boundaries.

Conspicuously missing from Diamond's list of necessary conditions for privatization or a community-based solution is the ability to exclude outsiders from appropriating the resource that the individual or group has husbanded. In particular, there is no recognition that unless property rights

are established, *all* resources, regardless of whether or not they are migratory, are shared and all are subject to the tragedy of the commons.

The collectively irrational nature of ‘tragedies’ is poignantly captured by posing the hypothetical question (Diamond p. 426): “What did the Easter Islander who cut down the last palm tree say as he was doing it?” An entirely plausible answer is: “If I don’t do it someone else will, and without exclusive rights there is no way I can stop them.” Instead, Diamond invokes ‘landscape amnesia’ as a plausible explanation: over time forests gradually dwindled until trees had become of no economic significance, at which point cutting the last one was no big deal. That is, as trees became scarcer the importance of conserving them diminished.

The evidence

Diamond marshals historical accounts and archaeological findings on a relatively small sample of civilizations to assess the collapse hypothesis. In his view “The past offers us a rich database from which we can learn, in order that we may keep on succeeding” (Diamond, p. 3). This empirical approach raises three concerns. The first is the possibility that cases were selected to support the underlying hypothesis; the second is the reliability of the factual conclusions one can draw from the available historical and archaeological evidence; and the third is the observation that well-established data may allow far more rigorous testing of the collapse claim.

On the first issue, the conclusions one can draw from a collection of historical accounts depends critically on how the episodes were selected. Diamond does not discuss this issue. The evidence would speak most clearly and credibly if one started with a representative sample of the world’s civilizations, compared objective measures of resource abundance and depletion in each, and then observed which subsequently collapsed and which did not. The practice of choosing a set of collapsed and successful civilizations at the outset, describing their attributes, and then drawing conclusions from comparisons runs the risk that the selection process may unjustifiably support the hypothesis of interest.

On the second point, the record of evidence on how ancient civilizations behaved is often sketchy, leaving questions about what actually happened. For example, Diamond (p. 229) cites archaeological research in claiming that the Norse civilization in Greenland collapsed because the population denuded its farmland and refused to eat fish, which were plentiful. Recent research has refuted this claim with evidence that Norse settlers' diets actually were rich in fish, based on analysis of their bone fragments (Arneborg, *et al.* May/June 2002.).

Diamond considers Easter Island to be the clearest example of a society that destroyed itself by overexploiting its resources. His account is one of colonization by Polynesians at or before AD 900, deforestation that was gradual initially but accelerated to a peak by 1400. He concludes that destruction of the forests was complete at least 100 years before the first Europeans arrived in the early 1700s. Forest loss led to soil depletion, loss of agricultural opportunities, starvation, an abrupt population crash and a descent into cannibalism. A reexamination of the archaeological, historical and scientific evidence has led other observers different conclusions on the timing of the demise and to question whether it was self-inflicted (Hunt and Lipo 2006; Peiser 2005). Recent evidence from C-14 dating places the original Polynesian colonization at 1200, leaving far less time for the island's inhabitants to accomplish the deforestation Diamond attributes to them. The first European contact occurred in 1722 and some early European explorers described Easter Island as fertile and agriculturally productive rather than a denuded wasteland. Between the first European contact and the arrival of missionaries in 1864, the island's population found itself on the brink of extinction. According to Peiser (2005) and other observers, the collapse was not self-inflicted but rather resulted from slave raiding during the 1860s and to smallpox epidemics caused by European visitors.¹

Some of what appears to be evidence really is not. In summing up, Diamond (pp. 515-6) argues for a link between ecological collapse and political/economic/social trouble spots by posing hypothetical questions and offering hypothetical answers. Asking a hypothetical ecologist to name

¹ The absence of a clear record of what happened to these civilizations can invite one to speculate. For example, the Easter Island chiefs and Maya kings are described (Diamond p. 439) as "too self-absorbed in their own pursuit of power to attend to their society's underlying problems." Of course, we have no actual record of their thoughts.

the world's worst ecological basket cases, he asserts that the list must include: Afghanistan, Bangladesh, Burundi, Haiti, Indonesia, Iraq, Madagascar, Mongolia, Nepal, Pakistan, the Philippines, Rwanda, the Solomon Islands and Somalia. Posing a parallel question to a hypothetical political expert, this time asking about political turmoil, violence and institutional breakdown, he asserts this list must include the same 14 countries. No objective evidence is provided to support either answer.

The remainder of this paper is largely motivated by the third observation: the collapse hypothesis is amenable to rigorous empirical study using well-documented, widely used data. Constraints on data availability generally restrict study to episodes within the last century. This feature and the use of statistics rather than accounts of ancient civilizations clearly make for less compelling reading. Given the importance of the collapse hypothesis for the fate of civilizations, however, it deserves to be tested using the best data available.

To date these tests have not been carried out. A separate literature has examined a related hypothesis, however: nations with abundant natural resources are cursed economically and politically. Reviewing facets of this research can shed light on the tenability of Diamond's collapse hypothesis. It can also aid in the design of rigorous empirical tests for future research. Rigorous empirical study of the collapse hypothesis arguably should address the three areas of concern raised earlier: establishing causation rather than just demonstrating correlation, incorporating the role of contributing or conditioning factors in assessing the relationship of interest, and scrutinizing the quality of data admitted into evidence. The theoretical and empirical literature on the resource curse has addressed each of these concerns to some degree.

Collapse and the Resource Curse

The collapse thesis states that resource and environmental degradation cause civilizations to collapse; the abandonment of monuments, cities and infrastructure by the Maya, Angkor, and Easter Island societies and the disappearance of their civilizations resulted from resource over-use. This

argument has surface plausibility. Reasoning from simple economic logic, having more of a resource should enhance well-being and having less should lead to poverty. Following a plausible link to social conditions and political organization, severe poverty could in turn lead to institutional decline or disintegration.

It is instructive to run this argument in reverse with a thought experiment, however. Supposing Diamond's thesis is correct, an infusion of additional resources somewhere along the dismal path to collapse should forestall or at least delay the demise. That is, a resource windfall should bring increased economic well-being and more desirable and durable institutions, particularly in societies that are on the road to decline. Applying the same reasoning, if the collapse hypothesis is correct then societies with abundant resource endowments in some initial state should experience relatively long lasting economic prosperity and enjoy institutions that enhance general well-being. If we followed one society doomed to follow the collapse path, it would be resource-abundant, wealthy and well-governed at the start of the process and resource-deprived, economically impoverished and poorly governed at the end.

Theory and empirical evidence on the resource curse contradicts these predictions. Historical case studies and econometric analysis indicate that large resource endowments or resource windfalls can bring economic decline and weakened institutions. This counter-intuitive finding is nuanced, however. 'Nuance 1' is that resource abundance or a resource windfall is likely to be an economic and institutional 'curse' only if the host country's institutions are 'weak' initially—that is, if the rule of law is not well-established, if corruption is common and if government's main concern is mollifying political elites rather than providing public goods for the masses. When these unfortunate initial conditions are in place, a resource windfall often causes further institutional impairment and economic decline. This nuance is important because it can explain the disparate fates of oil-rich countries such as Norway and Nigeria, as well as diamond-rich countries such as Botswana and Sierra Leone. 'Nuance 2' is that, empirically, a 'resource curse' is most likely when the resource in question is concentrated in space rather than diffuse, e.g., a mineral or oil deposit.

Two disclaimers should also be noted. First, some observers regard the empirical evidence for the resource curse as unconvincing. Summaries and citations to several skeptical assessments can be found in Deacon (2012) and van der Ploeg (2011). Second, the resource curse and the collapse hypotheses are not perfectly comparable. The resource depletion examples and arguments Diamond outlines largely concern forests, water, soils, wild game, fish and the like. These resources are relatively dispersed and generally consumed by local populations. Evidence for the resource curse has mainly come from differential abundance of oil, minerals, tree plantations, and other relatively concentrated resources. These resources often are sold for consumption by outsiders.

While acknowledging these differences, both literatures refer to differential abundance of natural resources that can support a population either by direct consumption or as a source of wealth. Diamond hypothesizes that a diminished resource base will lead to economic decline, violent conflict over the scant resources that remain, and institutional breakdown. The resource curse argument largely hypothesizes that an abundant resource base will lead to economic decline and institutional impairment. To enhance comparability the following review of literature on the resource curse emphasizes research that uses physical abundance measures of resource wealth rather than resource-based windfalls resulting from price spikes.

The Natural Resource Curse

Economists' interest in the resource curse was spurred by Sachs and Warner's (1997, 2001) (SW) cross-country growth regressions, which indicated that countries highly specialized in primary products such as mining, fossil fuels, forestry and other extractive sectors exhibited slow growth. Their empirical model linked growth in per capita income to factors that economic growth theory indicates are important, including initial GDP, openness to trade, schooling and investment rates. SW also included the importance of primary product exports as a regressor and found it has a large, significant, negative coefficient. Noting that an economy's primary product sector is largely resource

extraction, they dubbed this finding the natural resource curse. According to SW's estimates, increasing a country's primary products export share by one standard deviation reduced its predicted growth rate by 0.6 to 1.5 percentage points. SW also included a measure of institutional quality and found that, while it was significant, it did not diminish the primary products coefficient. From this they concluded that the effect is not primarily political in nature. SW's explanation for the unexpected natural resource result emphasized the 'Dutch disease', a market-based theory to explain the poor economic performance of the Netherlands following the discovery of North Sea oil.

Other observers have proposed different market-based explanations. However, certain patterns in empirical results have shifted the search for explanations to models that incorporate political economy reasoning. Both patterns were mentioned earlier: resource abundance tends to be a curse only when governance and the rule of law are weak initially, and a curse is most likely to plague resources found in dense concentrations. Neither pattern is predicted by conventional market-based explanations. They can be explained with theories of how resource extraction and political systems interact, however. Some political economy theories also predict that resource abundance or windfalls will erode political institutions. The opposite prediction, that resource scarcity will prompt institutional collapse, is a prominent part of Diamond's thesis.

Circumstantial evidence points toward a political effect even without formal empirical analysis (Deacon 2012). During the oil price run-up of 1979-81, Venezuela's public spending on infrastructure and industrial policy, directed mainly to benefit political elites, swelled enough to cause this oil rich country to run a current account trade deficit! Between 1970 the early 2000s, a period of oil price increases and dramatic oil discoveries in Nigeria, wealth in that country became extremely concentrated, which seems to indicate institutional decline. The top 2% of Nigerian income earners earned as much as the bottom 17% at the start of the period and as much as the bottom 55% by the end. The fraction of the population earning less than \$1 per day nearly tripled. Both countries also suffered an economic curse over roughly 1970-2000. Nigeria's GDP per capita fell by nearly 30%

despite enormous oil revenues; Venezuela's output per capita fell 1.4% per year despite 14% annual increases in its terms of trade.

Theories of a political link

A theme in several political economy theories is that some governments focus on providing public goods while others use government's coercive powers to enrich the politically powerful, and the difference between the two can be traced to the distribution of political power (Deacon 2012). While government policy obviously has dimensions beyond public good provision and targeted transfers, focusing on these two stylized alternatives can be illuminating. Where power is highly concentrated, a political leader can gain office by enriching political elites through transfers. Where power is diffuse, large numbers must be satisfied to gain office and such broad support can be efficiently generated providing public goods for the entire population. This reasoning predicts that corruption will be common and public service delivery to be ineffective when power is concentrated. Conversely, it predicts that corruption will be less common and public good provision (including the rule of law) relatively effective when power is dispersed.²

Some political economy theories of the resource curse treat government policy as the outcome of a 'rent-seeking' contest between politically powerful groups, without incorporating government institutions explicitly. Rent-seeking consumes resources without producing anything, and thus diminishes economic well-being. The rents involved could take the form of high paid government jobs, bribe payments, or theft from resource extraction contracts. Other models incorporate political institutions in a stylized way. A common approach is to represent institutional constraints on the actions of government leaders implicitly by asserting that leaders make policy choices to maximize a weighted sum of personal rewards and the average citizen's welfare. The polar

² To elaborate, spending on transfers to specific groups in exchange for political support is relatively unattractive when political power is dispersed because the large size of the group whose support must be won dilutes the transfer each member would receive. Conversely, providing nonexclusive public goods is ineffective when political power is concentrated because most of the benefit would accrue to non-elites.

cases of democracy and autocracy can, respectively, be represented by placing all weight on average citizen welfare or on the leader's utility.³

One rent-seeking model predicts a phenomenon called the 'voracity effect' (Tornell and Lane 1999).⁴ It applies to a polar case of bad governance: government allows powerful interests to transfer wealth from the private sector, making the private sector capital stock a common pool. Transfers might be accomplished by bribes, nationalization of assets, transfers of tax revenue to special interests, etc.; government is the conduit that transmits these transfers. Private investors can protect wealth, however, by transferring it to a less productive informal sector where it is hidden from the government and from special interests. Transfers to this less productive informal sector reduce the economy's growth rate. The prediction that makes this theory relevant to the resource curse is that a windfall to the formal capital stock, e.g., an oil discovery or oil price increase, causes rent-seeking to become more voracious and expands transfers to the less productive sector. This can reduce long run utility.

This outcome can aptly be called a curse. The required conditions are that government imposes no constraints on transfers from the formal capital stock and the number of powerful interests competing for rents is relatively small. If these conditions are not met, the windfall is a blessing. Empirical tests have focused on oil price increases as the windfall event and incorporated the role of weak institutions by including an interaction between institutional quality and resource abundance. Empirical work on the voracity effect has found support for its main predictions ((Tornell and Lane 1999; Lane and Tornell 1996; Arezki and Brückner 2010). One anecdote is revealing: during the oil price increases of the 1970s government transfers more than doubled as a share of GDP in Nigeria, Venezuela and Mexico and growth rates in all three countries were below trends and actually negative in the first two.

³ Another approach is to introduce elections as the method of choosing leaders and specify that individual voting decisions depend on prospective utility under the candidates' proposed policies and on idiosyncratic preferences for candidate attributes (Lindbeck and Weibull 1987). This can be adapted from purely democratic one person-one vote systems to systems in which political influence is less evenly distributed.

⁴ The discussion of different models and associated empirical results is brief. More detailed treatments and citations to relevant literature can be found in Deacon (2012).

In other models the ‘curse’ arises because rent-seeking competition for a resource rent attracts labor away from productive pursuits. Mehlum, *et al* (2006) argue that a resource windfall can divert entrepreneurial talent away from wealth creating industrialization and toward rent-seeking unless institutional constraints make rent-seeking unprofitable. Diverting potential entrepreneurs to non-productive activities depresses aggregate welfare and reduces economic growth, and this diversion is likely to occur if institutions are friendly to rent seekers. (This generally agrees with the voracity effect.) A notable feature of this model is that a sufficiently large resource rent can overwhelm institutions and cause an otherwise well-functioning government to lose control over rent-seeking. The prediction that resource rents can erode government institutions has become prominent in empirical work on the resource curse.

A model by Hodler (2006) makes similar predictions. Politically powerful groups devote real resources to securing a fixed resource rent, which is wasteful. Equilibrium dissipation is relatively large when there are many competing groups (contrary to the voracity effect). Rent-seeking also spills out into the private economy, making a portion of produced output subject to rent seeking. This additional competition lowers income below what it would be if the resource rent did not exist in the first place, which clearly is a curse. The contest in this model and one by van der Ploeg and Rohner (2010) can be interpreted as actual fighting for resource rents, implying predictions of violent conflict.⁵

It is useful at this point to sum up the implications of these models. First, the ‘curse’ applies with full force only to a resource rent, the value of a resource that is fixed in supply, and not to produced output. If produced outputs were similarly vulnerable to rent-seeking those outputs would

⁵ In political systems where incumbent leaders and challengers must both stand for election, voters and politicians both face a commitment problem when attempting to exchange political support for government favors. Voters cannot commit because their individual votes cannot be verified by politicians; politicians cannot commit because their actions are not played out until after the election is determined. Robinson, Torvik and Verdier (2006) argue that both problems can be solved if politicians offer high paying government jobs to supporters; this aligns their voting interests and under certain conditions can induce politicians to follow through on promises. Robinson *et al* (2006) link this to the resource curse by arguing that the presence of a large resource rent makes incumbents try harder to retain office, which leads to greater public sector employment. Greater public employment reduces output (an economic resource curse) because public employees are less productive than private sector employees.

not be produced in the first place and no curse could arise. Second, the resource rent is subject to common pool competition and the strength of the competition depends on the country's institutional quality; the curse operates only when institutions are weak. Third, competition for the resource rent can erode governance institutions, implying a 'political resource curse'. Fourth, struggles to control the resource, including violent struggles, are likely to be most severe when the resource involved is abundant rather than scarce. The second and fourth predictions, that the curse is likely in institutionally weak countries with abundant resources, is consistent with violent struggles to control diamonds, oil and metallic minerals in Angola, Nigeria, Sierra Leone and Zaire.

Two of these predictions differ sharply with Diamond's collapse thesis. On the second point, Diamond does not link the decline of once rich, resource abundant civilizations such as the Maya and Angkor empires to initial institutional weakness. If anything, the evidence of public infrastructure, monuments, expansive spatial dominions and extensive capital indicates that institutions were initially strong: sufficiently stable to incentivize extensive capital investment and sufficiently well-organized to provide public goods such as infrastructure and collective defenses against outside aggressors. On the fourth point, Diamond's key prediction is that resource scarcity rather than abundance will lead to institutional breakdown and economic decline.

Case study evidence

Certain historical accounts of the discovery or appropriation of resource wealth agree with political economy theorizing. Spain's looting of gold and silver from the new world in the 16th century was a natural resource windfall of enormous proportions, and Spain's boom and bust cycle during that century and the next agrees with the resource curse prediction. Between 1557 and 1680 Spain declared bankruptcy on eight occasions.⁶ In agreement with Mehlum, Moene and Torvik

⁶ Ross (2001) describes a resource boom resulting from the discovery of bird guano on islands offshore from Peru, a resource endowment that gave the country a near monopoly in valuable nitrates. As in Spain, a boom-bust cycle in government finances followed. During 1846-1873 government revenue from guano grew rapidly, but government spending rose even faster. In 1876 the country declared bankruptcy.

(2006) Spain's downfall was partly attributed to a shift of entrepreneurial talent toward unproductive rent-seeking (Karl 1997, p. 35):

“[The monarchy] consolidated the loyalty of the lesser aristocracy through political favoritism, especially by selling patents of nobility and ecclesiastical appointments. This practice dramatically expanded the size of a parasitic noble class . . . while simultaneously siphoning off the most productive talent from business and commerce. . . . The state bought the talents of those who might have become small entrepreneurs through awarding of offices . . .”

Karl (1997) surveyed economic and political outcomes in six resource rich countries and found that natural resource wealth and resource rent windfalls often erodes political institutions, particularly if the host country starts from a weak institutional base. If wealth is concentrated in minerals and mineral rents accrue to the State, the effect is to shift the locus of authority in government to those who control these rents.

The effect of resources on institutions sometimes plays out in the actions of colonizing countries. In countries rich in concentrated resources, European colonists could achieve their goals by establishing governance institutions only so far as necessary to protect extraction operations. There was no need to extend civil authority and the rule of law to the countryside (Karl 1997, pp. 60-61.) In post-colonial Venezuela, Karl (1997) argues that the oil's economic dominance and its control by the state after nationalization promoted a rent-seeking culture and patron-client government.

A hardwood timber boom in Southeast Asia during the 1970s had similar effects on government institutions in the Philippines, in Indonesia and in the Malay states of Sarawak and Sabah (Ross 2001). Timber became a dominant economic force in all three countries and political elites altered institutions to acquire greater control over resource rents. Corruption increased and political power became more concentrated as elites channeled rents to political supporters.

Empirical evidence

Sachs and Warner's (1997) influential econometric study concluded that the resource curse was not a political phenomenon, but their empirical strategy was not well-suited to addressing this hypothesis. In particular, they did not allow for a resource curse effect that is moderated by political institutions. Sala-i-Martin and Subramanian (2003) (SS) altered SW's empirical framework by adding a second equation in which political institutions (a rule of law index) were specified to depend on historic resource abundance and other factors. Estimating this second equation revealed a 'political resource curse' in the data: resource abundance in an historic period was associated with institutional weakness in subsequent periods. When institutional quality predicted from this equation was inserted into the economic growth regression along with resource abundance and other conditioning variables, resource abundance had no separate effect. That is, resource abundance is a curse for governance and for economic growth, but the economic growth effect operates entirely through institutions.⁷ Following SW, SS relied on cross-country, cross-sectional data (with one observation per country) and used a country's share of primary product exports in GDP as a resource abundance measure. Both practices have been criticized in the literature and empirical researchers have increasingly turned to examining within-country data.

One such study was prompted by a major oil discovery in the small African island state of Sao Tome and Principe (STP) in the late 1990s and focused on the issue of a political resource curse (Vicente 2010). The discovery was significant: Exxon/Mobil's bids for production rights mounted to roughly 240% of STP's annual GDP. The neighboring island nation of Cape Verde (CV), which has neither oil reserves nor prospects for future discoveries, was treated as a control. Within-country corruption trends in the two countries following the discovery were viewed as results from a natural experiment. CV is arguably a reasonable control for several reasons. The political histories of the two countries are similar: both were Portuguese colonies and gained independence in the mid 1970s, both

⁷ Isham, *et al* (2003) and Leite and Weidmann (1999) followed similar strategies and obtained similar results. These contributions also estimated separate resource abundance effects for minerals, fuels and plantation crops (as a group) and for agricultural crops; they found a resource curse for the first category, but not the second.

had autocratic socialist regimes until 1989, and autocrats in both countries were ousted in multi-party elections in 1991. Electoral cycles and changes in party dominance were also similar in both countries in subsequent years. Both are small, neighboring island nations and have experienced significant population exchange.

Trends in a World Bank corruption indicator were sharply different in the two countries after the discovery. In prior years, both enjoyed a steady decline in corruption; after the discovery, STP's corruption trend was reversed. In addition, retrospective surveys of both nations' citizens were carried out to determine perceived corruption and the forms it took. Statistical analysis of the retrospective surveys confirmed that corruption accelerated in STP relative to CV after the oil discovery. Further, stronger corruption effects were reported by the country's most highly informed citizens, adding further corroboration that the effect is genuine.

A second study of the political resource curse took a similar approach, comparing trends in governance following oil discoveries, but worked with a cross section of countries instead of examining only two. Tsui (2010) compared the timing of major oil discoveries in individual countries to subsequent 30-year trends in the Polity IV 'Democracy' index. The key data are the timing and size of oil discoveries in countries where oil is now produced. The hypothesis of interest is that democracy will trend downward following an oil discovery in countries that are relatively non-democratic when the discovery is made, but not in more democratic nations.⁸

The dependent variable is the 30 year change in a country's democracy index following its year of major oil discovery; independent variables include initial (discovery date) Democracy level, the quantity discovered, indicators of oil quality, interactions between initial Democracy and these variables, and the trend in Democracy prior to the discovery. The resulting dataset is a cross section of observations on within-country Democracy changes (dependent variable) and attributes of the oil discovered and the host nation's political attributes as of the discovery date.

⁸ Discoveries are partly determined by political conditions because a given discovery is more likely to be economically valuable and thus to be 'booked' as a reserve when institutions are strong. This endogeneity issue was handled with a two-stage regression estimation procedure.

In countries that were non-democratic at the time of discovery, the democracy score 30 years later was found to be 10-20 percentage points below levels predicted by the prior trend. No such pattern was evident in democracy indicators for initially democratic countries. These effects remained significant when fixed effects for decades and for large oil producing Middle Eastern states were included.⁹

Evidence from within the US

Much of the empirical literature on the resource curse suffers from a glaring weakness: reliance on data sets comprised of one observation per country. Unobserved heterogeneity across countries can be loosely controlled by including country attributes as conditioning variables, but the results are open to skepticism. Papyrakis and Gerlagh (2007) (PG) addressed this concern by examining cross section data from U.S. states, eliminating cross country heterogeneity. While cross-state heterogeneity remains, this is arguably less problematic than cross country heterogeneity.

PG tested for an economic resource curse by examining growth in real per capita gross state product (GSP) during 1986-2000, controlling for conditioning variables suggested by growth theory such as initial income, openness, investment rates and schooling. Resource abundance was measured by the primary products share of GSP in 1986. The authors represented governance institutions by political corruption convictions between 1991 and 2007 per 100,000 citizens. PG found evidence of a resource curse when no conditioning variables other than initial income were included, but the effect

⁹ Haber and Menaldo (2011) (HM) report contrary results in tests for a link between measures of fossil fuel and mineral income and authoritarianism. Their empirical strategy uses yearly data for a sample of 18 countries organized as a panel. The dependent variable is a country's Polity score and the independent variable of primary interest is a measure of income a country generates from fossil fuel and mineral production (measured differently in different specifications). Because fixed effects are included, prices are effectively represented as control variables; hence, the oil income measure captures variations in a country's fossil fuel and mineral *production*. To address concerns that mineral output is endogenous, they use measures of reserves as instruments for output. While their results seem to disagree with findings of Tsui (2010) and others, HM are addressing a different question, one not necessarily linked to resource abundance: does a higher level of resource extraction lead to more authoritarian government. Collier and Goderis (2009) use a similar empirical approach, with panel data and attention to short- and long-run responses, but instead investigate whether or not resource booms caused by price fluctuations are associated with slower or faster growth, i.e., an economic resource curse. They strongly confirm the resource curse as a long run phenomenon in countries with weak governance; short-run effects are generally positive, but short lived.

became insignificant and small when more explanatory variables, e.g., investment rates, schooling levels, openness, were added. From this they concluded that there is an economic resource curse, but it operates through indirect channels.

PG did not incorporate a widely acknowledged regularity in theoretical and empirical accounts, however: resource abundance is a curse if institutions are initially weak, but not otherwise. The data in table 1 suggest that corruption and abundance of resources, at least fossil fuel resources, may be linked. Several of the high corruption states, Oklahoma, Montana, North Dakota, Louisiana and Alaska, have large fossil fuel extraction sectors and are resource rich more generally. Rode (2012) extended PG’s analysis to incorporate the interaction effect and found that PG’s the resource curse reappears, but only for relatively corrupt states; for non-corrupt states, resource abundance is advantageous. Table 2 reports summary regression results. When a *corruption × resource abundance* interaction term is added in column (3), it has a negative sign, consistent with the resource curse story, though it is only marginally significant. Adding the interaction term causes the resource abundance coefficient (share of mining in 1987 GSP) to switch from negative to positive and become significant, indicating that resource abundance is a blessing when institutions are strong. Rode’s (2012) empirical strategy does not address possible endogeneity of corruption.

Table 1
Average corruption (per 100,000 pop), 1976-2008

Lowest 10 states		Highest 10 states	
Oregon	0.084	Oklahoma	0.420
Washington	0.104	Montana	0.425
Minnesota	0.122	Alabama	0.446
New Hampshire	0.123	Illinois	0.452
Utah	0.134	Tennessee	0.472
Vermont	0.139	North Dakota	0.514
Iowa	0.141	South Dakota	0.539
Nebraska	0.142	Louisiana	0.587
Colorado	0.147	Mississippi	0.591
Wisconsin	0.165	Alaska	0.616

Table 2

Dependent Variable: <i>Average Growth Rate of Gross State Product (GSP), 1987-2000</i>	(1)	(2)	(3)
<i>ln(GSP)₁₉₈₇</i>	-2.51 (-4.46)	-2.55 (-4.76)	-2.21 (-4.50)
<i>Share of Mining in 1987 GSP</i>	-3.48 (-1.52)	-2.54 (-1.19)	4.95 (1.04)
<i>Corruption Convictions per 100,000 Citizens, 1991 – 2000</i>		-0.16 (-3.10)	-0.09 (-1.50)
<i>Interaction Term</i>			-1.81 (-1.63)

For all regressions, N = 50 (excludes DC). Robust t-statistics in parentheses.

Discussion and Conclusions

Resource Depletion, the Rule of Law, and the Causal Nature of the Collapse Hypothesis

Deforestation is often acute in the world's most politically troubled places (Deacon 1994). Conversely, nations with expanding forest cover tend to be among the world's richest; in several of these, forests have expanded for over a century (Kauppi, *et al* 2006). The two phenomena—forest depletion and impaired governance—are broadly correlated. Countries with depleted forests tend to be poor and ill-governed, while those with extensive forests tend to be rich and democratic. The following discussion focuses on interpreting the forest cover correlation; a similar correlation seems to hold among countries for the quality of soils, air and water so the observations may have broader scope.

Acknowledging the correlation, two key questions are relevant: Is this a causal association? And if so, in which direction does the arrow of causation point? Considering countries in the more fortunate state, it is difficult to imagine that rich, democratic, well-forested countries achieved their happy outcome as a result of forest conservation decisions (taken for some unspecified reason) in the distant past. In countries that are now prosperous, well-governed and richly forested, forests and forest products play a small role in economic activity and no one conjectures that forest abundance is what drives their political institutions. Alternatively, conventional economic reasoning supports causation in the reverse direction. Secure property rights, however established, favor both the conservation of forests and growth-inducing capital formation.

Historical accounts of forest practices and shifts in forest cover in stable, well-governed societies provide corroboration from the past (Deacon 1999). In the Roman Republic, legislation governing forest use dates to the fifth century BC. These laws covered control over how forests were used, required contracts for gathering wood and grazing animals and established a cadre of forest custodians for enforcement. Rome, Ptolemaic Egypt and other classical civilizations with stable institutions also invested in tree planting, imposed fines for setting fires and removing trees without authorization and even specified harvest rotation periods and annual cut limits for specific species. In the pre-colonization Inca Empire, the ruling caste claimed ownership of all woodlands and hunting areas and imposed the death penalty for use of these resources without permission. While making no claim for causal proof, it is difficult to imagine that forest conservation actions *caused* the success of these civilizations. More plausibly, superior governance institutions were established for unspecified reasons, and these institutions created the stable legal and governance platform needed to support both wise forest conservation and investment in private capital and public infrastructure.

What about the poor, ill-governed countries with denuded forestlands? Are they trapped in this unhappy state because their forests and/or other resources were depleted for some reason in the past? Assessing causation without an opportunity to experiment is difficult at best. One might test for forests as a causal factor by examining episodes where a country or community lost a substantial fraction of its forest cover due to a random, exogenous event such as a forest fire. If the government then disintegrated, this would support the causal force of forests. One could apply the same empirical approach to investigating a causal mechanism linked to degradation of other resources.

Simple economic reasoning based on a ‘default risk’ argument strongly supports a causal connection in the reverse direction. When governance is ineffective or predatory and the rule of law is not well-established, incentives to invest are weakened; extensive empirical evidence demonstrates that this leads to slow growth and poverty. Conserving a forest rather than harvesting and consuming it is also an act of investment; a current consumption opportunity is passed up to gain a better return in the future. The prediction, that deforestation rates will be high in countries with unstable

institutions or ineffective rule of law, agrees with empirical evidence (Deacon 1994). Empirically, poverty, resource depletion and weak rule of law tend to be found together.

Historical accounts provide some corroboration. Exogenous shocks that impaired institutions for reasons unrelated to forest conservation have occurred in the past, and the forest outcomes that followed can be interpreted as results from natural experiments.¹⁰ Security to claims of all assets, including forest and other natural resources, are at a minimum during times of war, enemy occupation and anarchy. World War II provides three such examples. In Europe, particularly rapid devastation of Poland's forests occurred during the years of its occupation by Germany, with cutting rates nearly three times as rapid as in prewar years. A similar phenomenon has been reported in France. In the Pacific theater, the Japanese occupation of Java has been credited with significant deforestation. At the war's end the country suffered through a period of violent turmoil in freeing itself from Dutch dominance and in establishing a new system of government. This strife also reportedly intensified the deforestation of the Javanese forests. Various writers have reported extensive forest destruction following the Greek War of Independence in 1821 from the Ottoman Empire, the Persian Wars in Greece during the third century BC and the defensive wars against the 'northern crusaders' by pagan forces in Lithuania. These examples document a causal link from institutional disintegration to forest destruction; of course they do not rule out the possibility of causation in the opposite direction in some instances.

Observations on the resource curse

There is still disagreement among researchers over whether or not the resource curse is an empirical regularity, either in economic or political forms. What constitutes convincing evidence is in the eye of the beholder, and it is unlikely that this disagreement will be resolved any time soon. While the empirical findings linking resource abundance to slow growth and weak governance are far from

¹⁰ Historical information in what follows is taken from Deacon (1999).

unanimous, it is clear from case studies and from formal econometrics that instances where resource booms have led to political and/or economic decline are not at all rare.¹¹

Whatever the research community may believe, there is a common perception among the lay public and the press that sudden, unexpected windfalls can cause institutions to erode in situations where the rule of law is not well established. An extreme case in point is the newly recognized mineral wealth in Afghanistan, including deposits of iron, copper, cobalt, gold and industrial minerals. The dollar figure attached to the deposits represents \$34,500 for every man, woman and child in the country, or approximately 35 times annual per capita income. Immediately, news articles raised the possibility of institutional erosion: "... the corruption that is already rampant in the Karzai government could also be amplified by the new wealth, particularly if a handful of well-connected oligarchs, some with personal ties to the president, gain control of the resources."

On the other side of the resource abundance ledger lies a set of resource poor countries that have long enjoyed superior economic performance and laudable institutions. Thomas Friedman of the *New York Times*, when asked to name his favorite country, immediately answered "Taiwan". When asked Why?, he explained as follows:

I always tell my friends in Taiwan: "You are the luckiest people in the world. ... You have no oil, no iron, no forests, no diamonds, no gold, just a few small deposits of coal and natural gas—and because of this you developed habits and culture of honing your people's skills, which turns out to be the most valuable and only truly renewable resource in the world today. *How did you get so lucky?*"

Clearly, societies can thrive without an abundant resource base.

A broader point mentioned earlier deserves re-emphasis: Diamond's collapse hypothesis is amenable to rigorous testing with available data. To date this empirical analysis has not been carried out. Many of the conceptual issues, data needs and empirical problems that would arise in such an

¹¹ To this observer, the most persuasive evidence comes from the case study accounts reported by Karl (1997) and Ross (2001) and the empirical results in Vicente (2010), Tsui (2010), Arezki and Brückner (2010) and Collier and Goderis (2009).

undertaking have been confronted already as part of the resource curse literature. This literature can therefore serve a useful purpose by pointing out successful research strategies to exploit and pitfalls to avoid. If the analysis were rigorous the results, however they turn out, would merit careful consideration by policy makers. This would be a valuable service given the prominence of the *Collapse* thesis.

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