The Political Economy of the Natural Resource Curse:
An Interpretive Survey

(Work in progress)

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Former U.S. President William J. Clinton:

“With ... [its] vast human and natural resources, a revitalized Nigeria can be the economic and political anchor of West Africa ....”

From remarks on signing of a joint declaration with Nigerian President Obasanjo, August 26, 2000. (Obtained from CNN.com transcripts.)

Sheik Ahmed Yamani, former Oil Minister of Saudi Arabia:

“All in all, I wish we had discovered water.”


1 Introduction and motivation

The preceding quotes illustrate both the optimism often expressed that exploitation of natural resources will lead to prosperity and the disappointment that sometimes accompanies the actual results. There is now abundant evidence that the populations inhabiting many resource rich countries are unusually poor, unhealthy, and politically oppressed. This is paradoxical. Both common sense and simple economics lead one to expect that natural resource abundance should confer benefits. Yet, Nigeria’s per capita GDP in 2000 was 30% lower than in 1965, despite oil

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revenue receipts of roughly $350 billion (1995 $) over that period.\footnote{Oil revenues after payments to foreign companies, as reported by Sala-i-Martin and Subramanian (2003, p. 4). Information on income is from Summers and Heston (2002).} During 1970-1990 Venezuela’s terms of trade grew 13.7% per year due to its oil exports, but its output per capita fell by 1.4% per year.\footnote{Information on Venezuela in this sentence and the next is from Lane and Tornell (1996).} In the same country, public spending jumped so sharply during the 1979-1981 oil price spike that its government actually ran a current account deficit. Saudi Arabia’s GDP per capita was lower in 1999 than it was before the oil price increases of the 1970s. According to Gylfason (2001, p. 848), 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 this pattern and grown rapidly, including Botswana, Chile (after Pinochet), Malaysia and Norway, and some observers have expressed doubt over the robustness of broader statistical evidence supporting the curse.\footnote{For example, see Brunnschweiler and Bulte (2008) and Alexeev and Conrad (2009).} On balance, whether resource abundance is a curse or blessing appears to depend on the circumstances and on the particular resource involved, so the generic label ‘curse’ cannot be applied without qualification. Still, the notion that having more of any natural resource be could disadvantageous in any circumstance is sufficiently puzzling to invite further study—and the profession has responded to this invitation with remarkable vigor.

Certain patterns in empirical results have directed the search for causal links to consider interactions with political institutions. One such pattern is that resource abundance tends to be a curse in some political contexts, but not in others. A second pattern is that a curse is relatively likely to plague some types of natural resources, specifically those found in dense concentrations, while other resources seem largely immune. Neither of these regularities is predicted by the neoclassical, market-based explanations summarized shortly. They are consistent with theories of how resource extraction and political systems interact, however. Some theories regard political
institutions as causal factors in how a resource is exploited and how a country’s economy responds to a resource rent windfall. Others treat resource windfalls as events that cause a country’s political institutions to change, for example by altering property rights, democracy, political stability, or friendliness to rent-seeking.4

Political economy theories of the resource curse are the focus of this survey, and emphasis is placed on how well, or poorly, these theories have been integrated with empirical work. One reason why this integration is important lies in the practical importance of pinning down the causal links involved in the resource curse. Simply verifying that resource abundance is empirically linked to slow growth is of little practical value. Policy makers in poor countries and in the international development community would need to know the transmission mechanism in order to do anything useful with the information. Telling countries to lock up their resource wealth is neither credible nor useful. On the one hand, if the resource curse is simply a statistical artifact and not a causal phenomenon, then leaving resources unexploited in order to avoid a growth slow down will fail to have the desired effect and will succeed only in wasting a valuable opportunity. On the other hand, if the resource curse is real, and for example operates through political institutions, then understanding the mechanism may allow a country to reform its institutions and exploit its resource wealth while avoiding the curse.

A second reason for focusing on integration of theory and empirics is that the resource curse is a potentially fruitful venue for testing political economy theories generally. The presumed causal factor or outcome variable, depending on the direction of causation, is generally observable. In theories that attribute political outcomes to resource wealth, the causal factor is the arrival of a resource windfall and such windfalls are generally easy to document. In theories that attribute resource extraction outcomes to political institutions, the outcome variables can generally be observed, e.g., in exploration activity, production rates, nationalization events, etc.

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4 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.
Often, one can pin down the arrival time of a resource windfall, as when a discovery is made or when a resource price jumps. This enables one to exploit research designs that examine within-country behavior before and after an event, while controlling for ‘untreated observations’.

1.1 Market-based theories of the resource curse

Early explanations of why greater resource wealth could lead to slow growth were based on conventional, market-based reasoning. Sachs and Warner (1997, 2001) reported early cross-country evidence suggesting a resource curse. They related growth in per capita income to the importance of primary products in a country’s exports, which they interpreted as natural resource abundance, controlling for initial income, openness to trade and the investment to GDP ratio.\(^5\) The resource abundance effect was negative and substantial—a resource curse. They found that a one standard deviation increase in the primary products export share reduced a country’s growth rate by 0.6 to 1.5 percentage points. Sachs and Warner (1997, 2001) emphasized the ‘Dutch disease’ as an explanation, a market-based theory to explain the poor economic performance of the Netherlands following the discovery of North Sea oil.\(^6\) The Dutch disease theory postulates that a natural resource boom will cause a country’s exchange rate to appreciate, making its manufacturing exports less competitive. If manufacturing exports are the engine of growth and resource exports are not, as Dutch disease adherents claim, then a resource boom that crowds them out will lead to slower growth.\(^7\) Bulte, et al (2005) conclude that the Dutch disease theory has little empirical support, noting that terms of trade effects generally are not significant in

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\(^5\) Primary products include food, agricultural goods, fuels, and minerals. The goods are thus heterogeneous and the export share is both a flow variable, rather than abundance, and is clearly determined by economic behavior, i.e., endogenous. These points have been emphasized by subsequent critics.

\(^6\) This paragraph and the next introduce these arguments and briefly explain how they work, without commenting in any detail on the evidence for or against them.

\(^7\) van der Ploeg (2009) provides a detailed summary of Dutch disease theory and other market based explanations for the resource curse. Different variants of the Dutch disease model are cited in Stevens (2003).
economic growth regressions. They also emphasize the varied experiences of resource rich countries and the fact that exceptions to the curse abound.

Other market-based explanations for the curse are also based on a crowding out argument, but differ on which specific type of investment is foregone. In Gylfason’s (2001) view a resource boom can cause a nation to regard its natural resource wealth, not human capital, as the key to its future and neglect educational investment as a result.8 Torvik (2002) sees the resource curse arising because a resource boom diverts entrepreneurial talent away from wealth creation, modeled as the formation of efficient, modern firms, and toward seeking resource rents from public sector.9

Early arguments for slow growth in resource intensive economies were structuralist in nature. One claimed a natural tendency for resource exporting countries to experience a declining terms of trade and a reduced ability to import capital goods needed for modernization.10 Subsequent empirical analysis failed to support this explanation.11 Another structuralist explanation stresses volatility in natural resource prices, and argues that such volatility aggravates investor uncertainty and makes it difficult to follow prudent fiscal policies (Stevens, 2003).12 In support of this explanation, van der Ploeg (2009) cites evidence from the empirical macroeconomics literature that exchange rate volatility is indeed bad for investment and growth.13 More recent structuralist explanations argue that a volatile exchange rate directly hinders exports and prospects for export-led growth (Gylfason et al, 1999).

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8 Birdsall, Pinckney, and Sabot (2001) also stress a link between resource abundance and low educational investments, but see the effect operating through a political channel.
9 Torvik’s (2002) model is actually based on a political economy argument. It is elaborated and extended in Mehlum, et al. (2006); this extension is discussed in detail later in this review.
10 Stevens (2003) describes several of the leading market-based arguments and related empirical evidence.
12 Sachs and Warner (1997) allowed for the effect of export price volatility in their empirical analysis, but did not find a negative effect on growth.
1.2 Political economy and the resource curse

As mentioned earlier, the emphasis on political explanations has been motivated by certain patterns in cross country empirical analysis that are not predicted by market-based explanations. In particular, a curse is most likely to occur when political institutions in the host country are ‘weak’ and a curse is more likely to accompany resources that are spatially concentrated rather than dispersed. Additional motivation comes from a substantial body of case study evidence that also links the resource curse to political factors. After surveying outcomes in six resource rich countries, Karl (1997) concludes that that natural resource wealth and resource rent windfalls can alter the political climate in the host country, particularly if it starts from a weak institutional base. She finds that having wealth is concentrated in minerals, with mineral rents accruing to the State, alters framework for decision-making and the locus of authority in government, and influences the types of institutions and policies adopted. Mineral resources tend to be concentrated in space, and for this reason the European colonists who first exploited them found they could extract rents by controlling only specific mining and export sites without extending civil authority and the rule of law to the countryside (Karl 1997, pp. 60-61.) In the case of Venezuela, the dominance of oil in the economy and its control by the state after nationalization promoted a rent-seeking culture and a patron-client system of governance. A secondary effect was that those with entrepreneurial talent were enticed away from wealth creation and into rent-seeking. Ross (2001) reports that a hardwood timber price boom in Southeast Asia had a similar effect on governance in the Philippines, Indonesia and the Malay states of Sarawak and Sabah. Timber became a dominant economic force of all three countries and political elites altered institutions to acquire a greater control over resource rents. Corruption increased and political power became more concentrated as elites channeled these newly created rents to political supporters.
Recently, evidence of a different kind of resource curse has emerged—a link from natural resource wealth to political instability, armed conflict and violence.\textsuperscript{14} The presumed motivation for such a link is twofold: resource wealth may be captured by rebels and used to finance a rebellion, and the possibility of controlling resource wealth if the rebellion succeeds strengthens the case for initiating a conflict. Empirical analysis confirms a strong association between resource abundance and the probability of civil war breaking out; while this is non-monotonic, the association is positive for most ranges of observed data.\textsuperscript{15} More detailed analysis indicates that oil, gas and diamond resource wealth is strongly associated with the onset of civil wars, as well as their duration.\textsuperscript{16} Evidence on the circumstances in which civil wars erupt points to various political channels through which this link operates. Ross (2006) identifies three such channels: (i) natural resource wealth makes the state a more valuable target for takeover, (ii) regional concentrations of resource wealth increase the probability of separatist conflicts, and (iii) resource abundance can weaken the state, rendering it less able to resolve conflicts and manage its economy, and thereby foster conditions in which conflict is likely to erupt.

The following section reviews theories of the determinants of institutional quality, identifying the degree to which political power is concentrated versus dispersed as a key consideration. Following this, Section 3 reviews political economy theories of the resource curse based on models of rent-seeking, that is, policies that treat policy outcomes as the result of competing private interests without introducing political institutions explicitly. Section 4 surveys political economy theories in which institutions are explicitly incorporated. Emphasis is placed on the detailed empirical implications of models. Reviews of empirical work are brief and specifically focused on how closely empirical tests follow the predictions of the models that

\textsuperscript{14} van der Ploeg (2009, p. 29 ff.) reviews the relevant empirical evidence.
\textsuperscript{15} See Collier and Hoeffler (1998, 2004) for empirical findings that treat primary exports as an indicator of resource wealth. van der Ploeg and Rohner (2010), reviewed later, develop a model of resource-based conflict.
\textsuperscript{16} See Ross (2006).
motivate them. Conclusions are presented in Section 5 and focus on strengths and weaknesses of existing theoretical models and opportunities for future empirical research.

2 Political Economy Precursors

Government has a monopoly on sanctioned coercion. This monopoly power can be used either to enhance the welfare of society at large or to enrich the specific individuals who control government’s actions. Government’s coercive power benefits society at large when it is used to collectively organize public good provision or to solve coordination problems, e.g., by forcing compliance with traffic laws. Government’s coercive power can also be used to benefit specific individuals, by transferring wealth accumulated by others to political elites, i.e., those who control government’s actions. When government coercion is used in this fashion it generally diminishes the incentive to accumulate wealth in the first place. While government behavior clearly has other dimensions, several observers have found this distinction, public good provision versus transfers to elites, to be illuminating.

A prominent line of thought identifies the concentration versus dispersion of political power in a country as a key determinant of whether government pursues objectives at one end of the spectrum or the other. The basic reasoning follows from the observation that, in order to control government, a potential leader must capture more of the political power or influence in a country than any rival can. If political power is dispersed and competition for office is vigorous, a successful political strategy must use government’s coercive power to confer benefits that are also broadly dispersed. Providing public goods is an effective strategy for gaining support in this circumstance, due to the economies of scale inherent in providing public goods to large numbers.

17 See Bueno de Mesquita, et al. (2003), Putnam (1993) and Acemoglu and Johnson (2005) for a detailed discussion of the following principles.
Using the government’s power to direct transfers to specific groups in exchange for political support would be unattractive, because the large size of the group whose support must be won dilutes the transfer each member would receive. Alternatively, if political power is concentrated among a few individuals or groups, a political leader can gain and hold power by using government coercion to transfer wealth to a subset of these powerful elites. The small size of the group whose support must be won makes targeted transfers an effective strategy in this case.

Providing nonexclusive public goods, such as impartial law enforcement or public health programs, would be ineffective in this circumstance, because most of the benefit would accrue to non-elite outsiders. This basic intuition on the relative size of the controlling group drives McGuire and Olson’s (1996) predictions on public good provision under different governance systems. It parameterized in Grossman and Helpman’s (1994) ‘protection for sale’ model of government policy outcomes. It also motivates theoretical predictions on public good provision under dictatorial versus democratic political systems and agrees with empirical tests in Deacon (2009).

The deep forces determining the distribution of political power are not well understood, but arguably could include a country’s history, climate, geography, and religion. On the importance of history, Putnam (1993) traces differences in the concentration of political power in various regions of modern Italy to events that occurred centuries earlier. In some countries political influence is entirely attributable to control of a military force, as in the Dominican Republic under Trujillo. Both recently and in the distant past, concentrated political influence has resulted from extraordinary religious authority, credible adherence to a political doctrine, or membership in a royal family. Some observers regard basic cultural factors, particularly the degree of trust and tolerance present in a society, as key determinants of government performance; see (LaPorta, et al

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18 Grossman and Helpman (1994) characterize government policy as choices made to maximize a weighted sum of social welfare and the utility of government decision-makers, and choosing the weights appropriately allows one to characterize choices by autocracies, democracies and variations in between.
Societies lacking trust and tolerance are considered less likely to develop governments focused on providing public goods broadly, and more likely to develop governments that serve the interests of narrow elites. Some trace trust and tolerance, in turn, to factors as religion and historical experience.

In democratic systems, voting is the key mechanism for determining political leaders and political power is generally regarded as broadly dispersed. Even here, however, differences in voting rules can give rise to variations in the concentration of power, and those who study such systems derive predictions from essentially the same reasoning just described. Lizzeri and Persico (2001) examine provision of a pure public good versus pork-barrel transfers under majoritarian systems, which they see as relatively power-concentrated, versus proportional voting systems, in which power is more widely shared. Their conclusions are broadly consistent with the principle elaborated above. Milesi-Ferretti et al (2002) use similar reasoning in deriving predictions on public good provision versus transfers under democratic voting.

Alternative theories of government’s role in an economy stress factors other than the distribution of political power. According to a contracting theory, the State’s main beneficial role is to enable the creation of property rights by providing a legal framework in which private parties can carry out exchange. Acemoglu and Johnson (2005) recognize this point, but argue that the distribution of political power affects the government actions and economic outcomes at a deeper level because it regulates the vertical relationship between ordinary private citizens and the politically powerful. An economic theory of governance put forth by Demsetz (1967) and North (1981) holds that institutions are created when the social benefits from creating them outweigh the transactions costs. An implication is that countries with great material wealth stand to gain more from governments that provide public goods and protect assets from theft than do
impoverished societies, which broadly agrees with cross-country evidence.\textsuperscript{20} The same correlation is consistent with causation running in the opposite direction, however.

Tests of these alternative theories have generally relied on cross country panel data. Acemoglu and Johnson (2005) found pervasive links between unequal political power and unfavorable outcomes for investment, economic growth and wealth. In tests of the contracting theory, the same authors found that variations in legal systems are significantly linked to economic performance, but these effects are largely confined to financial markets. Comparative empirical tests of political, economic and cultural theories of governance reported by LaPorta, \textit{et al}, (1999) indicate that political factors such as legal origins and ethnic heterogeneity are strongly linked to public good provision and political freedom. The same study found evidence consistent with the economic theory of governance—that good institutions arise when demand is sufficient—but causation was questionable, as strong economic performance clearly could be a direct consequence of good government. Support was also reported for a link between good governance and cultural factors, as indicated by religious affiliation.

The importance political scientists assign to the concentration of political power in determining government behavior is indicated by the central role this factor plays in the Polity database (Marshall and Jaggers, 2000), the premier data series on governance structures,. The Polity scores assigned to countries for autocracy and democracy largely reflect the presence of constraints on executive authority, the degree of political competition and the openness of executive recruitment. Operationally, countries tend to receive higher scores for democracy (and lower scores for autocracy) when the power of the legislature is strong vis a vis the executive, when groups in society are not excluded from participating in government and when competition for the control of government is vigorous. High democracy scores are consistent with a relatively uniform distribution of political power because they indicate fewer barriers to entry into political

\textsuperscript{20} The same correlation is consistent with causation running in the opposite direction, of course.
life, greater popular control of executive decisions (often by effective, popularly elected legislatures) and less exclusive control by political elites.

When political power is sufficiently concentrated that targeting transfers to political elites is the primary force motivating government decisions, the questions of how large these transfers are in equilibrium and how they distributed among different interest groups remain. The models developed to examine these situations focus on the phenomenon of rent-seeking, the use of economically valuable inputs to compete for favors from the public sector. Government institutions are typically not incorporated in these theories and ‘the government’ is not an explicit agent. Rather, government policy is treated as the equilibrium outcome of competition among independent, politically powerful private agents. A common symptom of concentrated political power is corruption, the use of government authority for private gain. Transfers to the political elite or their friends could be made by employing them in government jobs, where they can be paid excessive salaries or collect bribes for overlooking violations of laws and regulations. Targeted transfers may also take the form of theft of public funds or kickbacks for resource extraction contracts.²¹

3 Models of Rent-seeking and the Resource Curse

This section and the next are organized around broad strategies that have been used to model links between resource abundance and political institutions. The present section focuses on

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²¹ Corruption may also result from failure to provide basic public goods, such as law enforcement, in systems where political power is highly concentrated. One might expect Coasian bargaining to arise to capture the gains that could be realized by providing public goods such as legal institutions and public safety. Under the required bargain, a powerful, elite-dominated government would create a system legal rights leading to wealth creation, in exchange for a share of the added wealth. Acemoglu (2003) and Acemoglu and Johnson (2005) see the fundamental problem as one of commitment—the elite’s promise to fulfill the terms of the exchange is not credible if they are not constrained by pre-existing legal institutions. In fact, any wealth creation would only add further incentive to confiscate. In addition, the groups seeking property rights protection would need to solve a coordination problem in striking a deal with the sovereign because the rights system is a public good to those it protects.
models based purely on rent-seeking among private interests. The next section focuses on models with explicit political underpinning. Both sections emphasize predictions and implications for empirical work.

3.1 The Political Response to Windfalls: Voracity, Growth and the Resource Curse

The ‘voracity’ model applies to a polar case of bad governance: government’s coercive power is used solely to transfer wealth from the private sector to powerful interests. The transfers may be accomplished by taxes or some other policy that has the same effect, e.g., theft, bribe demands, forced participation, nationalization or expropriation.\footnote{The initial description of the model’s setup follows Tornell and Velasco (1992); additional features introduced in Lane and Tornell (1996) and Tornell and Lane (1999) are discussed later. Other aspects of this model have been developed in Tornell (1999) and Tornell and Lane (1998).} Government is simply a conduit for such transfers and does not appear as a separate entity. Instead, politically powerful groups independently transfer private sector wealth to themselves, constrained only by the transfers of other groups and by non-negativity constraints. In effect, the private sector capital stock is a common pool. This wealth appropriation diminishes the incentive to accumulate capital, which lowers the economy’s growth rate and its present value utility relative to the first-best outcome. The first-best outcome would be attained if there were only one group operating, which could then internalize the negative effects of wealth transfers. If the elasticity of intertemporal substitution is sufficiently low, economies with many powerful groups will experience slower growth and lower welfare than economies with few such groups. This agrees with intuition about common pools.\footnote{See Tornell and Velasco (1992), equation (4c).}

The model’s key results emerge with the introduction of a second asset that is less productive than the first, but immune to appropriation. In a developing economy the second investment option could be capital accumulated in the ‘informal’ economy, the sector that is
hidden from tax authorities. Alternatively, the second sector might be the capital market in a foreign country whose governance system protects wealth from arbitrary appropriation. To fix terms, the respective sectors are called ‘formal’ (vulnerable to transfers) and ‘informal’ (less productive but immune from transfers) in what follows. When this wealth haven is introduced, capital flows from the formal to the informal sector. Because the informal sector has a lower rate of return, the economy’s growth rate and present value welfare are sub-optimal. Depending on parameter values, introducing the informal sector may or may not improve welfare.\textsuperscript{24}

Surprisingly, an increase in the return to formal sector capital (due to enhanced productivity or a higher output price) causes transfers by elite groups to increase by \textit{more} than the productivity gain, resulting in a smaller formal sector capital stock: this is the ‘voracity’ effect.\textsuperscript{25} Its strength depends on the number of competing groups. Each group, \(i\), chooses a share of formal capital to transfer to itself, taking as given the shares all other groups choose to transfer to themselves, and knowing that its own transfer share will reduce the net (after-transfer) rate of return perceived by other groups. If \(i\)’s transfer demand causes the net rate of return faced by other groups to fall below the rate of return in the informal sector, then other groups will demand to transfer the entire stock of formal capital. This knowledge disciplines the transfer group \(i\) demands, but the discipline is relatively modest when there are only a few groups. With a small number of groups, each knows that it will get back a relatively large fraction of what is transferred in aggregate; each group also knows that the same is true for other groups. This allows the formal capital sector to keep operating even if the share transferred exceeds what would be required to equate net rates of return.

Conversely, when the number of groups is large the fraction of aggregate transfer each gets back is small, and this effect is diminished. This implies that when there are many interest

\textsuperscript{24} The key parameters are the elasticity of intertemporal substitution and the productivity difference between the two sectors.

\textsuperscript{25} From this point forward the discussion primarily follows Tornell and Lane (1999). Lane and Tornell (1996) develop a simpler one-sector model in which the voracity effect can still emerge under certain parameter values.
groups, so political power is diffuse, the negative effect of wealth transfers on growth and welfare are diminished, which agrees broadly with the political economy theories summarized in the preceding section.  

The negative growth response to an increase in productivity is what connects the voracity model to the resource curse. If formal capital consists mainly of natural resource wealth, a resource price boom or a new discovery would raise the formal sector’s rate of return. According to the voracity effect, this should cause capital to flow to the less productive sector, and growth should slow. Voracity only operates in the absence of institutional barriers to rent seeking, however. By implication, a resource productivity windfall should increase growth and welfare if barriers to such transfers are present. As elaborated shortly, this provides an explanation for why economic performance following the oil boom of the 1970s was so different in, for example, Norway versus Nigeria, and directs empirical researchers to allow for different resource boom effects in different institutional contexts.

3.1.1 A sketch of the voracity model

A streamlined version of this model can illustrate its underlying assumptions and basic structure. Aggregate capital in the formal sector, denoted \( k(t) \), produces output valued at \( p \) per unit and has a net physical rate of productivity \( \alpha \). Absent transfers from the stock, it would grow according to \( \dot{k}(t) = p\alpha k(t) \). There are \( n \) politically powerful groups in society. They act independently and each can transfer a portion of the aggregate stock to itself. Groups are identical

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26 The number of groups must be at least two for this effect to be present. An economy with one group would internalize all effects and reach a first-best outcome.

27 The degree to which the voracity model fits what actually happens in resource booms is discussed later.

28 The following sketch omits numerous details and assumptions present in Tornell and Velasco (1992) and Tornell and Lane (1999). It also adopts some slightly different notation, in an attempt to provide consistent notation across several of the models surveyed. van der Ploeg (forthcoming) develops a voracity model in which the common pool stock is an exhaustible resource rather than produced capital. He develops results on the extraction paths chosen by independent groups and compares them to the familiar Hotelling and Hartwick rules for exhaustible resource extraction.
and in equilibrium each demands the same transfer, \( r(t) \), from the stock in any period. From the perspective of a single group, the rate of return on a unit of capital left in the formal capital stock is

\[
p \alpha - (n - 1) r(t)/k(t) \equiv p \alpha - (n - 1) x(t) \tag{3.1}
\]

where \( x(t) \) is the equilibrium share of capital each group transfers to itself. A group does not deduct the share it receives itself in figuring the private rate of return to formal capital, because this is not lost to others.

Individual groups form strategies regarding transfers and consumption by maximizing constant relative risk aversion utility functions with constant discount rates. To simplify comparisons we focus on the case where the elasticity of intertemporal substitution is 1, so the utility function for each group is

\[
U = \int_0^\infty \log(c(t))e^{-\delta t} dt,
\]

where \( c(t) \) is a group’s consumption in period \( t \) and \( \delta \) is the discount rate. The solution concept is Markov perfect equilibrium and strategies are restricted to be functions of payoff relevant state variables, the formal and informal capital stocks. Each group chooses a transfer demand, taking as given the transfer rules of other groups. Each group therefore internalizes the effect its own actions have on the common pool capital stock (a payoff relevant state variable) and, in turn, on the transfer demands of other groups. In an economy with only one asset, the equilibrium growth rate of the formal (common pool) capital stock is \( p \alpha - n \delta \). \(^{29}\) This implies that each group’s present value utility in the one asset economy equals

\[
U^1 = \log(k(0)\delta)/\delta + (p \alpha - n \delta)/\delta^2. \tag{3.2}
\]

With only 1 group the first-best growth path is attained and (recalling \( \sigma = 1 \)) capital grows at rate \( p \alpha - \delta \).

\(^{29}\) The results in this sentence and the next are from Tornell and Velasco (1992, p. 1213) for the \( \sigma = 1 \) case, where the price of output, \( p \), has not been normalized to unity.

\(^{30}\) The negative relationship between present value welfare and the number of groups, \( n \), is intuitive in light of the common pool analogy, but it depends on the \( \sigma = 1 \) assumption.
The key results emerge with the addition of a second capital sector, which has productivity $\beta < p\alpha$ but is immune from transfers.\(^{31}\) The authors focus on ‘interior’ equilibria, outcomes in which no group chooses to appropriate the entire formal capital stock all at once. Depending on parameter values there may also be ‘extreme’ equilibria in which each group demands transfer of the entire formal capital stock at each point in time.\(^{32}\) When the second sector is introduced, capital flows out of the common pool formal sector and into the less efficient, but secure, informal sector. If the number of groups is relatively small, the aggregate transfer is large and the after-transfer rate of return on formal capital down to equality with the informal sector’s rate of return. Capital is accumulated in both sectors in this case. With a larger number of groups, transfers of formal capital are smaller and equilibrium is reached before rates of return on the two stocks are equalized. Transfers from the formal capital stock are entirely consumed in this case. In both cases, the equilibrium rate of return is lower than $p\alpha$, so the growth rate and present value utility are lower than levels attainable in the first-best outcome.

The voracity effect describes what happens when the return to formal sector capital increases. It is most easily seen where $n$ is small and capital is accumulated in both sectors. After tax rates of return are equalized in this case, so

$$p\alpha - (n - 1)x = \beta.$$  \hspace{1cm} (3.3)

(Recall that $x$ is the common share of $k$ transferred by each group in equilibrium.) To demonstrate the voracity effect, suppose the terms of trade in the formal sector increased by $\Delta p > 0$. To maintain equality in after-tax rates of return between formal and informal sectors, the share of $k$ each group transfers to itself must increase by $\Delta x = \Delta p\alpha / (n - 1)$. The aggregate share of formal capital transferred, $nx$, therefore changes as follows:

$$n\Delta x = \Delta p\alpha \cdot n / (n - 1) > \Delta p\alpha.$$  \hspace{1cm} (3.4)

\(^{31}\) From this point forward the discussion primarily follows Tornell and Lane (1999).

\(^{32}\) Lacking a theory of what might limit such extreme demands, they dismiss these extreme equilibria as uninteresting.
On balance, the aggregate $k$ transferred out of the formal sector exceeds what is generated by the productivity increase. The same effect would result from an improvement in the formal sector’s physical productivity, $\alpha$.

This is the ‘voracity effect’. If the formal capital stock’s productivity increases, each group demands a larger transfer and the increase in aggregate transfers exceeds the value of the productivity gain. Capital flows from the formal to informal sector following the productivity increase, which reduces the growth rate of the formal capital stock. The welfare effect of this slowdown depends on whether the number of groups is greater or smaller than a critical value $\tilde{n}$.

If $1 < n \leq \tilde{n}$, the economy accumulates positive capital stocks in both sectors, and both stocks earn the informal sector’s rate of return, $\beta$. The productivity gain shifts capital between sectors, but leaves the rate of return perceived by each group unchanged. Each group’s consumption and investment decisions are therefore also unchanged and the economy stays on the same growth path as before, so present value welfare is unchanged.\(^{33}\) If $n > \tilde{n}$, the windfall-induced transfers of formal sector capital are not large enough to drive the after-transfer rate of return on $k$ down to the informal rate of return. The transfers resulting from the windfall are entirely consumed in this case, so capital accumulation and consumption growth are both reduced and each group’s present value welfare falls.

The number of powerful groups thus plays an important role. While windfalls damage ‘large $n$’ economies worse than ‘small $n$’ economies, the former always perform better than the latter. Comparing two economies that differ only in the number of such groups, the one with the larger $n$ always achieves a higher growth rate and greater present value utility. Tornell and Lane (1999, p. 42) interpret the salutary effect of a larger $n$ as follows: “… if the shift to democracy brings with it the destruction of entrenched interest groups, and power becomes more diffused, then growth performance and adjustment to windfalls will improve.” While their interpretation is

\(^{33}\) The windfall due to the formal sector’s improvement is just offset by the loss that occurs when capital is shifted from the more productive to less productive sector.
reminiscent of arguments from political theories of governance that emphasize the importance of widely dispersed political power for ‘good’ governance, the reasoning embedded in the voracity model is entirely different.

3.1.2 Voracity and natural resource stocks

When imagining a resource windfall that sets off a feeding frenzy, it is hard not to think of petroleum or diamonds. Non-renewable resource stocks are not physically productive and are drawn down over time rather than accumulated, however, so they do not exactly fit Tornell and Lane’s (1999) description of formal capital. A better fit for formal capital is the capital invested in resource extraction, such as production wells, pumping equipment, pipelines and port facilities in the case of oil. This capital is physically productive and a new discovery or price increase would increase its rate of return. In countries prone to rent-seeking, it is plausible a portion of any windfall will be captured by powerful political interests. With this characterization, the voracity model gives sharp predictions. First, absent barriers to rent-seeking, investment in resource extraction capital and its after-transfer rate of return will be suboptimal. More specific to voracity, a productivity windfall will cause transfers of such capital that exceed the value of the windfall, resulting in a net reduction in formal capital devoted to resource extraction. Depending on the number of groups, a windfall may lower the after-transfer rate of return, the economy’s growth rate, and present value welfare.

A renewable resource stock located in a country with weak institutions arguably fits the voracity model directly. An example is a forest with biomass $k$ that regenerates according to

$$\dot{k}(t) = \alpha k(t),$$

where the growth rate ($\alpha$) is assumed to be locally constant. If special interests can use the political process to transfer a portion of the stock’s value to an untaxed informal sector, the analogy is complete. Transfers might take the form of fraudulent harvest concessions, outright theft of timber from government forests or diversion of timber revenues to political allies. The
situation in Indonesia during the timber boom described by Ross (2001) seems to fit this description well.

3.1.3 Evidence on voracity

According to the voracity effect, a positive shock to resource price or productivity in a country lacking institutional barriers to rent-seeking will cause increased transfers from the formal sector, a fall in the growth rate of formal capital and formal sector output and a reduction (or no change) in the return on formal capital. These predictions are examined somewhat informally in Tornell and Lane (1999), using data on the response of transfers and economic growth rates in three oil rich states, Nigeria, Venezuela and Mexico, following positive price shocks. The authors do not confirm the required absence of institutional restrictions on transfers, but all three countries had notoriously low institutional quality during this period. The authors note that government transfers as a share of GDP in each country more than doubled between 1970 and the early 1980s, which agrees with the voracity effect if these transfers are indeed payments to powerful interests.34 In the same period, GDP growth rates in all three countries were well below predicted values from a cross-country growth regression, and were actually negative in Nigeria and Venezuela.

In Lane and Tornell (1996), the authors focus directly on the institutional conditions required for the voracity effect to operate, the presence of powerful rent-seeking groups and an absence of institutional restraints on transfers. Arguing that industrial interests often are politically powerful and are most likely to be influential when highly concentrated, they construct a dummy variable for a concentrated manufacturing sector. A second dummy variable, based on data from the International Country Risk Guide, is defined to indicate weak institutional barriers to rent-seeking. Interacting these two variables yields a dummy variable, labeled Power, which

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34 In Mexico, government’s share of GDP rose by 150% between 1970 and the oil price peak of the early 1980s.
takes the value 1 when manufacturing interests are concentrated and institutional barriers are weak and zero otherwise.\textsuperscript{35} The format for testing is a standard cross-country regression equation in which the dependent variable is, alternately, per capita income growth and the average investment share of GDP over 1970 to 1990.

A central prediction is that countries vulnerable to voracity ($Power = 1$) will experience slower or unchanged growth in output and formal sector investment following a windfall, while non-vulnerable countries should experience faster growth in both terms following a windfall. The authors equate windfalls with positive terms of trade shocks and control for initial income, education and continent fixed effects. They find that positive terms of trade shocks yield significant growth improvement in non-vulnerable countries, but not in voracity-vulnerable countries. They also report that investment responds negatively to positive terms of trade shocks in voracity-vulnerable countries, but this evidence is less robust.\textsuperscript{36}

The voracity model predicts that a windfall will increase in ‘theft’ from the formal sector capital stock when institutions are weak. In a resource dominated economy, increased theft related to natural resource windfalls might be visible in more frequent expropriation, nationalization, or forced participation by national governments, in greater frequency of bribes to government resource agencies, and in fraudulent harvesting concessions or kickbacks on resource extraction contracts. Since these outcomes often are reported, it may be possible to test for voracity-induced theft directly, rather than testing only for the consequent growth and investment effects.\textsuperscript{37}

\textsuperscript{35} Power equals 1 when at least 50\% of manufacturing value added is concentrated in 3 or fewer 3-digit sectors and when the ICRG score reported by Knack and Keefer indicates weaker institutions than the sample median.

\textsuperscript{36} They also find that voracity-vulnerable countries had significantly slower growth and lower investment than non-vulnerable countries during 1970-1990.

\textsuperscript{37} Frequencies of theft are endogenous, of course, so deeper factors would be needed to represent an absence of institutional barriers to transfers.
3.2 Rent-seeking and the Misallocation of Entrepreneurial Talent

Spain’s appropriation of gold and silver from the new world in the 16th century was the most spectacular natural resource windfall ever experienced to that time. Spain’s boom and bust cycle during that century and the next—with eight declarations of bankruptcy between 1557 and 1680—was a resource curse of epic proportions. One observer (Karl, 1997, p. 35) attributes Spain’s downfall in part to a diversion of entrepreneurial energy from wealth creation to rent-seeking:

“[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 . . .”

This specific mechanism, in which a resource windfall becomes a curse by diverting entrepreneurial talent away from wealth creating industrialization and toward rent-seeking, is formalized in Torvik (2002) and Mehlum, et al (2006). They characterize the potential gains from entrepreneurship and industrialization by adapting a model of Murphy, et al (1989) in which use of a ‘modern’ technology yields increasing returns to scale and greater efficiency in production. Such modernization raises income and demand, which facilitates adoption of modern production methods elsewhere in the economy. This positive externality, which operates through demand, can be exploited by adopting a ‘big push’ policy, as described by Murphy, et al (1989).

The key assumption in Mehlum, et al (2006) is that a fixed number of individuals have entrepreneurial skills that can be used in only one of two alternative activities, operating modern enterprises that can generate positive growth externalities or engaging in unproductive rent-
seeking. A resource rent boom makes rent-seeking more attractive, causing some producing entrepreneurs to abandon modern production. Switching continues until the private returns in the two pursuits are equalized. Absent the demand-linked externality from modern production, the net result would be exact dissipation of the rent that set the reallocation in motion. With the demand externality, the net effect of a resource boom is to reduce economy-wide income. Abandoning one modern firm reduces demand for all remaining modern firms, which induces additional entrepreneurs to switch to rent seeking and lowers income even further. Since the net loss in income exceeds the resource rent that started the process, the result is indeed a curse.

To incorporate the role of institutional quality, Mehlum, et al (2006) specify that the payoff to rent-seeking depends both on the size of the resource rent and on the quality of a country’s institutions. Given a level of resource rent, sufficiently high institutional quality will prevent a resource curse from occurring because rent-seeking never becomes sufficiently lucrative to attract entrepreneurs away from modern production. If institutional quality is below a critical level, however, the same resource rent will divert entrepreneurial talent and the resource curse will ensue. The institutional threshold required to escape the curse depends on the size of the resource rent, so a large enough resource boom could cause an otherwise well-functioning country to slip below the threshold and end up in a rent-seeking equilibrium.

To convert an essentially static analysis to a model of growth, Mehlum, et al (2006) assert that a fixed number of new potential entrepreneurs is added to the pool each year, and the existing stock is reduced according to a fixed, proportional rate of mortality. In resource-poor countries these new arrivals tend to enter modern production, and generate growth-inducing externalities. In resource-rich countries new arrivals gravitate toward unproductive rent-seeking.

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38 The following discussion focuses on Mehlum, et al (2006), although many of the ideas in this paper and some of the results can be found in Torvik (2002). The latter paper does not incorporate two features that are prominent in Mehlum, et al (2006), the notion that property rights to produced wealth are eroded by rent-seeking and the growth features present in the latter work.
In this fashion, the static prediction that resource rich countries tend to be poor is transformed into a prediction on growth.

3.2.1 A sketch of the diverted entrepreneurship model

Consider an economy that has $N$ individuals with entrepreneurial talent, each of whom may be drawn into one of two activities: operating a ‘modern firm’ that uses an increasing return to scale technology and earns a profit, or competing in the political arena to grab a portion of a natural resource rent. A modern firm’s profit, measured in units of labor (the numeraire), is $\theta y - F$, where $\theta(> 1)$ is a constant determined by the modern production technology, $F$ is a fixed cost and $y$ is the firm’s rate of output. Labor is supplied inelastically in amount $L$, so any payment it receives is a rent. In addition, the economy’s natural resource generates a rent of $R$ per period. If there are $n_p$ entrepreneurs operating modern firms, total rent is

$$ Y = (\theta y(n_p) - F)n_p + L + R. \quad (3.5) $$

Output per modern firm is an increasing function of the number of modern firms, $y = y(n_p)$, due to the externality argument described earlier. Clearly, the economy’s net rent is an increasing function of the number of modern firms and is maximized when $n_p = N$.

The number of entrepreneurs who choose modern production rather than rent-seeking is determined by an equilibrium condition—that both activities earn the same private return. We express the equilibrium condition with the following notation. Let $r$ be the resource rent per potential entrepreneur ($r \equiv R / N$). Let $\lambda \in [0,1]$ be an increasing indicator of institutional quality, such that $\lambda = 0$ when all resource rents are captured by rent-seekers and $\lambda = 1$ when rent-seekers and producers both receive the same share. Finally, let $s = s(n_p, \lambda)$ be a multiplicative factor that indicates the fraction of resource rent an individual rent-seeker captures. Obviously, $s(n_p, \lambda)$ is

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39 The authors invoke a technical condition guaranteeing that the modern firm’s output is large enough to cover its fixed cost.
increasing in the number of productive entrepreneurs, \( n_p \), since having more productive
entrepreneurs means that fewer individuals compete against one another in the rent-seeking
process. Also, \( s(n_p, \lambda) \) is decreasing in institutional quality, \( \lambda \), since higher quality institutions
mean prevent rent-seekers from grabbing \( R \) entirely. With this notation, the equilibrium
condition is
\[
\pi_p = (\theta y(n_p) - F) + r\dot{\lambda}s(n_p, \lambda) = rs(n_p, \lambda) \equiv \pi_G, \tag{3.6}
\]
where \( \pi_p \) is the return to productive entrepreneurship and \( \pi_G \) is the return to rent-seeking. After
rearranging, (3.6) implies that the number of potential entrepreneurs engaged in rent-seeking will
increase if and only if
\[
(\theta y(n_p) - F) < (1 - \lambda)rs(n_p, \lambda). \tag{3.7}
\]
The lhs of (3.7) is the profit an entrepreneur foregoes by abandoning modern sector production
and the rhs is the gain in rent captured by switching from production to rent-seeking. Given
any \( n_p \), an increase in \( r \) clearly shifts talent toward rent-seeking, reducing \( n_p \). The decrease in \( n_p \),
in turn, reduces the lhs of (3.7) and increases the rhs, reinforcing the initial effect. With perfect
institutions \( \lambda = 1 \) and there is no return to rent-seeking, so all potential entrepreneurs choose to
produce. The link from this static prediction to a prediction on growth was described verbally
earlier; the extension is not formally outlined here.

3.2.2 Empirical Implications and Testing

The authors make a point that echoes a key result from the voracity effect: resource
wealth is a curse only in the absence of institutional barriers to rent-seeking. When institutional
barriers are present, a resource rent windfall should raise national income. They test this

\footnote{Notice that productive entrepreneurs and rent-seekers receive equal rent shares when institutional quality
is high, \( \lambda = 1 \), whereas all rents go to rent-seekers when institutional quality is low, \( \lambda = 0 \).}
implication by adding an interaction between institutional quality and resource abundance to Sachs-Warner type cross-country growth regressions. Institutional quality is represented by an index that combines ratings on corruption in government, risk of contract repudiation, risk of expropriation, bureaucratic quality and rule of law. Resource abundance is found to be correlated with slow growth when institutional quality is low, in keeping with their model. Significantly, they find no evidence for a Sachs-Warner resource curse in countries with high institutional quality. Their resource measure is the ratio of primary exports to GDP, which indicates sectoral composition rather than resource rent. In light of this, the lack of a significant growth effect from resource abundance in countries with strong institutions is unsurprising.

A country’s institutional quality, $\lambda$, is an immutable parameter in Mehlum, et al (1996), presumably determined by deep cultural forces. While the authors do not spell out these determinants, they might include a country’s historical experience, colonial origin, legal tradition, ethnic composition, religious makeup, and so forth. According to their model, a sufficiently large infusion of resource rent can overwhelm institutional quality and tip an otherwise ‘good government’ country into a rent-seeking equilibrium. In this sense, rent-seeking activity such as bribery, selective law enforcement, expropriation, and so forth are endogenous to the model. The empirical model uses similar rent-seeking variables as controls for institutional quality, however. Arguably, a country’s susceptibility to rent-seeking, $\lambda$, would be better represented by variables not determined by resource rents, e.g., one or more of the cultural factors described earlier.

Two of the model’s predictions are not tested: that the rent-seeking actions just described respond positively to a resource boom and that the curse is caused by a shift in production away from modern, increasing-returns technologies and toward more primitive methods. Other researchers have found support for the first of these predictions. Regarding the second, if the large output reductions estimated by the model are actually transmitted through this channel, it

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41 The underlying data are from Political Risk Services, measured in 1982.
42 What is surprising is that institutional quality alone has no effect on growth when resource intensity is low. This disagrees with results from the empirical growth literature.
should be possible to observe the effects of a resource boom playing out through shifts in sectoral activity away from high-growth, technology-intensive sectors and toward less progressive, less capital- and technology-intensive modes of production.

3.3 Rent-Seeking, Institutional Decline and the Number of Competing Claimants

Historical accounts of responses to natural resource windfalls often report that rent-seeking among competing claimants dissipates all or part of the resource rent, and that intensified rent-seeking erodes the country’s political institutions. The latter point is a strong theme in Ross’s (2001) examination the hardwood timber boom in Southeast Asia and in Karl’s (1997) description of events in oil producing states following the price shocks of the early 1970s and 1980s. Hodler (2006) develops a formal model that generates these phenomena as equilibrium outcomes and concludes that the rent dissipation and institutional decline resulting from a given windfall is likely to be greater in fractionalized than in homogeneous societies.

The agents in Hodler’s (2006) model are interest groups that compete for a rent that each regards as exogenous. Each group has a fixed endowment of effort that it can allocate between producing a private good and a rent-seeking activity, which he calls ‘fighting’. Effort spent fighting produces no output, but does allow a group to capture rent. The resource rent is effectively a ‘common pool’ and the share a group captures is assumed to equal the share its fighting effort represents in the fighting effort of all groups. A larger rent naturally leads to more fighting in equilibrium and greater waste. The mechanism for economic decline is therefore very straightforward. There is no shift away from investment to consumption, or away from an efficient sector to an inefficient one; rather, productive inputs become engaged in an activity, fighting, that generates no output. With identical independent groups, the degree of rent

43 While the term ‘fighting’ is used as a label for actions taken to acquire resource rents, this is not a model of war, instability, etc. The model and empirical analysis are directed toward understanding how diverting effort away from production and toward rent-seeking leads to low income and institutional decline.
dissipation depends positively on the number of groups and approaches 100 percent as the number increases. This is a standard common pool result.  

In addition, the intense rent-seeking brought on by the windfall spills out and erodes property rights in the non-resource sector. This institutional erosion provokes a true resource curse—an actual decline in welfare resulting from a windfall. Specifically, when agents in the economy allocate a portion of aggregate effort to fighting for natural resource rents, an equal proportionate share of the non-resource output gets transferred to the common pool, where it is allocated on the basis of fighting effort. This diminishes the incentive to produce ordinary output in two ways: the payoff to producing is reduced since only a portion of the output will be kept by the producer, and the payoff to fighting effort is increased, since the size of the common pool prize is greater. This result rests on two key assumptions: (i) natural resource rents, unlike other forms of wealth, are allocated only by rent-seeking, and (ii) part of the non-resource output is transferred to the common pool when this rent-seeking ensues.

The outcome is characterized as the Nash equilibrium of a one-shot, simultaneous move game. With identical groups and the functional forms adopted, very clear predictions are generated: if the number of groups is greater than 2, an increase in the natural resource windfall reduces both societal income and the security of private property rights, and these perverse effects are worse the larger is the number of groups.  

3.3.1 A sketch of the model

A streamlined version of the model is sketched using the following notation. \( R \) is the fixed resource rent, \( K \) is the number of groups, and \( x_i \) group \( i \)'s fixed endowment of effort, which

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44 See Dasgupta and Heal (1979) Chapter 5. This is analogous to the way competition among Cournot oligopolists dissipates the monopoly profit all could share if they acted as a joint monopoly. As the number of independent firms increases, the outcome approaches the competitive equilibrium and equilibrium profit approaches zero.

45 If the number of groups equals 2 the windfall has no effect on societal income. If there is only 1 group the outcome is first-best.
can be allocated either to fighting (rent-seeking), $f_i$, or to labor, $l_i$. The marginal product of labor in producing the private output is constant and normalized to 1. We initially ignore the effect of fighting on property rights to the produced good, and add that consideration in later. The share of rent captured by group $i$ equals the share its fighting effort represents in aggregate fighting effort.

Group $i$’s net payoff to rent-seeking is therefore $[f_i / \sum_{j=1}^{K} f_j]R - f_i$, and its optimal fighting effort satisfies

$$[f_{-i} / (\sum_{j=1}^{K} f_j)^2]R = 1$$

(3.3.1)

where $f_{-i}$ indicates the aggregate fighting effort of all groups other than $i$. With identical groups, each group’s fighting effort in a symmetric Nash equilibrium satisfies $R(K - 1) f^* / (K f^*)^2 = 1$, which implies a preliminary result:

$$K f^* = R(K - 1) / K.$$  

(3.3.2)

The lhs of (3.3.2) is aggregate fighting effort; it equals aggregate dissipation of the resource rent. The rhs indicates that aggregate rent dissipation approaches 100 percent as the number of groups rises toward infinity; with only 1 group there is no fighting or dissipation.

Fighting for the resource rent erodes property rights to the produced good, rendering a portion of it vulnerable to rent-seeking. This opens the possibility of a true resource curse.

Formally, the fraction made vulnerable equals $P = (\sum_{j=1}^{K} f_j) / X$ where $X$ is the economy’s aggregate effort endowment. For example, if one-third of the economy’s effort is used for rent seeking, then one-third of its produced output is relegated to the common pool where it is allocated by rent-seeking. The combined effects of rent-seeking on income can be seen by writing out group $i$’s income, $c_i$, as follows:
\[ c_i = \left[ 1 - \left( 1 / X \right) \sum_{j=1}^{K} f_j \right] l_i + \left( f_i / X \right) \sum_{j=1}^{K} l_j + R f_i / \sum_{j=1}^{K} f_j. \] (3.3.3)

The first term on the right hand side of (3.3.3) is the portion of group \( i \)'s output that the group retains for its own consumption; clearly, fighting by all groups diminishes each group’s incentive to produce. The second term is the share of other groups’ output that group \( i \) captures by rent-seeking. Both of these terms imply an amplified payoff to rent-seeking, and the driving force of the resource rent, \( R \), in determining the equilibrium rent-seeking effort is evident from (3.3.2). The third term is just group \( i \)'s share of the resource rent, captured by rent-seeking.

3.3.2 Implications, testing and interpretation

Data from a cross section of roughly 90 countries are used to test the model’s central predictions, that natural resource wealth leads to reduced income and less secure property rights, and that these effects are most damaging when the number of groups is large. Unlike the preceding two theories, Hodler’s (2006) does not entertain the possibility that institutional constraints could limit rent-seeking. The key variables are per capita income, property rights security, natural resource rents and the number of independent groups competing for rents.\(^{46}\) The number of groups is represented by separate variables indicating ethnic, linguistic and religious fractionalization. Each fractionalization variable is the probability that 2 randomly drawn individuals have a specific trait—ethnicity, language or religion—in common.

Key empirical findings are that greater resource wealth is associated with lower income when fractionalization is high, regardless of how fractionalization is measured. When fractionalization is low, resource wealth is positively correlated with income, though the effect is

\(^{46}\) The national income data are from the World Development Indicators, institutional variables are reported by the Frazer Institute and Heritage Institute, and natural resource wealth is from the World Bank. The years of measurement are as follows: 2000 for gross national income per capita, 2003 for both property rights (and economic freedom) and 1994 for natural resource wealth.
not always significant.47 Greater natural resource wealth and greater fractionalization are also associated with weaker property rights.48 Strictly speaking, the model implies that resource wealth interacts with the number of groups in determining property rights (see equation 3.3.2), but this prediction is not tested. With only one observation per country, it is impossible to control for unobserved heterogeneity across countries. The paper’s results, along with much empirical work on the resource curse, may be driven by unobserved idiosyncratic factors.

Certain aspects of the model and its empirical implications deserve further discussion. First, the model asserts that natural resource wealth can never be protected as private property regardless of a country’s constitutional structure, while property rights to produced output would be perfectly secure if there were no resource rent, even in a highly heterogeneous country. This difference in treatment leads directly to a resource curse and is adopted without any detailed justification. Second, the model attributes the income loss to a transfer of effort away from production and toward rent-seeking. Taking this interpretation literally, the size of the estimated income loss suggests that the reallocation may well be visible in data on employment by occupation or industry. Because several theories predict a link between lower income and resource wealth, examining such data would enable a sharper test of this particular resource curse mechanism.

A separate issue is the task of empirically identifying groups in a way that fits with the model. Results in Hodler’s (2006) model depend on the number of players participating in a noncooperative game, and the players are groups rather than individuals.49 For a collection of individuals to be regarded as a group in this sense, its members must agree on a single objective function and the collection must be able to subordinate its members’ individual interests to the

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47 The effect of resource wealth on income is the partial derivative of income in the empirical model with respect to resource wealth. The derivative’s value is the linear combination of the estimated coefficients and the fractionalization measure, and these partial derivatives are not reported.

48 These effects could be accounted for by omitted geographic variables. The author notes that including latitude in the property rights regressions causes the effect of fractionalization to become insignificant.

49 The number of groups plays a similar role in Grossman and Helpman (1994).
group’s objective. Intuitively, agreeing on a single objective and acting in concert is most likely when members have homogeneous preferences. Further, coordinating members’ actions requires low transactions costs within the group. One form of corroborating evidence that a particular collection of individuals is a valid group in this sense would be the presence of effective political organizations that represent the group’s collective interests, e.g., political parties that represent the interests of ethnic, religious, or language groups. Additionally, when the solution concept is Nash equilibrium, each group must take the strategy choices of other groups as given. This requires that transactions costs across groups are substantial, so groups are unable to coordinate. Intuitively, this condition seems most likely to hold when different groups represent different ideologies, language groups or religions or when they represent economic interests are diametrically opposed, e.g., rich landowners versus poor tenants.

3.4 Resource Rents and Violent Conflict when the Rule of Law is Absent

Struggles to control spatially concentrated resources such as diamonds, oil and metallic minerals have been blamed for civil wars in Angola, Nigeria, Sierra Leone, and Zaire. Two related reasons for this connection readily come to mind: rebel groups that capture concentrations of diamonds, cocaine and timber could use the proceeds to finance their activities, and the presence of resource wealth generally raises the payoff from capturing control of a country’s government. Cross-country empirical evidence has linked the probability and duration of civil

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50 The observation that a collection shares a particular attribute does not imply that they are a ‘player’ in this sense. Hodler’s (2006) finding that ethnic, linguistic and religious fractionalization leads to bad governance and poor economic outcomes is consistent with other explanations that do not see resource abundance as a driving force. See Alesina et al (1999) and Mauro (1998). Hodler does find, however, that the negative effect of fractionalization on economic performance is confined to resource abundant countries.

51 In principle, one can always find a system of side payments among groups that causes the joint-payoff-maximizing outcome to be Pareto preferred to the Nash outcome. Such coordination is least likely, and the Nash assumption is most plausible, when the costs of identifying Pareto improving side payments and agreeing on a division of the gains is high.
wars to resource abundance, measured as the share of primary products in a nation’s total exports (Collier and Hoffler 1998, 2002). Regional concentrations can also set off regional conflicts, as in Nigeria where a concentration of resource wealth in one area, and attempts by other regions to capture a share of it, contributed to the breakup and eventual re-establishment of centralized political power. Such conflict also raises investor uncertainty over claims to future returns, which in turn affects resource extraction decisions.52

The driving force in the models surveyed to this point is the effort rent-seekers devote to capturing resource wealth or windfalls when property rights are insecure. If this competition is not constrained by the rule of law, one can imagine that it might lead to armed insurrection or civil war. van der Ploeg and Rohner (2010) develop a two-agent, two-period model in which resource wealth can only be captured by fighting, literally rather than metaphorically. As in Hodler (2006) fighting effort reduces labor spent in production, and this reduces income. Because fighting causes uncertainty over future payoffs from resource extraction, the authors treat resource extraction policy and violent conflict as simultaneously determined.

The model has two agents, an incumbent government in power in period 1, and a rebel group that will assume control in period 2 if it wins the fight. The prize for winning is a direct benefit from holding office (a ‘bribe’) and control over the rent from resource extraction. In period 1 the incumbent government chooses a resource extraction policy; this policy determines the level of second period rents for the winner and affects the incentive to fight. Both players expend fighting effort period 1 and their relative effort levels determine each group’s probability of success.53 The outcome of conflict is known by the start of the second period and the winner collects the available payoff. The sequence of play is shown in Fig. 3.4.1, which is presented in lieu of a sketch of the model.

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52 See Bohn and Deacon (2000) for theory and evidence on this point.
53 The probability that one party wins equals the ratio of its own fighting effort to total fighting effort, a typical contest function.
Fig. 3.4.1 Strategies and payoffs in van der Ploeg and Rohner (2010)

Notes: $p = f_G / (f_G + f_R)$, and $L > N_G > N_G - \rho$. $W$ is the wage (opportunity cost of fighting effort.)
To make extraction policy depend on the level of conflict, the incumbent government is assumed to choose among three extraction plans. One involves nationalizing the resource and producing it in a balanced way over time. This is technically efficient (yields a higher total rent), but leaves a relatively large second-period rent to the winner of the contest, which encourages fighting. The second option is to nationalize and produce rapaciously. While technically inefficient, this strategy reduces the second-period (post-conflict) rent and lowers the both contestants’ incentive to fight. Under the third option, the government contracts with a private extraction firm and receives a license fee payment in the first-period, before the contest is decided. If the government wins the contest it honors this contract and collects nothing post-fight; if the rebels win they expropriate the firm’s entire profit. By assumption, the private firm must make an investment and pay a license fee to the government in the first period. If the government wins, the firm earns an extraction profit in the second period; if the rebels win the firm receives nothing in period 2.

3.4.1 Interpretation and implications

All substantive decisions are made and payoffs are determined in the first period before the outcome of the fight is known, so in this sense it boils down to a one-shot, simultaneous play game.\(^{54}\) Since the government’s first period choice of an extraction policy determines the possible second period rents, it determines the levels of fighting and success probabilities for both players. Naturally, fighting is least intense with rapacious extraction since the second period rent captured by the winner is zero with this policy. The efficient, balanced extraction policy leaves more rent in the second period, which encourages fighting. Under the private extraction policy, the firm pays a license fee to the government before the fight begins, knowing that its property will be

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\(^{54}\) Technically, the rebel faction decides on expropriating the mining firm’s second period profit in the case where the government chooses private firm exploitation and the rebels win the fight, but since there are no future periods this decision is inconsequential.
nationalized if the rebels win.\textsuperscript{55} The rebels’ second period payoff exceeds the government’s in this case, since the rebels will expropriate the firm’s second period profit if they win but the government must abide by its promise. Consequently, the rebel group’s incentive to fight and equilibrium probability of success are higher than the government’s under this extraction policy.\textsuperscript{56}

The reward from holding office, $B$, can be interpreted as an indicator of corruption; a higher bribe from holding office equates to a more corrupt regime. With this interpretation, the model predicts that corrupt countries will be plagued by intense fighting and low output. The size of the resource rent also affects the incentive to fight; summarizing, high resource rents, violent conflict, and rapacious exploitation are predicted to accompany one another. Presumably, the government’s choice of extraction policy depends on the size of the resource rent, the ‘bribe’ and other model parameters, but this relationship is not spelled out.\textsuperscript{57}

The model introduces a different resource curse than has been described so far—violent conflict induced by a desire to control resource rents. A conventional resource curse is also present because effort spent fighting is diverted from productive employment, which depresses output. Reduced investment, slow growth and capital flight are not a part of the story, however. While the paper does not provide tests, evidence linking resource abundance to violent conflict has been presented elsewhere in the literature.

\textsuperscript{55} The firm’s first period license payment equals its expected profit from extraction, i.e., extraction profit times the probability that the government wins the fight minus a first period investment outlay.
\textsuperscript{56} van der Ploeg (2010) also demonstrates that the government could diminish the incentive rebels have to fight and thus increase its own probability of remaining in office by committing to pay subsidies to rebels after the fight is concluded. They do not explain how this promise could be made credible, however.
\textsuperscript{57} There is no explanation of why the government can commit to not expropriating a private mining firm’s capital if it wins the fight, while the rebels cannot. Also, different structures for the private extraction contract are possible and different structures could lead to different outcomes.
The situations examined in the preceding models are anarchic in the sense that policy results from a contest among private interests, unconstrained by political institutions, constitutional restrictions or the discipline of elections to ensure that the outcome does not totally ignore the welfare of the masses. Except in van der Ploeg and Rohner (2010), government is not present as a distinct policy-making agent with its own goals and constraints.

Many observers regard institutions as pivotal in determining policy outcomes, however, and in any case it is of interest to develop models in which political institutions play a role if only to frame empirical tests regarding their importance. A simple way to incorporate political constraints that mitigate exploitation of the citizenry is to assert that policy is made by a government, and that government pays attention to both the welfare of unorganized, ordinary citizens and the rent it can capture by gratifying organized, rent-seeking interests. A range of political systems can be nested within this general approach by specifying that government decisions are made to maximize a weighted sum of the average citizen’s welfare and contributions from organized political interests, and then varying the weights. The models described to this point are at the end of the range where all weight is placed on organized interests. Democracy is at the other extreme, where all weight is on general welfare. This general approach was pioneered by Grossman and Helpman (1994) and has been widely adapted to characterize policy choices.

A second way to introduce governance institutions is to specify that control of policy is determined by political competition in an electoral setting, where individuals make voting decisions by judging both their prospective utility under each candidate’s policies as well as their idiosyncratic preferences for each candidate’s attributes. Lindbeck and Weibull (1987) developed this framework to examine equilibrium transfers under majority voting. Political influence is

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perfectly dispersed in this system, in the sense that each person casts one vote and the majority rules. The same approach can be extended to represent systems in which political influence is concentrated, however. In non-democratic systems, political influence may be correlated with membership in a royal family, a high-ranking position in the military, adherence to a particular religion, or a particular ethnic identity. Rather than casting votes, individuals pledge their political influence to one candidate or the other, and control of government goes to the candidate who receives the most support.\(^{59}\) With this generalization, the distribution of political influence in society determines the policies candidates will adopt when seeking to control government. The models reviewed next adapt these general political economy approaches to the resource curse setting.

4.1 *Public Employment as a Political Commitment Mechanism*

In political systems where politicians need popular support to gain office, both politicians and their citizen-supporters face a credibility problem. On the politician’s side, the actual performance on a promise made to attract support generally is not realized until after the political contest is decided. What assurance do supporters have that the promise will be kept once the new leader is in office? On the citizen’s side, the act of giving support often is not verifiable at the individual level, as with voting, and actual support may only come after the candidate’s promise is announced. If the politician’s promise is indeed a commitment, what ensures that the citizens who benefit will follow through with political support? Robinson, Torvik and Verdier (2006) address these commitment problems directly and develop a model in which the solution is public employment. In their model, the contest between candidates is decided by an election. An incumbent’s pre-election offer of public employment to potential supporters represents a

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\(^{59}\) Deacon (2009) provides such a generalization.
commitment to post-election payoffs if the incumbent wins, because firing public employees is costly and the range for renegotiating public sector wages is limited. Citizens who receive public sector jobs have an incentive to support the incumbent even if their support cannot be verified individually, because they know their post-election jobs will be secure only if the incumbent prevails. The policies at issue in this model are resource extraction, public employment, taxes and transfers.

Policy outcomes are characterized as equilibrium outcomes of a 2-period game. An incumbent, $A$, and a challenger, $B$, both offer proposals on each policy variable in a pre-election period. By virtue of incumbency, $A$ chooses how much of a natural resource stock to extract in the pre-election period; naturally, this determines how much remains for the winner to extract in the second period. The extraction time path $A$ chooses clearly depends on the probability of retaining office and on the resource price in both periods. The resource rent in either period can be used by the office holder for personal consumption or for patronage (hiring public employees). Due to incumbency, $A$, can hire voters as public employees before the election. Critically, public employment will carry over into the post election period if the incumbent wins the election because firing public employees is costly. Voters are not naïve. Realizing there is no future beyond the second period, they rationally ignore any promises made with respect to post-election taxes and transfers; consequently, these policy variables play no substantive role. The actions available to each player and their sequence are shown in Figure 4.1.
Incumbent, A
- A decides amount to extract in period 1, $e$; allocates this between consumption and ‘patronage’.
- Only A can hire public employees in pd. 1.
- Public employment credibly commits A to post-election payoffs, since it is costly to fire public employees.
- Any promises A makes on taxes or transfers are not credible.

Challenger, B
- Announces post-election policy on employment, taxes, transfers, but it is not credible.

Voters
- Given period 1 employment and expected period 2 wage, voters decide which candidate to support.
- Votes also depend on candidates’ attributes.

Incumbent, A, if successful
- Consume remaining resource, $R(e)$.
- Assuming the cost of firing, $F$, exceeds the productivity gap between public and private employment, $H$, public employees are not fired.
- Period 2 wage is renegotiated.
- Since this is final period:
  - set tax rate to maximize revenue
  - set transfers to zero.
  - no new public employment.

Challenger, B, if successful
- Consume remaining resource, $R(e)$.
- Since this is final period:
  - set tax rate to maximize revenue
  - set transfers to zero.
  - no public employment.

Figure 4.1 Events and strategies in Robinson, Torvik and Verdier (2006).
Politicians identify with groups, also indexed $A$ or $B$, in a benevolent way. Each politician seeks to maximize a weighted average of his expected private income and his group’s income. Politicians care nothing for the welfare of the opposing group. As a consequence, incumbent $A$ will offer public employment only to members of his own group. Voters have idiosyncratic preferences, which they combine with expected incomes under the candidates’ respective policies in deciding which candidate to support. After policies are announced there is an election. Voters’ choices between $A$ and $B$ are characterized by the probabilistic voting model of Lindbeck and Weibull (1987).\textsuperscript{60}

Because it is costly to fire a public employee, hiring public sector workers before the election is a commitment mechanism—it imposes a cost on the politician for taking the second period action that would otherwise be a best response. Due to benevolence, only members of a candidate’s own group are hired; consequently, members of group $A$ are most likely to vote for the incumbent, even though their idiosyncratic preferences for the two candidates are not biased in that direction.

4.1.1 Key empirical implications

The model’s key results are as follows. First, the resource is over-extracted in the first period relative to the extraction policy that would maximize 2-period income. This is unsurprising given the incumbent’s uncertain election prospects. Second, a higher resource price in both periods results in greater public employment, an increased probability that the incumbent will retain office, and a more efficient resource extraction policy. Intuitively, a higher price in both periods makes the resource more valuable, and makes the incumbent more willing to sacrifice current income in order to stay in office.

\textsuperscript{60} After the election is decided, the winner and any public employees who are members of his own party negotiate a new wage. The outcome of this negotiation is a Nash bargaining solution, where the threat points are the net cost of firing a public employee (the politician’s threat point) and the wage the employee could earn in the private sector.
This can only be done by hiring more public employees in the first period, which generates the employment result. Expanded public employment also raises the probability of re-election and this causes second period rent to be discounted less heavily. As a result, extraction path becomes more efficient. An expectation of a higher resource price in the second period has essentially the same effect.\(^{61}\)

A politician’s benevolence toward his own group plays an interesting role. Greater benevolence raises the value the incumbent places on his group members’ welfare, and inclines the incumbent toward greater pre-election public sector employment, even though it reduces the politician’s personal payoff. Two implications of this observation are that greater benevolence (i) increases the incumbent’s probability of retaining office (via the public employment effect) and (ii) reduces national income due to the relatively low productivity of public sector employment. This benevolence link also carries over to the effect of resource price booms: a resource boom is more likely to reduce overall income when the incumbent is ‘highly benevolent’ toward members of his own group. The cost of firing public employees, \(F\), may also reflect factors linked to benevolence, e.g., the strength of social ties, networks, etc. A high value of \(F\) strengthens the commitment mechanism and makes public sector employment more attractive to the incumbent. This, in turn, accentuates the negative effect of the resource curse. As the authors note, an institutional feature that forced public sector employment to depend on merit rather than patronage would eliminate the resource curse in this model.\(^{62}\)

\(^{61}\) The model predicts a negative employment response if the resource price rises temporary in the first period, which is counter-intuitive. The temporary price boom raises first period extraction and lowers second period extraction, which is unsurprising. Lower future extraction reduces the gain from staying in office, however, which makes the incumbent less willing to hire public employees before the election.

\(^{62}\) The authors carry out no formal empirical analysis, but do offer anecdotal evidence on various implications of their model. The most compelling corroboration comes from accounts of public employment patterns during resource price spikes. Case study evidence of expanded public employment in Nigeria, Venezuela, Mexico, Ecuador and Trinidad and Tobago during the oil price spikes of the 1970s and 1980s agrees with the model’s main conclusion. Supportive evidence on public employment in Zambia during a copper boom is also cited.
4.2 A Model of Rent-Induced Regime Transitions

According to historical accounts, a natural resource windfall can concentrate political power among those who control resource stocks. As a result, the criterion for political success can shift away from satisfying broad segments of the population and toward gaining control of resource wealth. In extreme cases, competition to control resource wealth can become violent. As mentioned earlier, civil wars in Angola, Nigeria, Sierra Leone, and Zaire have been attributed to competition to control oil, diamonds and metallic minerals. Rent-seeking models of political economy are not well-suited to examining how and why government institutions break down or shift since they are, in effect, institution-free.

The possibility of a windfall-induced shift in which anarchy replaces democracy is examined by Aslaksen and Torvik (2006) in an elegant treatment that combines well-known models of these two alternative regimes. They develop propositions on the likelihood of a transition from democracy to conflict, based on the payoffs politicians face under both systems. Two rival politicians or political factions participate in a repeated game. Each period each rival must decide whether to ‘cooperate’, which means accepting the outcome of a democratic election, or ‘defect’, which means rejecting the electoral outcome and initiating conflict, and can base the decision on the history of play in prior periods. Once conflict begins it persists into the indefinite future, so rejecting the democratic outcome amounts to playing a trigger strategy. A natural resource is the sole source of rent in the economy and political competition amounts to a contest to control

Karl (1997) cites the dominance of oil in the Venezuelan economy and its control by the state after nationalization for its patron-client system of governance.
this rent. The authors develop results linking the size of resource rents and the strength of ideological preferences to the viability of sustained democracy and to equilibrium welfare.

4.2.1 A sketch of the model

Aslaksen and Torvik (2006) cast their analysis as a repeated game in which two political rivals, either individuals or factions, compete to control the government. Each period, the rivals either announce policies and stand for an election or fight one another to control the government. In either case, the winner gains access to a resource rent controlled by the government. With conflict, the two rivals compete for control by devoting productive resources to fighting and the rivals’ probabilities of winning are determined by their relative fighting efforts. If the contest is by election, the loser can either accept her loss and try again in the next period, or initiate conflict. Aslaksen and Torvik (2006) allow their agents to play history depending strategies, and focus on conditions under which democracy, i.e., an absence of conflict, can be sustained as a Nash equilibrium when agents play Nash reversion (‘trigger’) strategies. In this context, ‘cooperation’ means acquiescing to the electoral outcome at a particular stage of play and ‘defecting’ means initiating conflict, and if conflict is initiated it persists indefinitely. The possibility of multiple equilibria in such games is well known and the authors focus on characterizing the ‘best’ trigger strategy equilibrium.\(^6\)

Consider a country that is initially democratic, with policy outcomes decided according to a probabilistic voting model (Lindbeck and Weibull, 1988). Two candidates, A and B, compete by promising rent transfers to individual voters. The number of voters is normalized to unity. Voter i’s utility under a particular candidate’s policy equals the sum of two terms: the log of income, which depends on the policy the candidate offers,

\(^{6}\) By ‘best’, the authors apparently mean maximum joint utility.
and an additive term that indicates candidate’s ideological attributes relative to the voter’s preferences. Candidates know the distribution of ideological preferences up to a ‘relative popularity’ parameter that is not revealed until the election is over. Both individual ideology and the relative popularity parameter are uniformly distributed with mean zero and densities $\phi$ and $\psi$, respectively. The density of the relative popularity term, $\psi$, plays an important role in what follows. It can be interpreted as an inverse indicator of the strength of ideology in voters’ preferences. A small $\psi$ indicates that the range of ideological preferences is broad and that voters at the extremes of the distribution are willing to sacrifice large amounts of income to get a good ideological match.

Under democracy, both candidates make campaign promises that amount to rent transfers to individual voters. Individual $i$’s utility if candidate $B$ wins is

$$\omega^i_B = W^i_B + \sigma^i + \delta$$  

(4.1)

where $W^i_B$ is $i$’s utility from income, $\sigma^i$ is $i$’s ideological preference for $B$ relative to $A$ and $\delta$ is the relative preference parameter for $B$ over $A$, revealed to politicians after the election. From the definitions, $i$’s utility if $A$ wins is $W^i_A$. Voter $i$ will vote for candidate $A$ if

$$\sigma^i < W^i_A - W^i_B - \delta$$  

(4.2)

and vote for $B$ otherwise.

The winning candidate controls a resource rent, $R$, which can be allocated between personal gratification, $X^I$, and income transfers to voters, $R - X^I$, where $I$ indexes the candidates. Voters earn wage income, $w$, from private sector employment, so a voter’s income under candidate $I$’s policy is $w + R - X^I$. Criterion (4.2) can now be

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65 The relative popularity parameter indicates a candidate’s general appeal to all voters and the post-election realization of $\delta$ determines which candidate wins.

66 Each voter is offered an identical transfer under the policies announced by each candidate.
filled out by taking the log of voter \( i \)'s income and adding in \( i \)'s candidate specific preference term. The number of votes cast for candidate \( A \) can then be found by integrating the distribution of \( \sigma^i \) for all values satisfying (4.2). Given the form of the utility function and the uniform distribution of \( \sigma \), \( A \)'s vote total has a simple closed form solution as does \( A \)'s probability of winning the election. Candidate \( A \) chooses a transfer policy, \( R - X^A \), to maximize expected rent, \( \Pr(N^A > \frac{1}{2})X^A \), taking \( B \)'s policy as given.

The candidates’ objective functions are symmetric and the rent retained by the winning candidate in a symmetric equilibrium has a simple expression:

\[
\tilde{X}^i = \frac{w + R}{2\psi + 1}.
\] (4.3)

Each candidate’s ex ante expected payoff from winning the election is one-half of \( \tilde{X}^i \) per period. The expected present value payoff under perpetual democracy is

\[
V^i = \frac{1}{1 - \beta} \cdot \frac{w + R}{2(2\psi + 1)}.
\] (4.4)

As (4.3) and (4.4) show, the willingness of voters to trade off income in the form of promised transfers for a good ideological match allows politicians to keep a portion of the resource rent for themselves without ensuring a loss at the polls. The more important is ideology (the smaller is \( \psi \)) the greater is the rent the winning candidate retains.\(^{67}\) Equivalently, politicians’ rents under democracy tend to be small when ideology doesn’t matter and politicians are forced to compete on the basis of rent transfers.

A regime change from democracy to conflict occurs if either party refuses to accept the result of the election. Once conflict begins it persists forever, initiating conflict amounts to ‘pulling a trigger’. The decision of whether or not to accept an electoral loss is determined by comparing the loser’s present value utility under continuing democracy,

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\(^{67}\) This finding echoes one of Lindbeck and Weibull’s principle results.
with a one-half probability of winning any future election, to the same individual’s present value utility under perpetual conflict. The former payoff is simply the right-hand side of (4.4), postponed one year, or $\beta V^l$. The latter payoff, of course, requires a model of outcomes under conflict.

In the conflict regime, rivals compete for control of government by committing resources to fighting. Each rival incurs a fixed cost of $F$ units of effort if conflict is initiated. Each contestant’s probability of winning in any period equals the ratio of her fighting effort to total fighting effort for both parties. With symmetric agents, each contestant deploys identical fighting resources each period and the probability of winning is one-half for each. The opportunity cost of each unit of effort devoted to fighting equals the private sector productivity, $w$. With these assumptions, each rival’s per period expected utility from conflict is $(R / 4) - wF$ and the present value payoff under perpetual conflict equals

$$U^l_c = \frac{1}{1 - \beta} \left[ \frac{R}{4} - wF \right].$$  \hspace{1cm} (4.5)

An outcome in which each candidate adheres to democracy is viable only if the losing candidate earns a larger payoff from continued democracy, i.e., if $\beta V^l > U^l_c$. This criterion is satisfied if

$$\frac{\beta}{2(2\psi + 1)} [w + R] > \frac{R}{4} - wF.$$  \hspace{1cm} (4.6)

From (4.6), continued democracy cannot be sustained unless $\beta > \psi + \frac{1}{2}$, regardless of other parameter values. If this condition is satisfied, democracy is more likely to survive from one period to the next if $R$ is small relative to $w$, which amounts to a political
resource curse. Democracy is also more likely to persist if $\psi$ is small so ideological preferences are relatively strong, and if the discount factor, $\beta$, is relatively large.

4.2.2 Empirical implications and possible extensions

Politicians in this model choose political institutions endogenously, and this leads to novel predictions. The authors show that self-enforcing democracy is possible, regardless of resource rents, if ideology is important relative to income in deciding the outcome of elections and if future payoffs are not discounted too heavily. The role of the discount factor is obvious, since the opportunity cost of defecting and resorting to conflict is the expected present value payoff under continued democracy. The reason for the surprising ideology result is that greater emphasis on ideology yields greater expected rent for politicians under democracy, and therefore less incentive to reject an electoral loss in favor of conflict.

The model implies a political resource curse, since continued democracy is less likely to be sustained when resource rents are large relative to the wage. While greater resource rent raises expected utility under both democracy and conflict regimes, it makes the conflict payoff relatively more attractive under conditions where sustained democracy is viable. When this viability condition is met, a greater resource rent adds more to the present value reward a candidate receives under conflict than under democracy.

The model demonstrates how a resource boom could cause a transition from democracy to conflict, but is silent on forces that might cause transitions in the other direction. Of course, these reverse transitions are sometimes observed and a more complete treatment would allow for such cases. Within the model’s repeated game, the same individual politicians look forward to competing against one another each period into the indefinite future under continued democracy. If there is a probability that either
individual will not be a viable candidate in the future, however, the condition for continued democracy is more difficult to satisfy since, in effect, the individual politician discounts future returns more heavily. This consideration might open a role for political parties as players in the game, rather than individuals, since parties presumably are more long-lived than individual players.

4.3 Protection for Sale, Political Competition and the Resource Curse

Bulte and Damania (2008) adapt the influential protection for sale paradigm to address the resource curse. Protection for sale does not account for political competition, a factor that many observers regard as a determinant of policy generally, and the authors include this element as a prominent feature. As in Torvik (2002) and Mehlum, et al (2006), the mechanism that diminishes income and implies a resource curse is a potentially inefficient allocation of labor and entrepreneurial talent between a modern manufacturing sector that enjoys increasing returns to scale and a more primitive sector.68 In Bulte and Damania (2008), the primitive sector is linked to extracting the resource.

An incumbent government can direct economic activity between sectors by supplying a quasi-public input. Based on the government’s choice, the input becomes available to all firms in the chosen sector, but is excludable between sectors. The government chooses its public input policy to maximize receipts from political contributions, bribes, and the like. As in Grossman-Helpman, each political interest offers a schedule linking its political contributions to public input levels. Organized economic interests are producers in the manufacturing and natural resources sectors. Each sector

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chooses a contribution schedule to maximize its group’s profit, taking as given the other sector’s contribution schedule and knowing that government will choose a policy that maximizes its own objective function.\textsuperscript{69}

The authors introduce political competition by postulating a challenger who will assume power if he can deliver higher aggregate welfare than the incumbent, irrespective of what organized political interests may prefer.\textsuperscript{70} Regime change imposes a cost on society, however, which subtracts from any aggregate welfare a challenger’s policy would otherwise provide. The highest feasible aggregate welfare the challenger can offer, net of transition cost, thus places a lower bound on the welfare the incumbent must offer in order to remain in office. In this fashion, political competition disciplines the incumbent and enhances equilibrium welfare. If the incumbent has a feasible policy choice that matches or exceeds the challenger’s maximum aggregate welfare minus the transition cost, then he will not be deposed.\textsuperscript{71} This ‘transition constraint’ generally constrains her policy choices, however, and prevent her from simply maximizing bribes and political contributions.

The interaction between incumbent and challenger is, in effect, a single play multi-stage game.\textsuperscript{72} A resource boom is characterized as an increase in the resource price. This raises that resource sector’s profit and its willingness to contribute. If the transition constraint is not binding, the result is a policy shift in favor of the less efficient resource

\textsuperscript{69} In Grossman-Helpman the policy variable that political interests seek to control is a tariff or import quota; here it is a level of public input provision. Policy outcomes in Bulte and Damania (2008) are realized only after contributions have been committed, so the organized interests must be confident that the government will honor the promised policy. No specific commitment mechanism is specified.

\textsuperscript{70} Unlike the incumbent, the challenger seeks no contributions from economic interests. The challenger seeks only to maximize aggregate welfare because this is a necessary condition for regime change. The outcome of the challenge is decided only after the promise is made, so there is a commitment issue here as well.

\textsuperscript{71} Given that a welfare maximizing policy is feasible for the challenger, it is unclear why it would not also be feasible for the incumbent. If it were, regime change would never occur.

\textsuperscript{72} The authors observe that it could be interpreted as a repeated game with a finite number of repetitions, since the subgame perfect Nash equilibrium outcome in this case is repeated play of the Nash equilibrium to the single play game.
sector, which reduces economy-wide income and generates a resource curse. If the transition constraint binds, however, the incumbent may be blocked from any shift that would lower welfare, thus avoiding the curse. As a consequence, a resource boom is always a curse in an autocratic country where political competition is absent, but can be a blessing if political competition is present and transition costs are relatively low.

The model’s empirical implications are similar to Mehlum, *et al* (2008), with the proviso that the disciplining force is the possibility of regime change, rather than the regime’s inherent friendliness to rent-seekers.

4.4 *Public Goods Supply and the Perils of Unearned Income*

A key insight of the ‘selectorate model’ of Bueno de Mesquita, *et al* (2003) is that government’s inclination to spend funds on public goods rather targeted transfers to political allies depends on the size of the group who’s support is needed to hold power. This political parameter depends, in turn, on a country’s basic political culture, e.g., whether it is a military dictatorship, a monarchy, an oligarchy or a democracy. The ‘selectorate’ is the group of individuals eligible to become members of a ‘winning coalition’. The winning coalition is a group capable of choosing the country’s leader. In some countries the winning coalition might be small, e.g., a majority of the military’s high ranking officers, in which case a sensible political strategy is to spend public funds on targeted payments to its members. Alternatively, if a winning coalition must be large to succeed, then a better way to gain the necessary broad support is to spend government funds on public goods.

A second key feature of the selectorate model is that individuals do not know whether or not they will be included in a challenger’s winning coalition prior to the
selection of a leader. The incumbent leader’s winning coalition is already known, however, since it has been in power and its members identified. This gives the incumbent an inherent advantage in attracting support. It also dissuades existing members of the leader’s coalition from defecting. Both effects are amplified when the winning coalition can be small.

Smith (2008) extends this model to entertain potentially adverse outcomes from resource windfalls. The selectorate model’s logic implies that ‘unearned income’, such as a resource windfall, will benefit the average citizen more under a large coalition system than under a small coalition system. A resource windfall thus raises the average citizen’s payoff from converting a small coalition system to a large coalition system, and thereby raises the threat of revolution and reduces political stability in small coalition systems.\(^73\)

Additional empirical implications stem from the way public good provision responds to a windfall under different forms of government. In a large coalition system, the leader’s best response is to increase public good provision, and thereby enhance the probability of retaining office. Greater public good provision leads to increased income, implying a positive link from resource rents to income in large coalition systems. In a small coalition system, the leader faces the possibility of revolution and this alters the choice of public good response. Smith (2008) argues that certain public goods could help coordinate rebel activities, e.g., communication infrastructure and freedom of assembly. These naturally will be suppressed\(^74\) The same services enhance productivity, however,

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\(^73\) Strictly speaking, the analysis implies that the incumbent leader always retains office. The possible existence of other equilibria exist is not addressed. A key assumption, adopted without discussion, is that an activist who mounts a successful revolution replaces the former regime with a large coalition system, i.e., a democracy. This enhances the payoff from revolution to an average citizen. As in other resource curse theories involving regime change, the free-rider problem inherent in mounting a revolution is not addressed. The author rules out the use of history dependent strategies, such as Nash reversion.

\(^74\) No such bias in public good provision is predicted for large coalition regimes.
so contracting reduces income. If the latter effect swamps the windfall, the result is a resource curse.

4.5 Political Competition, Entry Barriers and the Resource Curse

Entry barriers and the incentives firms have to erect them in order to deter competition are familiar concepts in the theory of markets. Tsui (2009) adapts these notions to a political context and draws implications for the effect natural resource wealth has on economic performance and political institutions. Rival candidates compete to hold office, motivated by the potential power to capture rent that accrues to the public sector. An incumbent can be replaced if her popular support declines relative to the challenger’s, and citizen support for either competitor depends on the income citizens anticipate under their announced policies. The incumbent can increase the cost of challenging by erecting entry barriers. The political equilibrium is characterized by: the incumbent’s policies on public goods, entry barriers, and tax rates that maximize expected present value of the rents of office; budget balance in the public sector; and zero expected rent (net of entry barriers) for political ‘entrants’. Within this context, greater natural resource wealth has both economic and political implications.

What makes resource wealth ‘special’ in Tsui’s world is its assumed inelasticity of supply. This allows a resource rich country rich to tax with relatively low deadweight costs. With low-cost public funds, the country can provide public goods in abundance, and this enhances productivity and income. When no political effects intervene, added resource wealth increases income beyond the direct income gain attributable to the resource, i.e., a resource blessing.
Greater resource wealth generally encourages entry into political competition, however. The incumbent’s logical response is to raise entry barriers, e.g., by expanding the military, engaging in repression, etc. Erecting entry barriers uses resources, and in addition causes potential political entrants to spend resources overcoming such barriers. Both effects tend to diminish output, generating a resource curse if the effect is strong enough.

Tsui (2010) argues that the transaction cost for extracting rent and the cost of erecting entry barriers both are higher in democratic systems than in nondemocratic systems. Consequently, the incentive to raise entry barriers is relatively small, and the degree of competition relatively high, in democratic regimes. He regards an ‘ideal’ democracy as a regime in which entry barriers and rent-extraction cost are both prohibitive, so few barriers are erected and little rent extracted. There is no political resource curse in such regimes. In nondemocratic regimes it is unclear whether resource wealth increases or decreases violence and instability. While such wealth attracts challengers, it also leads to higher barriers, so regime turnover may be increased or decreased.

5 Conclusions and Research Directions

The resource curse addresses what is arguably the most important question in economics: Why so some countries grow while others do not? The practical payoff from identifying the links that cause resource windfalls to retard economic growth is therefore enormous, particularly if this knowledge leads to clear policy recommendations for host

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75 Tsui (2010) also generates results on the incumbent’s expected longevity in office, which depends both on the economic income the incumbent produces for constituents relative to challengers and on entry barriers erected.
governments or international aid agencies.\textsuperscript{76} If one takes seriously a particular political economy model for the resource curse, then empirical verification should examine \textit{all} of the model’s predictions. Documenting that windfalls or resource abundance are empirically linked to slow growth was a contribution at one point in time, but a variety of political economy models now carry this prediction and different models generally attribute the connection to different channels. To be policy relevant, empirical research on this question must identify the channels that transmit these effects and reject theories whose predictions are falsified. With this motivation, the following discussion outlines several opportunities for empirical research oriented toward verifying or falsifying the causal mechanisms specified in theoretical treatments.

First, several models predict that the presence or absence of institutional barriers to rent-seeking plays a key role in the existence and strength of a resource curse. When such barriers are present, the institutional decay and slow growth that would otherwise follow a windfall can be prevented. An ideal experimental design for testing this effect would separate countries into two types, those that have institutional barriers and those that do not; both groups would then be subjected to a resource windfall and observed to see how rent-seeking and economic growth respond. Absent the opportunity to experiment, empirical researchers have relied on data from cross country data sets, either cross-sections or panels. A common empirical design in such work separates countries into groups based on rent-seeking \textit{activity}, e.g., frequency of bribes, quality of the bureaucracy, risk of contract repudiation, etc. To be a valid control, an institutional variable cannot be influenced by the treatment, the windfall. Yet several of the theories reviewed predict that a resource windfall will lead to increased rent-seeking activity. In light of this, the following variables arguably merit consideration as controls for the

\textsuperscript{76} Of course, the resource curse may take different forms in different contexts. To this point the literature has entertained different responses to windfalls in different institutional contexts, but other differences may matter as well.
presence or absence of rent-seeking barriers: a country’s ‘stock of experience’ with
democratic governance; a country’s religious makeup, linguistic or religious
fractionalization, ethnic divisions; a country’s colonial origins (if any) and legal tradition;
a country’s history of adherence to constitutional restrictions on government action.77

Second, empirical designs that look at resource windfalls and exploit the timing
of arrival are arguably more convincing than those that focus on abundance. Natural
resource windfalls are most often generated by price changes rather than changes in
physical availability, such as discoveries. The arrival time of arrival of a price-induced
windfall is generally easy to pin down and the magnitude easy to measure. This temporal
information enables one to exploit research designs that examine within-country behavior
before and after an event, while controlling for untreated observations, i.e., those with no
resource reserves. The timing question can raise an ambiguity with approaches that use
resource abundance as the treatment rather than a windfall. With non-renewable
resources, physical abundance is largely determined by geological factors and existing
theoretical approaches do not say when the effect of abundance on economic growth or
political behavior will be felt. For example, should one look for the effect of oil wealth on
Nigeria’s economy and politics in current data, in the period just following independence
from the UK in 1960, or during all periods in between?

Third, several theoretical models and some historical accounts cite the diversion
of entrepreneurial talent away from wealth creation and toward rent-seeking as a key
mechanism whereby a natural resource windfall can be a curse, both politically and
economically. According to this argument, the arrival of a windfall that accrues to
government causes economic activity to shift away from a modern, increasing returns
sector and toward more primitive sectors. These detailed implications seem potentially
testable with data on changes in formation rates for new firms, shifts in production

between sectors, shifts in employment between technical, high skill, high education occupations versus unskilled employment and (possibly) in university enrollment rates in technical, skill-intensive fields of study.

Fourth, Robinson, et al, emphasize the commitment problems politicians and their supporters both face in distributing the rent from a resource windfall, and explain how public employment can provide a solution. Their key prediction seems easily testable—public employment will expand following a resource windfall. The size of the effect is predicted to depend on the political leader’s benevolence toward his supporters, which may be difficult to test formally, but perhaps not impossible. According to their, the curse of slow growth follows because public employment is less productive than private employment. This generic prediction, which does not depend on a windfall as the driving factor, seems potentially testable as a separate proposition. Robinson, et al do not incorporate an institutional variable in their analysis, to indicate the propensity of a system of government to use public employment as a commitment device, but incorporating this extension seems straightforward. For example, countries with ‘better’ governance could be characterized as having alternative commitment devices, such as legislation, that allow politicians to make credible promises, making expanded public employment unnecessary.

Fifth, the model of regime transitions developed by Aslaksen and Torvik predicts that the arrival of a windfall increases the probability of regime transition away from democracy and toward conflict. This should be testable with readily available data. It also predicts that such shifts are less likely to occur in societies that place a strong emphasis on ideological attachments, and less on purely economic dimensions of policy. This is undoubtedly more difficult to test, but perhaps not infeasible.

Sixth, with regard to the voracity model of Tornell and Lane, it was argued earlier that the appropriate definition of formal capital in an economy dominated by a
natural resource is capital invested in extraction. With this interpretation, the voracity effect implies that resource extraction capital will *decline* following a resource price windfall in economies that are vulnerable to rent-seeking, and that the effect will be most pronounced when rent-seeking influence is concentrated in relatively few groups. In the case of petroleum, at least, this prediction seems testable with available data.

Finally, the rent-seeking models surveyed treat outcomes as equilibria of games played by independent agents, and these agents are generally characterized as groups. When the outcome depends on the number of players, empirical testing requires an ability to identify separate groups in a way that agrees with their role in the theory. As independent players in a non-cooperative game, each group must be able to subordinate its members’ interests to the group’s objective, which requires a commonality of interests and low costs of coordinating members’ behavior. In addition, different groups must take actions independently from one another, without coordinating to eliminate wasteful competition. This requires that transactions costs between groups are relatively high, which seems most likely when the interests of different groups are in direct opposition. While this observation does not suggest a new opportunity for testing, it implies simple criteria for defining groups for use in empirical work.
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