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# Diamonds, Blood, and Taxes

## A REVENUE-CENTERED FRAMEWORK FOR EXPLAINING POLITICAL ORDER

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This article addresses an important gap in research on the causes of civil war: the lack of a theory that explains why lootable resources like alluvial diamonds are linked to civil war in some cases and peace in others. To help fill this gap, we propose a revenue-centered theoretical framework that shifts the focus from rebels to rulers and states, situates rulers in the context of the institutional and economic constraints on their ability to earn revenue, and combines this focus on revenue with a focus on state spending. In countries rich in lootable resources, the ability of rulers to achieve political order depends on (1) the availability of nonlootable resources; (2) the mode of extraction of lootable resources, especially whether they are extracted by hard-to-tax artisans or, alternatively, by large, taxable industrial firms; and (3) patterns of state spending. This framework supplements widely used models of civil war that emphasize the state's capacity to defeat an insurgency yet do not answer the important prior question of why state capacity varies so widely across resource-rich countries.

*Keywords:* civil war; diamonds; lootable wealth; resource extraction; Africa

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### 1. INTRODUCTION

What is the relationship between lootable wealth and political order? Recent studies of contemporary civil war have found a strong and positive relationship between lootable wealth and conflict.<sup>1</sup> To explain this finding, these studies argue that lucrative,

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1. Collier and Hoeffler (1998), Keen (1998), Collier and Hoeffler (2004), and De Soysa (2000). This finding has not been successfully replicated in all subsequent studies (e.g., Fearon and Laitin 2003;

easy-to-procure resources, such as gems, precious hardwoods, and illegal drugs, “breed” civil war by supplying the means and motive for armed conflict. Alluvial diamonds have been identified as an especially strong risk factor in predicting civil war.<sup>2</sup> As documented by numerous journalistic reports and scholarly case studies, alluvial diamonds played a central role in many civil wars in contemporary Africa (e.g., Sierra Leone, Angola, Congo, and Liberia).<sup>3</sup> Moreover, one recent analysis found that among resource-rich countries, producers of alluvial diamonds had the highest civil war rate in the 1990s.<sup>4</sup> Because of their strong association with civil war, alluvial diamonds have been labeled “blood diamonds” and the “ultimate loot.”<sup>5</sup>

Yet even the ultimate loot does not generate civil war in most cases. As seen in Table 1, alluvial diamonds are actually more likely to be associated with peace than war: the majority of countries (60 percent) that are significant producers of alluvial diamonds have *not* experienced civil wars since the end of the cold war.<sup>6</sup> Even in Africa, the region with perhaps the highest incidence of armed conflict since the end of the cold war, half of the continent’s ten significant producers of alluvial diamonds did not have civil wars during this period. These contrasting outcomes in the face of alluvial diamonds raise important, yet unanswered, questions about the relationship between lootable wealth and civil war. What factors distinguish the diamond-producing countries that collapsed into civil war from the majority that enjoyed peace? Despite the positive relationship between alluvial diamonds and civil war observed in half of Africa’s major alluvial diamond producers after 1990, why did the other half *not* collapse into chaos? What can the peaceful producers of alluvial diamonds teach us about how to achieve political order in the conflict-ridden cases?

Addressing these questions requires that we get beyond an important limitation of previous research on natural resources and conflict: the lack of a theory that explains why lootable wealth is linked to civil war in some instances and peace in others. This article aims to contribute to building such a theory. We propose a *revenue-centered* framework that explains the contrasting political consequences of lootable wealth as a result of variation in the institutional and economic constraints faced by revenue-

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Humphreys 2005 [this issue]), leading some to argue that lootable resources affect the *duration* of civil wars, not their initiation. For example, Fearon (2004) finds that lootable resources, such as gemstones, tend to prolong civil wars, whereas Humphreys (2005) finds that diamonds tend to shorten wars. One explanation for the contradictory and often inconclusive findings of recent quantitative research on resources and civil war concerns the lack of valid measures and data on lootable resources. See Lujala, Gleditsch, and Gilmore (2005 [this issue]) for an effort to overcome these measurement problems in the case of diamonds. For a review of recent quantitative research on the civil war–resources relationship, see Ross (2004b).

2. Alluvial diamonds are distinguished from deep-shaft, Kimberlite, or “primary” diamonds by their low economic barriers to entry, which make alluvial diamonds a lootable resource. Alluvial diamonds are also called “secondary” diamonds.

3. See, for example, Harden (2000) and Campbell (2002).

4. Ross (2003, 52). The civil war rate among Ross’s sample of eight countries that produce alluvial diamonds is 0.50.

5. The term “ultimate loot” is from Buhaug and Gates (2002, 420).

6. We choose the end of the cold war (1990) as the temporal starting point for our analysis because the conventional view in the literature argues that the likelihood of civil war increased significantly during this period. Thus, in world-historical perspective, the post–cold war period is a “most-likely case” of civil war, and hence, the absence of civil war during this period in so many countries with alluvial diamonds poses a theoretical puzzle.

TABLE 1  
Alluvial Diamond Producers and the Occurrence of Civil War, 1990-2002

<i>Civil War</i>	<i>No Civil War</i>
Angola (1975-2002)	Brazil
Democratic Republic of Congo (1991-present)	Central African Republic <sup>b</sup>
India <sup>a</sup> (1984-1994)	Ghana
Ivory Coast (2002-present)	Guinea
Liberia (1989-present)	Guyana
Sierra Leone (1991-1999)	Indonesia
	Namibia
	South Africa
	Venezuela

SOURCE: Our classification of alluvial diamond producers is based on data from Levinson, Gurney, and Kirkley (1992); Janse (1995, 1996). Our data on diamond producers differs from the data presented in Lujala, Gleditsch, and Gilmore (2005 [this issue]). First, our sample excludes countries that produced less than eight thousand carats of alluvial diamonds in 1990. Second, we do not consider the date that diamonds were discovered, because the date of discovery in all fifteen countries in the sample occurred at least thirty years prior to the temporal starting point of our analysis (that is, 1990). Finally, our terminology differs from Lujala, Gleditsch, and Gilmore's because we use the terms "alluvial diamonds" instead of "secondary diamonds" and "kimberlite diamonds" instead of "primary diamonds." The classification of cases of civil war relies mainly on P. Collier and A. Hoeffler, "Greed and Grievance in Civil War," (World Bank, 2001), Table 1: <http://econ.worldbank.org/programs/conflict/topic/13188/>. We also draw on Fearon and Laitin (2003), replication data: <http://www.stanford.edu/jfearon/apsr03repdata.zip>. Fearon and Laitin's classification differs from Collier and Hoeffler's for the following cases in our sample: Democratic Republic of Congo, which Fearon and Laitin code as a case of civil war during 1960-1965, 1977-1978, and 1996-1999; India, which is coded as a case of civil war during 1952-1999; Indonesia, which is coded as a case of civil war during 1965-1999; Liberia, which is coded as a case of civil war during 1989-1997; and South Africa, which is coded as a case of civil war during 1983-1994.

NOTE: The table includes all countries that had an estimated annual production of at least eight thousand carats of alluvial diamonds in 1990. This cutoff point excludes the following countries with minor or unsubstantiated occurrences of alluvial diamonds: Algeria, Burkina Faso, Cameroon, Congo-Brasaville, Gabon, Kenya, Malawi, Mozambique, Nigeria, Russia, Uganda, and Zambia. Other countries that fall into this category have surely also been excluded.

a. The civil war in India involved separatist conflicts in Punjab and Haryana as well as in Jammu and Kashmir. There is no evidence that alluvial diamonds played any role in motivating or funding these separatist conflicts; nor are alluvial diamonds an important enough source of revenue for the government of India to have significantly affected its fiscal capacity to supply political order.

b. The Central African Republic has recently been plagued by ongoing coups and political instability. It is not clear that the death toll is high enough to classify the CAR as a case of civil war.

seeking rulers. Defining lootable resources as high-value goods with low economic barriers to entry, we argue that in countries rich in these resources, the ability of rulers to get the revenue with which to govern and, hence, maintain political order depends on (1) the overall *resource profile* of the economy, especially whether *nonlootable* resources, that is, goods with high economic barriers to entry, are also available to rulers as a source of revenue;<sup>7</sup> (2) *economic institutions*, especially what we call the *mode*

7. Examples of nonlootable resources include deep-shaft minerals (e.g., Kimberlite diamond deposits) and petroleum.

of extraction, that is, whether lootable resources are extracted by difficult-to-tax artisans or, alternatively, by large, taxable companies; and (3) how rulers *spend* revenue, in particular whether they consume it frivolously or invest it prudently in strengthening the military, providing social welfare, and improving their capacity to earn revenue in the future. Our framework departs from previous research on resources and civil war by shifting the focus from rebels to rulers and states, analyzing the institutional and economic constraints that determine the ability of rulers to get the income with which to govern, and combining this focus on revenue with a focus on spending. Taken together, these steps provide a more powerful specification of the relationship between lootable resources and conflict, one that accounts for both civil war *and* peace as alternative outcomes in the face of lootable wealth.

The next section presents the building blocks of our revenue-centered framework for explaining why lootable resources are linked to civil war in some cases and peace in others. We then provide a comparative analysis of three diamond-producing countries in Africa. The analysis shows how our revenue-centered framework can account for puzzling cases that existing theories of civil war fail to explain. A concluding section summarizes the argument and calls for a sharper focus on rulers, states, and revenue in future research on civil war.

## 2. A REVENUE-CENTERED FRAMEWORK FOR EXPLAINING POLITICAL ORDER

Our theoretical framework is rooted in a long tradition of work on the relationship between state capacity and political order.<sup>8</sup> The framework centers on the revenue imperative—the fundamental requirement that all rulers face to get the income with which to govern.<sup>9</sup> Our core assumption is that revenue forms the “sinews” of the state and that a lack of revenue increases the risk of state collapse, which, in turn, increases the risk of civil war. We further assume that how rulers *spend* revenue also affects the probability of civil war: for example, spending on administrative and coercive infrastructure can lengthen the reach of the state, thereby making it harder for rebels to organize, and spending on social welfare may help mitigate societal grievances whereas wasteful consumption by rulers may foment grievances.

To explain why some countries rich in lootable resources collapse into civil war whereas others do not, we thus focus on the interaction amongst three key components of a political economy system: first, the overall *resource profile*—especially whether *nonlootable* resources are available to rulers as an alternative source of revenue to

8. The *locus classicus* on the link between state strength and political order is Hobbes (1651/1985). See also Skocpol (1979) and Cohen, Brown, and Organski (1981). On how state capacity to deter and defeat insurgents affects levels of societal violence, see Tilly (1978), Wickham-Crowley (1992), Collier and Hoeffler (2004, 2002), and Fearon and Laitin (2003). On the relationship between natural resource wealth and state capacity, see Shafer (1994) and Karl (1997).

9. The revenue imperative is the central focus of the vast literature on the “fiscal sociology” of state building in Western Europe. See Schumpeter (1991), Weber (1978), Ardant (1975), Levi (1988), Skocpol (1979), Tilly (1990), and Moore (2004).

lootable resources;<sup>10</sup> second, the *mode of extraction* of lootable resources—especially, whether these resources are extracted by hard-to-tax artisans, or alternatively, by large, taxable industrial firms; and, third, patterns of state *spending*—in particular how rulers manage the trade-offs amongst different forms of investment. We also consider how variation in the type of political regime may affect the relationship between revenue and political order.

It bears emphasis that our argument is probabilistic. We do not claim to offer a full and complete model of civil war onset: for example, rebels may fail to organize and take advantage of opportunities for challenging a fiscally decrepit, revenue-starved state. Nor is a lack of state revenue a necessary condition for civil war. Indeed, some revenue-rich states have been prone to war, as evidenced by the armed conflicts in certain oil-producing countries with relatively capable and well-funded militaries (e.g., Nigeria). Still, our dual focus on how rulers acquire and spend revenue helps explain war and peace as alternative outcomes in resource-rich countries.

## 2.1. INCOME: THE REVENUE OPPORTUNITY STRUCTURE

Taken together, the resource profile—that is, the balance between lootable and nonlootable resources in the economy—and the mode of extraction—that is, whether extraction is carried out by small-scale artisans or large industrial firms—form a *revenue opportunity structure* for rulers and rebels alike. Previous research on the economic causes of civil war has been rebel-centered, focusing on the ability of insurgents to get the income with which to rebel. Yet far less attention has been devoted to the ability of rulers and states to get the income with which to govern and thus deter or defeat rebel challenges.<sup>11</sup> To get beyond this limitation, we shift the focus from rebels to rulers. Moreover, by adding a novel focus on how distinct modes of extraction (i.e., artisanal or industrial) determine the ability of states to earn revenue from lootable resources, we get beyond a second limitation of much prior research: the assumption that income generated by lootable resources necessarily escapes the control of rulers and is thus readily available to rebels.<sup>12</sup> By contrast, we argue that depending on the mode of extraction, rulers, not rebels, will control the income generated by lootable resources. And if this occurs, then lootable resources can produce not civil war, but political order.

10. We limit our focus to revenue opportunities in the mineral sector because prior research argues that this sector plays a pivotal role in the resource–civil war relationship.

11. Exceptions include works that consider counterinsurgency military spending by the government. See, for example, Collier and Hoeffler (2004), Grossman (1999), and Fearon and Laitin (1999). Yet such studies do not address the crucial prior question of how governments get (or fail to get) the revenue to pay for military expenditures in the first place. Our integrated focus on government revenue and spending gets beyond this limitation.

12. See, for example, Collier and Hoeffler (2004).

## The Resource Profile: Nonlootable and Lootable Resources

At the most general level, it is helpful to distinguish two types of resources: nonlootable and lootable.<sup>13</sup> *Nonlootable* resources have high economic barriers to entry, and hence, large amounts of capital and technology are required to exploit them profitably. Bauxite; copper; petroleum; and deep-shaft, Kimberlite diamonds are examples of nonlootable resources. By contrast, *lootable* resources have low economic barriers to entry and can be profitably exploited by small-scale artisans. Alluvial diamonds and other precious gemstones are good examples of lootable resources. Most economies have a *mix* of nonlootable and lootable resources, and, as we argue below, the value of the lootable sector relative to the value of the nonlootable sector has an important impact on the likelihood of state collapse and civil war.

Nonlootable resources provide favorable revenue opportunities for rulers. The large amount of capital and technology required to mine nonlootable resources profitably forms a natural barrier that excludes small-scale artisanal miners. This makes it easier for the state to establish monopoly control over the resource because it eliminates the need to invest in coercive capacity to deter wildcat miners. Moreover, the low value-to-weight ratio that characterizes nonlootable resources attenuates “agency problems” inside state-owned companies (e.g., theft of the resource by rogue employees).<sup>14</sup>

Even if the state does not establish monopoly control, thus allowing private actors to play a role, it can still earn large amounts of revenue from nonlootable resources. This is because nonlootable resources are likely to generate “tax handles” that provide low-cost opportunities for states to earn revenue.<sup>15</sup> Because of the high barriers to entry characterizing nonlootable resources, only a small number of large, deep-pocketed firms are usually able to extract them profitably. And a small number of large companies is far easier to monitor and tax than a multitude of small-scale, artisanal miners. This is especially true when the firms are publicly traded transnational companies (TNCs) that make information about their production and earnings transparently available to shareholders through quarterly reports posted on company Web sites.<sup>16</sup> Thus, nonlootable resources, because they effectively exclude hard-to-tax artisanal miners, will generate high returns for the state, whether it directly extracts the resource through a state-owned company or, alternatively, taxes large private firms.<sup>17</sup>

13. See Shafer (1994) for a pioneering study of how sectoral variation in barriers to entry explains the contrasting economic performance of states. On the distinction between lootable and nonlootable resources, see also Auty (2001), Le Billon (2001), Snyder (2001), and Ross (2003).

14. Yet the low value-to-weight ratio of nonlootable resources does not necessarily attenuate other agency problems, such as shirking and lackadaisical effort. Hence, taxing private industrial firms with disciplined internal hierarchies may prove more lucrative for rulers than relying on bloated, inefficient, and ill-disciplined state-owned enterprises.

15. The notion of “tax handles” is from Musgrave (1969). See also Cheibub (1998).

16. Of course, even publicly traded companies can be corrupt and nontransparent in reporting earnings, as the recent Enron and WorldCom scandals highlight. Still, it is usually less costly for governments to monitor and tax large companies than to monitor and tax small artisans.

17. In the interest of parsimony, we ignore the issue of the relative bargaining power of the government and private firms, which plays an important role in determining the tax rate and, hence, the amount of revenue the government can extract.

Lootable resources, by contrast, provide far less favorable revenue opportunities for rulers. The low economic barriers to entry characterizing loutable resources make it easy for small-scale, artisanal miners to profit from them. Moreover, low barriers to entry also make it difficult for the state to establish its monopoly control over loutable resources. The state will have to invest a large amount in building coercive capacity to deter wildcat miners. In addition to providing attractive economic opportunities to small-scale, wildcat miners, the high value-to-weight ratio characterizing loutable resources also creates internal discipline problems inside state-owned and private companies alike, thus requiring costly investments in security and monitoring infrastructure (e.g., pneumatic, “hands-free” sorting of diamonds) to generate a profitable flow of revenue. In sum, establishing direct control over loutable resources is a difficult and often ineffective means for rulers to generate revenue, especially in weak states.

The option of taxing private actors is not necessarily a feasible means of generating revenue in the face of loutable resources either. In contrast to nonlootable resources, loutable resources may fail to provide tax handles. Because of their low economic barriers to entry, loutable resources generate large artisanal sectors, and the high costs involved in monitoring a large number of small producers make artisanal mining notoriously difficult to tax.

### **The Mode of Extraction: Artisanal and Industrial Mining of Lootable Resources**

Despite the important challenges that loutable resources pose for revenue-hungry states, rulers may nevertheless be able to earn income from these resources. *The ability of states to earn revenue from loutable resources will depend on how much of the total value of the sector is generated by artisanal miners, or, alternatively, by industrial firms.* If artisanal extraction is the dominant mode in the loutable sector, then the state will not be able to control very much of the income generated by the sector. By contrast, if industrial extraction is the dominant mode, then the state can potentially control a large share of the income. Thus, what we call the *mode of extraction*—artisanal or industrial—determines the opportunities for rulers to earn revenue from loutable resources.

To summarize our argument thus far, as seen in Figure 1, the risk of state collapse, and, hence, civil war, in countries rich in loutable resources is lowest when *nonlootable* resources are the dominant source of wealth in the economy. This is because nonlootable resources provide the most favorable revenue opportunities for rulers. By contrast, the risk of state collapse and civil war is highest when *loutable* resources are the main source of wealth, and the dominant mode of extraction is *artisanal*. This is because artisanal extraction of loutable resources provides the least favorable revenue opportunities for rulers. Finally, the combination of *loutable* resources and *industrial* extraction generates an intermediate risk of state collapse and civil war.



		<b>Mode of Extraction</b>	
		<i>Industrial</i> ( <i>a'</i> )	<i>Artisanal</i> ( <i>a</i> )
<b>Resource Profile</b>	<i>Lootable</i> ( <i>l</i> )	2  medium	1  high
	<i>Non-Lootable</i> ( <i>l'</i> )	3  low	4

**Figure 1: The Revenue Opportunity Structure and the Risk of State Collapse**

NOTE: Cells denote the risk of state collapse: high (quadrant 1), medium (quadrant 2), or low (quadrant 3). Artisanal extraction of nonlootable resources (for example, bauxite) is so rare (quadrant 4) that we do not include it.

## 2.2. SPENDING: HOW RULERS USE REVENUE

Understanding the relationship between lootable resources and political order requires that we look beyond the revenue opportunity structure and the ability of rulers to get revenue by also considering how they actually *use* the revenue at their disposal. States that enjoy a favorable revenue opportunity structure may still be unstable and vulnerable to collapse if rulers squander their income by putting it into Swiss bank accounts instead of investing in improving public services and strengthening the military. Likewise, states that face unfavorable revenue opportunities and collect little revenue may nevertheless be quite stable if the rulers invest their scarce resources wisely. Thus, a focus on state spending is necessary to explain why some resource-rich countries collapse into civil wars whereas others do not.<sup>18</sup>

18. Although previous studies of civil war (for example, Collier and Hoeffler 2004; Fearon and Laitin 1999) focus on state spending, they limit their focus to *counterinsurgency* spending. By contrast, we broaden the focus by considering other kinds of government spending in addition to military spending.

In assessing how state spending affects the risk of civil war, it is helpful to focus on state investment in three key areas: (1) tax capacity, (2) coercive capacity, and (3) social welfare. Spending on tax capacity increases the state's "take" both from artisans and industrial firms.<sup>19</sup> This form of state spending should be considered a *revenue-enhancing* investment because it leads directly to an increase in future revenue. Similarly, spending on coercive capacity can boost future revenue by increasing the state's ability to identify and punish tax evaders and also by improving the state's ability to regulate and even shrink the artisanal sector, thereby plugging a gap through which revenue escapes its control. Moreover, spending on coercive capacity can increase future revenue by enabling the state to provide the security necessary to induce taxable industrial firms to invest in both the lootable and nonlootable sectors.<sup>20</sup> Finally, and perhaps most important, spending on coercive capacity has a *revenue-conserving* effect, because it improves the state's ability to deter and defeat rebellions and thereby reduces the risk of the loss of revenue as a result of societal unrest.<sup>21</sup>

A third form of state spending requires consideration: expenditures on social welfare. We assume that spending on social welfare reduces the risk of civil war by attenuating citizen grievances, thus making them less available for recruitment by rebels. Yet in contrast to spending on tax capacity, spending on social welfare is *not* revenue enhancing because it does not directly lead to an increase in the state's future income. Thus, too much spending on social welfare can ironically have a negative effect on political stability, because it may trigger a fiscal crisis, especially in the context of an unfavorable revenue opportunity structure.

We formalize our reasoning by integrating the three components of our framework—the resource profile, the mode of extraction, and government spending—into a dynamic constrained optimization problem (see the appendix). Although this formalization does not establish a causal relationship between lootable resources and state collapse using empirical data, it does provide a heuristic device that articulates how government spending on tax capacity, coercive capacity, and social welfare—subject to constraints imposed by the resource profile and mode of extraction—affects future

19. Yet too much tax capacity can drive firms and even artisans out of the economy and may thus reduce total revenue. This possibility will depend on the tax rate and also on the economic alternatives available to firms and artisans.

20. This assumes, of course, that the state's coercive forces do not use their weapons to extort and steal from firms and investors. Thus, we assume a "professional" as well as a "capable" military. For a model that relaxes this assumption and considers cases in which "specialists in violence" are predatory, see Bates, Greif, and Singh (2002).

21. Contrary to the finding that military spending has no deterrent effect on rebellion (Collier and Hoeffler 2002), studies by Herbst (2004) and Henk and Rupiya (2001) provide empirical evidence that state spending does, in fact, influence the risk of civil war. Herbst suggests that because of their limited funds, African leaders do not regard a competent military—which may also pose a threat of military coup to the regime—as a high priority. As a result, African leaders systematically underinvest in agencies that physically protect the state from rebellion. Data provided by Hank and Rupiya lend support to this argument, indicating that in 1996, forty-eight Sub-Saharan African countries on average spent 2 percent of their GDP on the military (compared to a worldwide average for the mid-1990s of 5 percent). Moreover, pressure from external donors to reduce military spending and fund other national priorities, as well as a growing reluctance on the part of Western powers to intervene militarily on behalf of African regimes, all contributed to a decline in the effectiveness of African militaries. On the relationship amongst state spending, military capacity, and rebellion, see Herbst.

revenue and, thus, political order.<sup>22</sup> Formalizing our framework makes it possible to generate predictions about “maximum revenue potential,” that is, about how much revenue rulers can possibly earn under the constraints posed by resource profiles and modes of extraction. Although these predictions assume that rulers make optimal decisions about how to spend current revenue in a way that maximizes future revenue, real rulers do not make optimal decisions and, hence, will be revenue “underachievers.” By relaxing the assumption that rulers make optimal investment decisions, our framework can be modified to account for the effects on political order of suboptimal, and even reckless, spending by rulers.<sup>23</sup> In assessing the effect of suboptimal spending on political stability, our reasoning about the constraints defined by the revenue opportunity structure would still apply: the greater the economy’s maximum revenue potential, the larger the deviation by rulers from optimal decision making that can be tolerated before a revenue crisis and state collapse occur. Finally, our framework can be calibrated to generate testable predictions about revenue, spending, and the likelihood of state collapse, a task we reserve for future research.

### 2.3 POLITICAL INSTITUTIONS: DOES THE TYPE OF REGIME MATTER?

For the sake of simplicity, our theoretical framework assumes an autocratic dictatorship: rulers face no time constraint on their tenure; nor are they held accountable to citizens by democratic elections. How do differences in regime type affect our argument? Does the logic of the revenue-centered framework for explaining political order work differently under semidemocratic or democratic regimes? Because variation in regime type figures prominently in several existing models of civil war onset, these questions merit consideration.<sup>24</sup>

All regimes, regardless of their type, require revenue to govern. Put starkly: no revenue, no regime. We thus expect the logic of our argument about how revenue opportunities and state spending determine political order to hold across autocracies, semidemocracies, and democracies. Empirical research supports this inference: in a recent study, Cheibub (1998) found no significant relationship between regime type and the ability of governments to extract revenue through taxation.<sup>25</sup>

Still, a focus on regime type may prove fruitful for theorizing about revenue and political order. For example, differences in regime type may affect the relationship

22. It bears emphasis that our formalization assumes a purely rational ruler and disregards the resources and strategies of rebels. As discussed below, we also assume an autocratic government that neither is accountable to citizens through elections nor faces time constraints on its tenure.

23. One alternative to the model developed in this article is to adopt a systems dynamics approach. Agent-based modeling constitutes a second alternative, one that lends itself well to exploring the role of boundedly rational, heterogeneous, and adaptive rulers and to incorporating an explicitly spatial component into the analysis—tasks we reserve for future research.

24. Studies that consider the relationship between regime type and civil war include Muller and Weede (1990), Hegre et al. (2001), Fearon and Laitin (2003), and Englebret and Ron (2004).

25. It bears emphasis that Cheibub’s (1998) analysis focuses only on revenue extracted through taxation and, hence, does not consider revenue extracted by other means, for example, through state-owned companies.

between revenue and political stability by partly determining the amount of income rulers require to govern. The cost of political order may be greater in *semidemocracies* than in democracies and autocracies, because, as Hegre et al. (2001, 33) put it, "Semidemocracies are partly open yet somewhat repressive, a combination that invites protest, rebellion, and other forms of civil violence." To manage this protest and thus keep power, rulers in semidemocratic regimes may have to spend more on coercive capacity and social welfare. By contrast, rulers in *autocracies* may require less revenue to maintain order, because closed regimes do not permit protests in the first place and, hence, do not have to expend resources to regulate and control them.<sup>26</sup> This, in turn, means that autocracies may be better able than semidemocracies to survive in the face of unfavorable revenue opportunity structures that provide few tax handles. The amount of revenue required to maintain political order in *democracies* is ambiguous. On one hand, rulers in democratic regimes may require less revenue to maintain order because they enjoy legitimacy among the majority of citizens.<sup>27</sup> Legitimacy could reduce the costs of order by making it unnecessary to spend as much on coercive capacity, extractive capacity, and social welfare. On the other hand, rulers in democratic regimes may require *more* revenue to govern, because citizens in such systems are free to organize and lodge demands for costly public benefits. Still, democratic rulers who fail to spend enough to satisfy citizen demands do not necessarily jeopardize political order, because democratic regimes provide a nonviolent mechanism—elections—through which citizens can replace governments that do not satisfy their demands.

Regime type may also influence the relationship between revenue and political order by determining the amount of discretion rulers enjoy with regard to spending. Because they are not accountable to citizens through elections, rulers in autocracies and semidemocracies should face fewer constraints on how they can spend revenue than do rulers in democracies. Consequently, rulers in autocratic and semidemocratic regimes are, *ceteris paribus*, more likely than democratically accountable incumbents to spend revenue in ways that generate citizen grievances—for example, by spending mainly on coercive and tax capacity instead of social welfare. The discretion rulers enjoy over spending is especially likely to be a source of political instability in semidemocracies, because these regimes are partly open and, hence, provide greater opportunities for rebellion by citizens with grievances.

Although it lies beyond the scope of the present article, integrating variation in regime type more systematically into the revenue-centered framework poses an important task for future research.

26. Still, autocratic rulers need sufficient revenue to maintain a credible deterrent against protest: for example, a sufficiently powerful and well-equipped military or police force to render a believable threat that protestors will be suppressed.

27. Of course, many nondemocratic regimes also enjoy legitimacy.

### 3. EMPIRICAL ANALYSIS: DIAMONDS WITH AND WITHOUT CIVIL WAR

Our revenue-centered theoretical framework focuses on three critical variables: availability of nonlootable resources (i.e., the “resource profile”), whether lootable resources are extracted in a way that can be taxed by the government (i.e., the “mode of extraction”), and patterns of government spending. To illustrate how the framework can be applied to explain the contrasting political consequences of alluvial diamonds, this section analyzes two major producers of alluvial diamonds that did not experience civil war in the 1990s—Ghana and Guinea—and compares them with a third, Sierra Leone, that did collapse into war. It bears emphasis that this small-*N*, comparative analysis does not provide a test of our theoretical framework: this would require analyzing the entire universe of alluvial diamond producers listed in Table 1 or, alternatively, a sample of cases randomly selected from this universe. Moreover, a satisfactory test would require adding the new variables highlighted by our framework to existing statistical models of the causes of civil war and then carrying out quantitative, cross-national analyses to compare the explanatory power of existing models to that of models incorporating our new variables. Still, by allowing a close examination of cases, the empirical analysis provides a “plausibility probe” that shows whether the logic of the theory and the expected interactions among variables resonate with causal processes observed within actual cases.<sup>28</sup> Moreover, the empirical analysis shows how the variables highlighted by our framework help explain puzzling cases that pose challenges to existing theories of the causes of civil war. Hence, the analysis advances the central objective of this article—building a stronger theory of the contrasting political consequences of lootable resources.

#### 3.1. CASE SELECTION: A NESTED COMPARATIVE ANALYSIS

Table 2 lists all fifteen countries that are significant producers of alluvial diamonds, giving their scores across seven key variables shown by previous studies to be significant correlates of civil war: per capita income, population, rough terrain, petroleum, new state, political instability, and semidemocracy.<sup>29</sup> From the universe of alluvial diamond producers, we select three cases that were closely matched in 1990 across the

28. On the use of case studies to trace causal processes, see George and McKeown (1985) and Brady and Collier (2004). On how case studies can compliment large-*N* analyses in research on civil war by, for example, helping identify new variables omitted from existing models, see Sambanis (2004).

29. We have focused on the variables found to be correlates of civil war by Collier and Hoeffler (2004), Hegre et al. (2001), and especially Fearon and Laitin (2003). Fearon and Laitin use the term “anocracy” instead of “semidemocracy.” This term corresponds to a score between -5 and 5 on the difference between Polity IV’s democracy and autocracy measures, which range from -10 to 10. The predicted probability of war onset from the Fearon and Laitin econometric model (with the following explanatory variables: warl, gdpnl, lpopl, lmtnest, ncontig, oil, nwstate, instab, polity2l, ethfrac, relfrac) were generated for Ghana, Guinea, and Sierra Leone and are available from the authors.

TABLE 2  
Correlates of Civil War for Fifteen Alluvial Diamond Producers, 1990

	<i>Per Capita Income</i> <sup>a</sup> (-)	<i>Population</i> <sup>b</sup> (+)	<i>Rough Terrain</i> <sup>c</sup> (+)	<i>Petroleum</i> <sup>d</sup> (+)	<i>New State</i> <sup>e</sup> (+)	<i>Instability (Transition)</i> <sup>f</sup> (+)	<i>Semi- democracy</i> <sup>g</sup> (+)
Angola	0.701	10,020	2.370244	1	0	0	0
Brazil	4.271	149,042	1.410987	0	0	0	0
CAR	0.585	3,008	1.686399	0	0	0	0
Congo, DR	0.424	35,562	1.648659	0	0	0	0
Cote D'Ivoire	1.336	11,902	0	0	0	0	0
<b>Ghana</b>	<b>0.821</b>	<b>14,870</b>	<b>1.435085</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Guinea</b>	<b>0.775</b>	<b>5,717</b>	<b>1.193922</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Guyana	1.117	798	2.631889	0	0	0	0
India	1.235	849,515	2.442347	1	0	0	0
Indonesia	1.826	178,232	0.336472	0	0	0	0
Liberia	0.844	2,460	0.470004	0	0	0	0
Namibia	2.854	1,439	2.476538	0	1	0	0
<b>Sierra Leone</b>	<b>0.92</b>	<b>4,136</b>	<b>0.993252</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
South Africa	3.341	37,959	2.163323	0	0	0	1
Venezuela	5.907	19,325	3.104587	1	0	0	0
Mean	1.797	88,265.67	1.624247	3/15	1/15	0/15	1/15

NOTE: The table includes all countries that had an estimated annual production of at least eight thousand carats of alluvial diamonds in 1990. Cases selected for comparison in our study are highlighted. The predicted effect of each variable on the risk of civil war is given in parentheses.

a. For *per capita income*, we utilize Fearon and Laitin's (2003) measure *gdpnl*, the log of per capita gdp from the Penn World Tables.

b. For *population*, we utilize Fearon and Laitin's measure *pop* (unit: 000s).

c. For *rough terrain*, we use Fearon and Laitin's measure *lmtst* where the threshold for mountainous terrain is 6.5.

d. For *petroleum*, we use Fearon and Laitin's dummy variable for *oil*, which marks country years in which fuel exports exceeded one-third of export revenue.

e. For *new state*, we use Fearon and Laitin's dummy variable for *nwstate* marking countries in the first and second years of independence.

f. For *instability*, we use Fearon and Laitin's dummy variable for *instab*, which indicates whether a country had a change of at least three in its score on the Polity IV regime index in any of the three years preceding the year in question.

g. For *semidemocracy*, we use Fearon and Laitin's dummy variable for *anocl*, which marks regimes that score between -5 and 5 on the difference between Polity IV's democracy and autocracy measures.

correlates of civil war and, hence, from the standpoint of existing models, faced similar levels of civil war risk: Ghana, Guinea, and Sierra Leone. As seen in Table 2, these three countries had low per capita incomes, a factor that existing studies show to have a significant statistical association with civil war.<sup>30</sup> Yet the three countries had no other risk factors: all had small populations, lacked rough terrain, petroleum, and political

30. The mean value of per capita GDP in 1990 for all 161 countries in the Fearon and Laitin (2003) data set is 4.517, with a standard deviation of 4.621.

instability, and were neither new states nor semidemocracies.<sup>31</sup> The fact that the three countries are located close to each other and in the same region, West Africa, provides the additional advantage of control over ecological factors as well as “neighborhood” effects.<sup>32</sup> It bears emphasis that our theoretical argument is not “Africa specific”: its logic should apply to other regions. Still, a focus on these three African cases serves to illustrate how our framework can be used to explain the contrasting political consequences of lootable wealth.<sup>33</sup>

Despite their closely matched scores in 1990 across the variables shown in previous research to be significant correlates of civil war, Ghana, Guinea, and Sierra Leone soon diverged: in 1991, Sierra Leone collapsed into nine years of war, whereas Ghana and Guinea had no wars as of 2005. These divergent paths pose puzzles for existing models of civil war onset and thus underscore the importance of exploring variables omitted from these models to explain the contrasting outcomes across the three countries.

As seen in Figures 2 and 3, when the civil war started in 1991, Sierra Leone had only *one* attribute shown by previous research to be a significant risk factor for civil war: low per capita income. Yet curiously, civil war did not occur during an earlier phase, when Sierra Leone had *more* attributes shown to be risk factors for war. During 1972 to 1974, Sierra Leone had two risk factors (low per capita income and political instability). And during 1969 to 1971, Sierra Leone had *three* risk factors (low per capita income, political instability, and semidemocracy) yet still experienced no war.<sup>34</sup> Why did a higher risk of civil war result in peace, whereas a lower risk resulted in war?

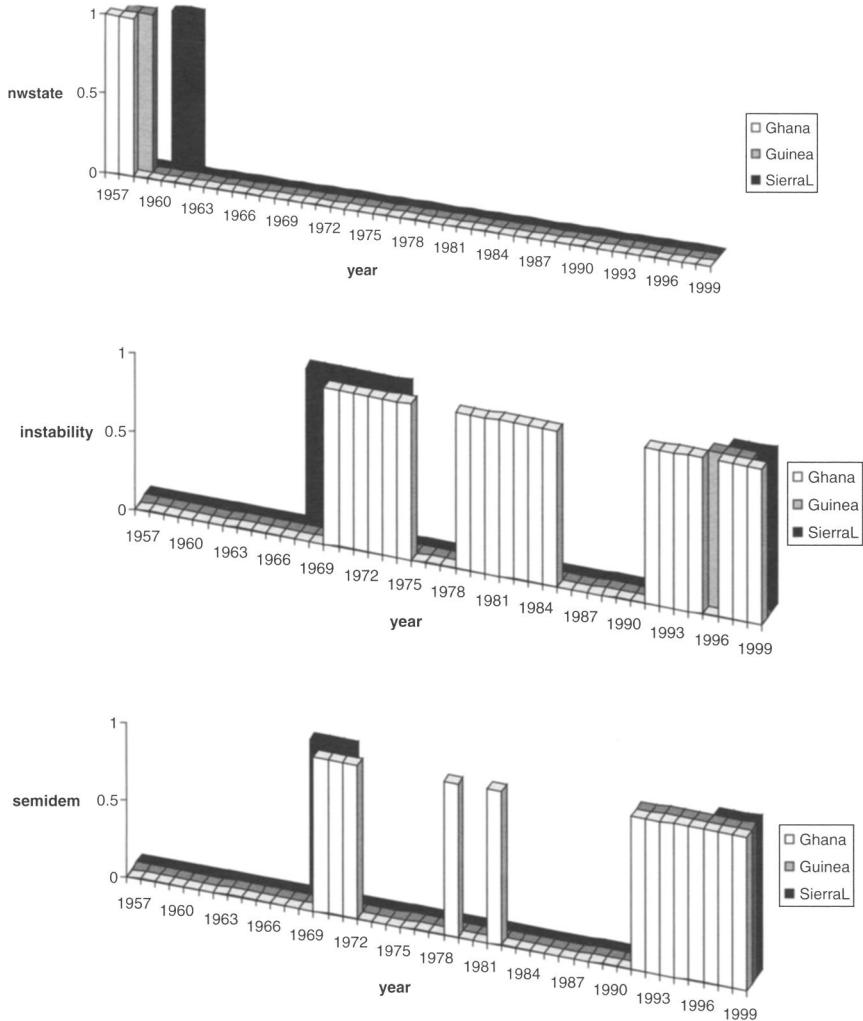
The cases of Ghana and Guinea raise further questions about existing models of civil war onset. As seen in Figures 2 and 3, over the course of the 1990s the number of risk factors in Ghana and Guinea increased from one to three, because both countries experienced semidemocracy and political instability in addition to low per capita income. From the standpoint of existing models of civil war onset, changes during the 1990s resulted in a higher predicted risk of war in Guinea and Ghana than had existed

31. The mean value of population size in 1990 for all countries in the Fearon and Laitin (2003) data set is 36,755,000 with a standard deviation of 122,626,000.

32. See Homer-Dixon (1999) for an argument that environmental factors are an important cause of violence and civil war. On how “neighborhood” can affect a country’s risk of civil war, see Sambanis (2004). One dimension on which the three cases differ sharply is their colonial past: Ghana and Sierra Leone were British colonies, whereas Guinea was a French colony. Fearon and Laitin (2003, 86) found no evidence that French colonial legacy in Sub-Saharan Africa had a direct impact on the probability of civil war.

33. The logic of our research design corresponds to what Przeworki and Teune (1970) call a “most similar systems” design. Our research design also employs what Lieberman (2004) terms “nested analysis,” that is, a form of research that combines insights from the statistical analysis of a large sample of cases with the in-depth study of one or more of the cases from the large sample. On nested research designs, see also Coppedge (2001). See Humphreys and Mohamed (2003) for another example of how a nested design can be used in the study of civil war.

34. Regarding the relationship between political instability and civil war onset, Fearon and Laitin (2003, 85) found that “The odds of [civil war] onset in a given year are estimated to increase by 67 percent if there was instability in government arrangements in any of the previous three years.” Regarding the relationship between semidemocracy and civil war onset, Fearon and Laitin (2003, 85) found that semidemocratic regimes “have about 68% greater odds of civil war outbreak in any given year than would a full autocracy.”

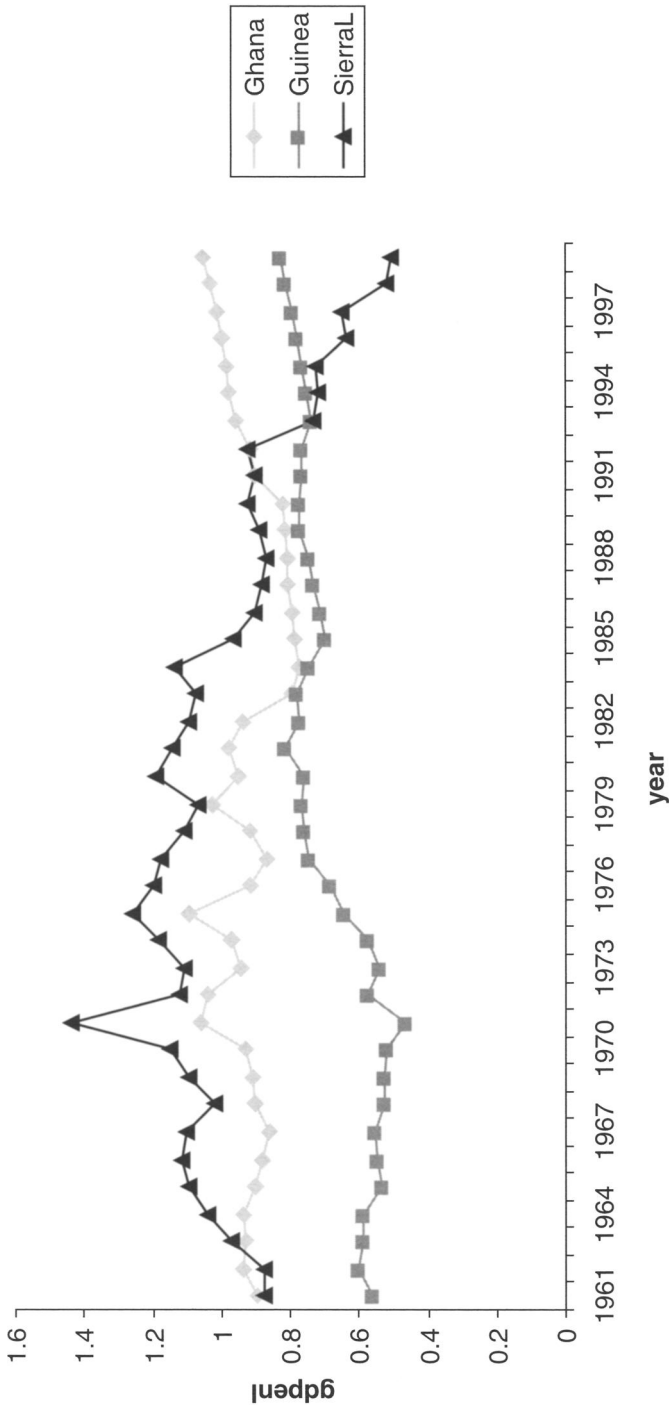


**Figure 2: Longitudinal Measures of New State, Political Instability, and Semidemocracy from Correlates of Civil War Data: Ghana, Guinea, and Sierra Leone**

NOTE: New state, instability, and semidemocracy are all dichotomous variables whose value equals 1 or 0 for a given year.

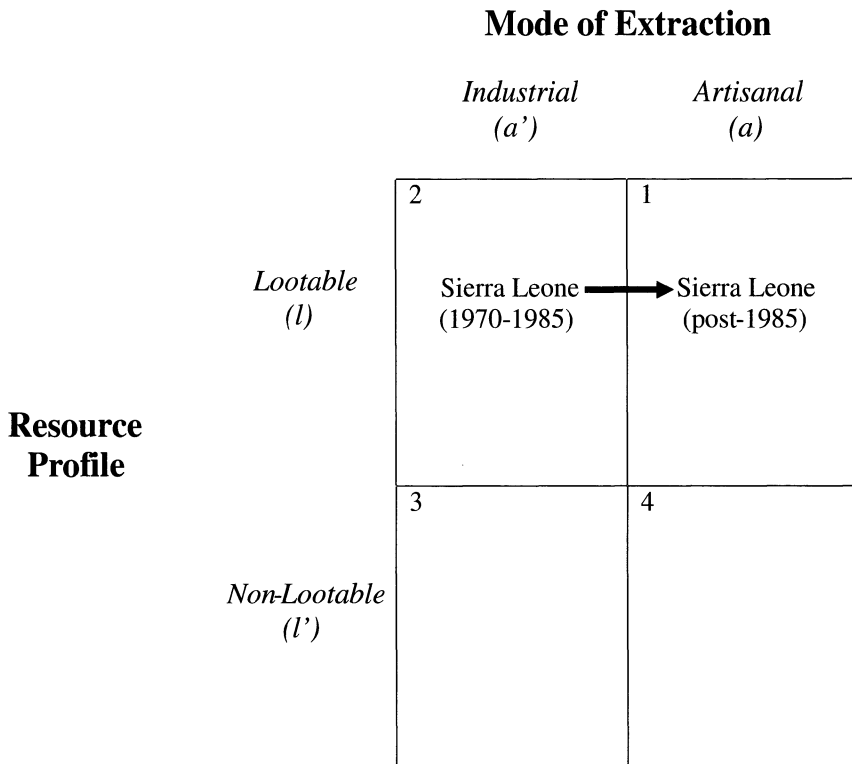
in Sierra Leone in 1991, where a war began in the face of a single risk factor (that is, low per capita income). Despite the greater level of predicted risk after 1990 in Ghana and Guinea, neither country experienced civil war. Why did a higher level of war risk





**Figure 3: Longitudinal Measures of Per Capita GDP from Correlates of Civil War Data: Ghana, Guinea, and Sierra Leone**

NOTE: *gdpnt* is the log of per capita GDP from the Penn World Tables. All three countries in our sample have per capita GDP values that lie well below the mean value for *gdpnt* (3.65) in Fearon and Laitin's (2003) correlates of civil war data set. The maximum value for *gdpnt* in the data set is 66.7 (Kuwait) and the minimum value is 0.048 (Yemen).



**Figure 4: The Transformation of the Revenue Opportunity Structure in Sierra Leone**

NOTE: Alluvial diamonds are the leading mineral sector in Sierra Leone. Extraction of alluvial diamonds in pre-1985 Sierra Leone under the rule of Siaka Stevens was quasi-industrial, because Stevens concentrated control of diamond marketing in a relatively small network of Lebanese middlemen. Stevens's successor, Joseph Momoh, lacked his predecessor's capacity to tax this network, and thus the income generated by alluvial diamonds increasingly escaped state control. The risk of a revenue crisis and state collapse is high in quadrant 1, moderate in quadrant 2, and low in quadrant 3. We do not consider quadrant 4 because few if any cases fall into this category.

in Ghana and Guinea lead to peace, whereas a lower level of risk in Sierra Leone led to war?

As summarized in Figures 4 and 5, a focus on the revenue opportunity structure helps explain these puzzling outcomes.<sup>35</sup> In Sierra Leone until 1985, the concentration of the marketing and exporting of alluvial diamonds in the hands of a small number of

35. Because we have not yet completed the collection of data on government spending in the African cases, the empirical analysis here focuses on the revenue opportunity structure.

		<b>Mode of Extraction</b>	
		<i>Industrial</i> ( <i>a'</i> )	<i>Artisanal</i> ( <i>a</i> )
<b>Resource Profile</b>	<i>Lootable</i> ( <i>l</i> )	2  Ghana (gold*)  Guinea (alluvial diamonds)	1  Ghana (alluvial diamonds)
	<i>Non-Lootable</i> ( <i>l'</i> )	3  Guinea (bauxite*)	4

**Figure 5: The Revenue Opportunity Structure in Ghana and Guinea**

NOTE: The leading mineral sector in each country is identified with an asterisk. The risk of a revenue crisis and state collapse is high in quadrant 1, moderate in quadrant 2, and low in quadrant 3. We do not consider quadrant 4 because few if any cases fall into this category.

Lebanese dealers provided tax handles for the government that enabled it to get the revenue with which to govern. These tax handles help explain the absence of civil war in the early and mid-1970s despite the higher level of risk. The breakdown of the tax handles after 1985 deprived Sierra Leone's government of revenue and helps explain why the state collapsed into civil war in the early 1990s. In Guinea, the leading mineral sector was bauxite, a nonlootable resource that provided a steady stream of income to the government. Moreover, a large share of Guinea's alluvial diamonds was extracted industrially, which further increased the government's take. Because of this favorable revenue opportunity structure, Guinea was able to avoid the state collapse and civil war experienced in the 1990s by its neighbor, Sierra Leone, where, after 1985, artisanal extraction of alluvial diamonds made it far more difficult for the government to earn revenue. In Ghana, as in Guinea, the leading mineral sector—gold—was also dominated by an industrial mode of extraction. This provided tax handles for the government that offset the revenue problems posed by Ghana's diamond sector, which

was dominated by difficult-to-tax artisans. The income the government of Ghana earned from gold helps explain the maintenance of political order in the 1990s despite the increased risk of civil war resulting from the emergence of political instability and semidemocracy.

In sum, the governments of Guinea, Ghana, and, until 1985, Sierra Leone all faced favorable revenue opportunity structures. This helps explain why alluvial diamonds did not breed chaos in these cases. By contrast, the shift in the mode of extraction after 1985 in Sierra Leone resulted in an unfavorable revenue opportunity structure that helps explain the country's subsequent collapse into civil war. A focus on the revenue opportunity structure thus attenuates the omitted-variable problem that renders existing models of civil war unable to explain the contrasting outcomes across these countries.<sup>36</sup>

### 3.2. SIERRA LEONE: DIAMONDS AND THE TRANSITION FROM POLITICAL ORDER TO CIVIL WAR

Sierra Leone during the 1990s held the dismal title of “the worst place on earth” and was arguably the paradigmatic case of a collapsed state (Traub 2000). Because alluvial diamonds have been the country's leading mineral sector since the 1930s, the case of Sierra Leone is commonly taken as confirmation of the conventional view that lootable wealth breeds state collapse. Yet until recently, Sierra Leone was not plagued by civil war and political disorder. Siaka Stevens (1968-1985) ruled the country for nearly two decades and was able to transfer power peacefully to his chosen successor. Moreover, the very same lootable resource that later fueled Sierra Leone's civil war— alluvial diamonds—provided much of the revenue with which Stevens governed. What explains the contrasting effects of alluvial diamonds across the two periods? Why were alluvial diamonds associated initially with peace and subsequently with war?

We argue that a focus on the mode of extraction helps explain the contrasting political effects of alluvial diamonds across these distinct phases of Sierra Leone's history. In the early 1970s, Stevens was able to transform the artisanal mode of extraction of alluvial diamonds by using the power of government to favor a minority diaspora community of Lebanese diamond merchants, thereby creating tax handles and thus generating revenue for his government. Stevens's government pursued an active policy of favoritism toward the Lebanese in the distribution of mining and dealing licenses. Moreover, government troops suppressed illicit alluvial diamond mining outside Lebanese-controlled channels (Reno 1995).<sup>37</sup> The resulting concentration of diamond marketing and exporting in the hands of a small number of Lebanese diamond deal-

36. Existing models of civil war onset are probabilistic in nature and do not aim to explain every case fully. Still, the empirical analysis shows that our framework can account for variance left unexplained by existing models and thus serves as a useful supplement to these models.

37. During the first five years of Stevens's rule, the share of diamond dealing licenses held by individuals of Lebanese heritage increased from 15 to 78 percent (Reno 1995, 90). On the Lebanese diamond merchants, see also Van der Laan (1965), B. Zack-Williams (1990), A. Zack-Williams (1995).

ers—a “quasi-industrial” mode of extraction—made it easier for Stevens’s government to tax the income generated by diamonds. Thus, Stevens secured the resources he needed to maintain his patron-client networks and survive an attempted coup in 1971 and student demonstrations in the mid-1970s.

The tax handles that Stevens built began to decay during the latter period of his rule, which increased the risk of fiscal crisis and state collapse. First, the Lebanese merchants became increasingly less dependent on Stevens, because the wealth they acquired under his rule ironically allowed them to hire personal armies that made the dictator’s protection increasingly dispensable. This buildup of private armies was paralleled by a weakening of the state’s coercive capabilities. In a pattern typical of patrimonial dictators, Stevens undermined the regular army in an effort to prevent a military coup—limiting military spending, capping recruitment at a mere two thousand troops (in a country of 4 million), and relying increasingly on paramilitary forces loyal to his person.<sup>38</sup>

As a result, the balance of coercive power began to shift in favor of the Lebanese diamond traders, initiating a trend of declining government revenue: by the mid-1980s, an estimated 70 percent of exports left the country through nonformal, nontaxable channels, and little revenue went into the state treasury (Reno 1995, 151-52). Yet this “informalization” of export revenues under Stevens did not immediately jeopardize political stability, because some of the income still went to the ruler, his supporters, and his paramilitary forces. It was the transfer of power in 1985 from the aging Stevens to Major General Joseph Momoh that led to the final breakdown of the tax handles Stevens had constructed, because Momoh failed to inherit, penetrate, or supplant the informal networks for marketing diamonds that had formed under Stevens.

Momoh faced mounting problems when he took office. The country was in the grip of an economic crisis and faced increasing pressure from international creditors. To resolve this crisis, Momoh desperately needed to get control of the country’s diamonds. Yet the network of rogue state officials and Lebanese traders inherited from the Stevens era posed a formidable barrier to Momoh’s efforts to achieve this goal. Moreover, Momoh lacked the coercive resources of his predecessor, because Stevens had reduced the size of the army to just two thousand troops. Indeed, it was precisely Momoh’s weak power base that made him attractive to Stevens as a successor, since the old dictator intended to stay in Sierra Leone and enjoy his wealth there, and he thus wanted to ensure that his successor would be too weak to threaten his business networks with the Lebanese (Reno 1998, 115-18).<sup>39</sup>

By wooing foreign companies into Sierra Leone’s diamond sector, Momoh attempted unsuccessfully to shift the mode of extraction away from the old system dominated by Lebanese middlemen toward a more conventional form of industrial extraction. In 1987, Momoh made a deal with an Israeli firm, LIAT Finance and Construction. In exchange for a concession to control the bulk of the country’s diamond

38. On the logic of ruler-military relations in patrimonial regimes, see Snyder (1992).

39. According to Hirsch (2001, 30), Momoh’s “only claim on the nation’s top position was his sycophantic and fawning loyalty to his leader [that is, Stevens]. Momoh was notoriously inept.”

mining region, LIAT would expel unruly strongmen from the mining areas and create a private monopoly answerable to the president, thus boosting the revenue under Momoh's control. Yet the deal failed to generate much revenue for the government, largely because the Israeli company was more interested in passing off smuggled gems from other countries as Sierra Leonean than in actual mining. Momoh's arrangement with LIAT ultimately collapsed when the company's CEO was arrested in the United States on charges of fraud and forgery and was then extradited to Israel to face charges of selling state secrets to South Africa (Reno 1995, 160; Reno 1998, 120).<sup>40</sup>

In the wake of LIAT's collapse, Momoh's revenue base shrank dramatically, as illustrated by the fact that official diamond exports were only \$22,000 in 1988, whereas Momoh's rivals, the Lebanese syndicates, were exporting diamonds estimated to be worth \$250 million annually. And in 1989, only twelve carats, or 0.0003 percent of the amounts common in the mid-1970s, were exported through official channels. A lack of revenue made it impossible for Momoh to pay the army. When the Revolutionary United Front (RUF) launched an invasion from Liberia in 1991, Sierra Leone's underfunded military disintegrated. The RUF swiftly seized control of Sierra Leone's diamond fields and used the income from diamonds to finance a decade of violence and civil war.

The analysis of Sierra Leone shows how a focus on the mode of extraction helps explain why alluvial diamonds are linked to peace and, alternatively, to civil war during different periods of a country's history. By using the power of government to concentrate extraction of alluvial diamonds in the hands of a small group of Lebanese diamond merchants, Stevens built tax handles that generated the revenue he required to rule. The breakdown of these tax handles under Stevens's successor, Momoh, contributed to a fiscal crisis that increased the risk of state collapse.

### 3.3. GUINEA: DIAMONDS, BAUXITE, AND POLITICAL ORDER

Consider the following scenario. Rebels backed by the Liberian strongman Charles Taylor invade a country with large deposits of alluvial diamonds that borders Liberia. The rebels drive toward the diamond fields, aiming to take control of this lucrative lootable resource. This scenario describes the situation in Sierra Leone in 1991, when the RUF invaded from Liberia, seized the country's diamond-rich region, and triggered Sierra Leone's collapse into a decade of civil war. The same scenario provides an equally accurate description of another of Liberia's neighbors: Guinea. In September 2000, the RUF together with Liberian army forces invaded southern Guinea, advancing within one hundred kilometers of the country's main alluvial diamond deposits.<sup>41</sup> Yet in Guinea the rebels failed to capture the diamonds. Instead, the Guinean military successfully repelled the invasion and the government kept a firm grip on power. What

40. LIAT's main activities were shipping South African gems to Europe by disguising them as Sierra Leonean products and sending machinery and supplies to South Africa with fraudulent manifests listing Sierra Leone as their destination (Reno 1998, 119-20). Sierra Leone essentially served as a front for South African trade in the context of the embargo against the pariah Apartheid regime.

41. Gberie (2001, 12).

explains these sharply contrasting outcomes in Sierra Leone and Guinea? Despite the presence in both cases of alluvial diamonds and an invading rebel force determined to capture them, how was the government of Guinea able to maintain political order and avoid the dismal fate of its neighbor in Sierra Leone? The absence of civil war in Guinea is especially puzzling from the standpoint of existing models of war onset: Guinea in 2000 had *three* attributes found in previous studies to be significant causes of civil war—low per capita income, semidemocracy, and political instability during one of the previous three years—whereas Sierra Leone in 1991 had just *one* such attribute (low per capita income). Hence, Guinea should have been more susceptible to civil war than Sierra Leone. Why, in contrast to Sierra Leone, did Guinea not collapse into civil war?

We argue that the rulers in Guinea in 2000 faced a far more favorable revenue opportunity structure than the rulers in Sierra Leone in 1991. This, in turn, enabled them to get the revenue with which to pay and equip the military and thus defeat the rebels. In contrast to Sierra Leone, where alluvial diamonds were the leading sector, Guinea's main source of tax revenue and foreign exchange was a nonlootable mineral: bauxite.<sup>42</sup> Guinea is the world's second largest producer of bauxite, and this nonlootable resource, which was extracted by a handful of big companies, generated a large and steady source of revenue for the government.<sup>43</sup>

In addition to its nonlootable leading sector, Guinea enjoyed another important advantage over Sierra Leone: despite the fact that all of Guinea's diamond production is alluvial, a significant level of *industrial extraction* of alluvial diamonds existed alongside artisanal extraction. This dual mode of extraction made it possible for the government to capture a large share of the value of diamond production, which, when added to the enormous revenues earned from bauxite, provided a firm fiscal foundation for the state.

Partly as a result of a new mining code introduced in 1995, which provided attractive incentives for foreign investment and allowed non-Guineans to own up to 85 percent of a business venture, industrial extraction of alluvial diamonds expanded greatly. Industrial mining firms made efficiency-enhancing investments in modern mining technologies, which increased both their profits and the government's revenue. For example, the Canadian company Trivalence Mining Corporation invested in new technology that allowed "hands-free" sorting of diamonds. According to a company document, "a sortex machine fluoresces the diamonds as they pass through the machine on a conveyor belt and automatically shoots them into a locked steel box using a jet of compressed air. . . . The end result is an increase in the number of carats recovered."<sup>44</sup>

42. In 2001, mining accounted for 16 percent of Guinea's GDP of \$16.31 billion and 90 percent of exports. Bauxite, which is used to make aluminum, provided the major source of foreign currency, accounting for a steady 60 to 70 percent of export earnings, with an additional 20 to 25 percent generated by gold and alluvial diamonds. See United States Geological Survey (2002).

43. Tax revenues from the main bauxite mining company—Compagnie des Bauxites de Guinée (CBG)—accounted for an average 62 percent of total tax revenues between 1986 and 1992. CBG is a joint venture between the government of Guinea (49 percent ownership) and a consortium of foreign mining companies (Arulpragasam and Sohn 1997, 145).

44. See [www.trivalence.com/guinea\\_history.htm](http://www.trivalence.com/guinea_history.htm).

Because of these improvements, production increased dramatically in 2000.<sup>45</sup> These productivity gains meant more tax revenue for the government of Guinea.

The case of Guinea highlights the importance of situating lootable resources in the context of a country's overall resource profile to determine their effect on political order. Even in the face of lootable resources, the state may still be able to get the revenue with which to govern if a large, nonlootable sector like bauxite exists. Moreover, the stabilizing effect of nonlootable resources was amplified in Guinea by the mode of extraction in the lootable sector: industrial extraction played an increasingly important role in alluvial diamond mining. Because of this favorable revenue opportunity structure, the government of Guinea had the income with which to pay and equip the army. This helps explain why in Guinea, in contrast to Sierra Leone, low per capita income and a rebel invasion from neighboring Liberia did not result in the onset of civil war.

### 3.4. GHANA: DIAMONDS, GOLD, AND PEACE

Ghana produces more alluvial diamonds by weight than any other West African country, and nearly all of Ghana's diamond production is alluvial.<sup>46</sup> Moreover, the mode of extraction in Ghana's diamond sector is overwhelmingly artisanal.<sup>47</sup> And in contrast to Guinea, where the leading mineral resource is nonlootable bauxite, nonlootable resources play just a small role in Ghana's mineral sector: Ghana's leading mineral export is gold, which is conventionally regarded as lootable.<sup>48</sup> Because the resource profile is dominated by lootable resources, the government of Ghana would appear to face an unfavorable revenue opportunity structure. Moreover, during much of the 1990s, Ghana had three attributes shown in previous research to be significant correlates of civil war: low per capita income, political instability, and semidemocracy. Yet as of 2005, Ghana had nevertheless avoided war. What explains the maintenance of peace in Ghana in the face of alluvial diamonds and three key correlates of civil war?

We argue that the mode of extraction of Ghana's most important lootable resource, gold, helps explain the absence of civil war. Although Ghana is the largest producer of alluvial diamonds by weight in West Africa, the value of Ghana's gold exports far exceeds the value of its diamond exports.<sup>49</sup> And most of Ghana's gold is mined by a handful of industrial firms: six large companies account for an estimated 90 percent of total production.<sup>50</sup> Moreover, most of these firms are publicly traded companies that

45. Production of diamonds at Trivalence's AREDOR mine in 2000 was 40,803 carats, a 63 percent increase over 1999. Diamond sales rose to more than \$15 million in 2000, an 89 percent increase over sales in 1999. See [www.trivalence.com/guinea\\_history.htm](http://www.trivalence.com/guinea_history.htm).

46. Janse (1996, 7).

47. Approximately 75 percent of the total value of the diamond sector is generated by artisans (United States Geological Survey 2002).

48. Revenue from gold accounted for 92.8 percent of Ghana's mineral sector export revenues in 1994 (Addy 1998, 236).

49. The estimated value of Ghana's gold exports in 2000 was \$702 million, whereas the estimated value of diamond exports was \$15 million (Coakley 2002).

50. Ashanti Goldfields Co. Ltd. is by far the dominant company in the sector. Moreover, of the eleven major gold mines in operation in Ghana in 2000, the four largest mines accounted for nearly 70 percent of the total gold output of the country. This concentration of output makes it easier for the government to collect



make information on production and earnings available to shareholders. In addition to their small number, the relative transparency of these companies makes them easy for the government of Ghana to tax. Thus, in Ghana, the predominantly industrial mode of extracting gold has rendered this lootable resource a major source of government revenue.

How the government of Ghana *spent* its revenue, in turn, helps explain why the political instability generated by the country's transition in the early 1990s from an authoritarian to a semidemocratic regime did not result in civil war.<sup>51</sup> During the 1980s, the government of Ghana made revenue-enhancing investments to improve its capacity to eliminate smuggling of gold and cocoa. These investments in strengthening the government's tax capacity led to an increase in tax collections (Callaghy 1990, 276). The government used its revenue to rehabilitate the country's transportation infrastructure and to launch in 1987 a major social welfare program, the Program of Action and Measures to Address the Social Costs of Adjustment (PAMSCAD), which Jeffrey Herbst (1993, 53) describes as "the most ambitious program on the [African] continent to alleviate the social costs of [economic] adjustment."<sup>52</sup> This government program of spending on infrastructure and social welfare, a program made possible in part by the availability of revenue from gold, helps explain why the transition to a semidemocratic regime in Ghana, though marked by many protests and marches, did not cause a civil war. A focus on the revenue opportunity structure and patterns of government spending thus helps explain why the combination in Ghana of political instability and semidemocracy, factors found in previous research to be significant correlates of civil war, resulted not in war but peace.

The absence of civil war onset in Ghana in 1994 to 1995, when a long-standing land dispute in northern Ghana between the Konkomba and Nanumba tribal ethnic groups erupted into fighting that caused hundreds of deaths, further illustrates how a focus on government revenue and spending helps explain why lootable resources are linked to civil war in some cases and peace in others. The government of Ghana was able to resolve this conflict by imposing a state of emergency in the region, sending troops, and brokering a peace agreement, which included an allocation of \$1.2 million of aid to people affected by the fighting.<sup>53</sup> Because it had the revenue with which to pay and

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revenue. An estimated 150,000 artisanal miners also operate both legally and illegally in Ghana's gold sector. Yet officially reported artisanal gold production has ranged from just 2 to 9 percent of total national gold production since 1998 (United States Geological Survey 2002). Artisanal production is obviously larger than the officially reported amount, due to unreported sales by artisanal miners and also due to the internal use of gold for ceremonial purposes, which is substantial in Ghana. Big chiefs probably have their own artisanal miners who supply gold directly to them. Still, the value of industrially mined gold is far greater than the value of artisanally mined gold (personal communication with George J. Coakley, United States Geological Survey, August 11, 2003).

51. On Ghana's regime transition, see Gyimah-Boadi (1999).

52. Herbst (1993, 149) notes that PAMSCAD funds were used for "political purposes," including "alleviating the government's political problems by providing disgruntled Ghanaians with side payments." See also Callaghy (1990, 284), who notes that the World Bank and the International Monetary Fund (IMF) provided funding that helped finance PAMSCAD.

53. See [http://news.bbc.co.uk/1/hi/world/africa/country\\_profiles/1023444.stm](http://news.bbc.co.uk/1/hi/world/africa/country_profiles/1023444.stm); [www.onwar.com/aced/data/golf/ghana1994.htm](http://www.onwar.com/aced/data/golf/ghana1994.htm); [www.onwar.com/aced/data/golf/ghana1995.htm](http://www.onwar.com/aced/data/golf/ghana1995.htm).

equip the army and also to make emergency aid payments, the government of Ghana was able to staunch this conflict and thus prevent it from leading to civil war.

The case of Ghana thus validates our argument that the income generated by lootable resources does not necessarily escape the government's control, thereby becoming available to rebels. Whether the government will earn revenue from lootable wealth depends on the mode of extraction: if the dominant mode is industrial, as in Ghana's gold sector, then the government will have tax handles that enable it to earn income from lootable resources. If, in turn, the government spends its revenue on improving tax capacity, equipping the armed forces, and disbursing social welfare, then the risk of state collapse and civil war is reduced, even in countries with lootable wealth.

To summarize, the empirical analysis shows how a focus on (1) the resource profile—especially whether nonlootable resources are available; (2) the mode of extraction of lootable resources—especially whether they are extracted by artisans or, alternatively, by large industrial firms; and (3) patterns of state spending helps explain why some alluvial diamond producing countries experience political order, whereas others collapse into civil war. The greater the weight of the lootable sector in the economy, the greater the risk of a revenue crisis and state collapse. Thus, where lootable alluvial diamonds are the “only game in town,” as in Sierra Leone, the risk of state collapse is high. By contrast, if nonlootable resources are the leading sector, as in Guinea, the risk of state collapse is attenuated. Still, the effect of lootable wealth on political stability depends on the mode of extraction: if the dominant mode of extraction is industrial, as in gold in Ghana and alluvial diamonds in Sierra Leone before 1985, then the state may still be able to get the income with which to govern. Yet if the dominant mode of extraction is artisanal, as in Sierra Leone after 1985, then the state will not be able to control the income generated by lootable wealth. This increases the risk of state collapse, especially when lootable resources are the leading sector. Finally, how states spend revenue also affects the risk of state collapse: in Sierra Leone, cutbacks in military spending under Stevens subsequently undermined Momoh's ability to manage the country's growing revenue crisis in the late 1980s, whereas in Ghana, spending on social welfare coupled with revenue-enhancing investments in the 1980s that improved tax capacity helped buffer the country from state collapse during a period of political instability in the early 1990s. Our revenue-centered framework thus provides a stronger specification of the relationship between lootable wealth and conflict, one that accounts both for political disorder *and* order in the face of alluvial diamonds. Moreover, our revenue-centered framework helps explain instances of civil war onset when the risk predicted by existing models was low (e.g., Sierra Leone in 1991) and instances of no civil war onset when the risk was higher (e.g., Sierra Leone [1969-1974]; Guinea and Ghana [post-1990]). The revenue-centered framework thus supplements existing models of civil war onset by helping account for variance left unexplained by these models.

#### 4. CONCLUSION: COPING WITH COMPLEXITY IN THE STUDY OF RESOURCES AND VIOLENCE

This article has focused on an important gap in research on contemporary civil wars: the lack of a theory that explains why lootable resources are linked to civil war in some cases and peace in others. To help fill this gap, we propose a new theoretical framework that gets beyond the rebel-centered perspective of much previous work by shifting the focus to rulers and states, situating rulers in the context of the institutional and economic constraints on their ability to earn revenue, and then combining this focus on revenue with a focus on state spending. We argue that in countries rich in lootable resources like alluvial diamonds, precious hardwoods, and illegal drugs, the ability of rulers to establish and maintain political order depends on (1) the overall resource profile of the economy—in particular how much nonlootable wealth is available as a source of revenue; (2) the mode of extraction in the lootable sector—especially whether lootable resources are extracted by hard-to-tax artisans or, alternatively, by large, taxable industrial firms; and (3) patterns of state spending—in particular whether rulers consume revenue frivolously or invest it in strengthening the military, providing social welfare, and improving their capacity to earn revenue in the future. An empirical analysis of Sierra Leone, Guinea, and Ghana shows how our revenue-centered framework supplements existing models of civil war onset by helping explain why the same resource (i.e., alluvial diamonds) is linked to sharply contrasting political outcomes both across these cases and within them over time.

Our focus on the contrasting political consequences of alluvial diamonds highlights the complexity of the resource-conflict relationship. Although recent research has increasingly recognized this complexity, the strategies used to manage it have limitations we aim to overcome. One frequently employed strategy for coping with the complexity of the resource-conflict relationship is to *parse the independent variable* (that is, resources) into finer types and subtypes. This has been achieved by introducing a host of new dimensions that generate typologies of resources.<sup>54</sup> This approach has the advantage of increasing the validity of data on resources and also getting beyond the lumpy, highly aggregated categories (e.g., “primary commodity exports”) used in the “first generation” of quantitative research on resources and conflict.<sup>55</sup> Moreover, parsing the independent variable can make it easier to detect causal mechanisms by reducing the number of cases to which the explanatory variable applies. Our focus on a specific lootable resource—alluvial diamonds—builds on this strategy of parsing the independent variable.

Yet the strategy of parsing resources into finer categories fails to solve the fundamental problem of complexity. Even at the very fine-grained level of “alluvial diamonds,” much unexplained variance still exists: as seen in Table 1, countries that pro-

54. Dimensions used to generate types and subtypes of lootable wealth include “diffuse versus point-source” resources (Auty 2001; Le Billon 2001), “obstructability” (Ross 2003), “detectability” (Snyder 2001), and “legality-illegality” (Snyder 2001, Ross 2003).

55. Examples of “first-generation” research include Collier and Hoeffler (1998, 2004) and De Soysa (2000).

duce alluvial diamonds are at least as likely to experience peace as war. To get beyond this limitation of parsing, we take two further steps. First, we situate alluvial diamonds in the broader context formed by a country's overall resource profile and then focus on the availability of nonlootable resources as an alternative source of income for rulers. This move makes it easier to see the full range of revenue opportunities available both to rulers and rebels. By contrast, a narrow focus limited to types of lootable resources obscures the broader revenue opportunity structure in which both states and rebels operate. Our focus on the overall resource profile thus provides a stronger understanding of the risk of state collapse. Second, we look beyond resources by focusing on *nonresource* factors that interact with resources and mediate their relationship to peace and conflict. Specifically, we analyze *economic institutions*—that is, the mode of extraction—and show how they help explain why the same resource, alluvial diamonds, produces contrasting political outcomes across cases.

A second strategy for managing the complexity of the resource-conflict relationship focuses on *parsing the dependent variable* (i.e., conflict). Thus, some researchers argue that lootable resources do not affect the *onset* of conflict, as initially claimed by Collier and Hoeffler (2004), yet they affect the *duration* of conflict, lengthening civil wars by generating discipline problems within the ranks of both government forces and rebel groups.<sup>56</sup> A study by Michael Ross (2004a) of civil wars in the 1990s in gemstone-producing countries supports this argument with its finding that in most cases “the gemstone trade appears to be causally unrelated to the initiation of conflict” (Ross 2004b). Most of the conflicts Ross analyzes started *before* rebels began using lootable resources as a source of income.

Although it may be true that few rebellions are launched using loot to fund their start-up costs, *lootable resources may still be causally connected to the onset of conflict, yet the causal connection may run through the state and its capacity to govern, rather than through rebels and their material incentives to rebel*. As numerous case studies of civil war in countries rich in lootable resources have shown, such resources can generate weak states because they are hard to control and tax.<sup>57</sup> If reliance on lootable wealth generates revenue problems that undermine state capacity, then opportunities for rebels to organize should be greater in countries with lootable resources. Our argument about the relationship between alluvial diamonds and state collapse builds on this insight from case-based research, yet we qualify the insight by adopting a broad comparative focus that includes diamond-producing countries that did *not*

56. Fearon (2004).

57. See, for example, Ellis (1999), Reno (1995), and Richards (1996). Drawing on the vast literature on the “rentier state,” Fearon and Laitin (2003) argue that petroleum, a *nonlootable* resource, increases the risk of civil war because it is essentially too *easy* to tax and control and thus results in anemic state capacity. Indeed, Fearon and Laitin use oil wealth as a proxy for state weakness. Yet this move overlooks the effect of government spending on state capacity in oil-rich states. For example, the government of Hugo Chavez in Venezuela has used its ample oil revenues to fund social programs that have extended the state's reach into and control over civil society. In contemporary Venezuela, income from petroleum has arguably strengthened, not weakened, state capacity. Although abundant natural resources may indeed make it unnecessary for states to develop extensive extractive capacities, resource-rich states can still spend their revenue in ways that enhance their capacities. Hence, resource wealth—whether it is lootable or nonlootable—should not be assumed to generate weak states.

experience civil. A comparative perspective shows that lootable resources do not necessarily lead to weak states vulnerable to civil war. Whether lootable resources result in weak, war-prone states or resilient states that supply political order depends on the availability of nonlootable resources (i.e., the resource profile), the mode of extraction, and patterns of state spending. Our revenue-centered theoretical framework thus supplements widely used models of civil war, such as Collier and Hoeffler (2004) and Fearon and Laitin (2003), that emphasize the state's capacity to defeat an insurgency yet do not answer the crucial prior question: why does state capacity vary so widely across resource-rich countries in the first place?

To conclude, this article poses several challenges for future research. We argue that the mode of extraction—artisanal or industrial—of lootable resources is an important intervening variable that mediates the effect of lootable wealth on political order. This argument raises the antecedent issue of what determines the mode of extraction. Addressing this question requires a focus on the factors that influence the investment decisions of industrial mining companies, for example, the mining and investment law, the fiscal regime (for example, taxation rates), energy and transportation infrastructure, property rights, the effectiveness of the legal system, and the ability of the government to provide security.<sup>58</sup> Rulers can potentially manipulate these factors and thereby build tax handles by changing the mode of extraction. *Hence, the revenue opportunity structure is not static: rulers may be able to alter it in ways that increase their future income and thus improve their ability to supply peace and order.*<sup>59</sup> Our analysis of Sierra Leone illustrates this point: Siaka Stevens was able to use the power of government to concentrate control of diamond marketing in the hands of a small group of Lebanese dealers, a move that made it easier for his government to tax the income generated by alluvial diamonds. Because the mode of extraction, in contrast to the more fixed and immutable resource profile, may be susceptible to manipulation by rulers, understanding its determinants could yield fruitful insights about how to achieve political order in resource-rich countries.

The observation that rulers can potentially change the mode of extraction highlights a second, and related, task for future research: exploring whether the ability of rulers to alter the mode of extraction is itself determined by other factors that cause civil war.<sup>60</sup> For example, if the state had collapsed in Ghana, industrial extractors of minerals may have fled, resulting in a predominantly artisanal mode of extraction despite efforts by leaders to maintain an industrial mode. Similarly, Momoh's failure in Sierra Leone to maintain the industrial mode of diamond extraction bequeathed by his predecessor, Stevens, was partly a function of the growing coercive power of private resource holders (for example, the Lebanese diamond traders), a factor that may

58. Moreover, war itself can alter the mode of extraction by driving out industrial firms as the risk to their investments increase. Peace can presumably have the opposite effect.

59. By the same token, rebels may also be able to alter the revenue opportunity structure in ways that enhance their income. Alternatively, rebels may try to destroy tax handles to make it harder for rulers to earn the income with which to govern. Adding rebels to our revenue-centered framework is an important step for future research.

60. We thank James Fearon for bringing this point to our attention.

itself have been a direct cause of the country's collapse into civil war. From the standpoint of these examples, the mode of extraction would operate as an endogenous variable.

With these challenges in mind, we believe that connecting economic resources and political outcomes in a more dynamic framework, one driven by individual behavior and motivation, rather than the aggregate, system-level variables (i.e., resource profiles and modes of extraction) on which we focus, could help better explain why lootable resources are associated alternatively with stability and instability during different phases of a country's history.<sup>61</sup> Like Sierra Leone, other African countries that produce alluvial diamonds and collapsed into civil war during the 1990s—for example, Democratic Republic of Congo and Liberia—were also ruled previously by long-lived political regimes. In Democratic Republic of Congo, Mobutu Sese Seko held power for more than thirty years (1965-1997), and in Liberia, William Tubman ruled twenty-seven years (1944-1971) and was succeeded by William Tolbert, who ruled nine years. Moreover, alluvial diamonds were a key resource that helped provide the income with which these rulers governed. A dynamic framework that explains shifts in the mode of extraction by analyzing the construction and breakdown of tax handles could help us better understand why diamonds were linked initially with peace and subsequently with chaos.<sup>62</sup> Such a framework could also provide insights about how to achieve peace in the world's many diamond-rich yet conflict-ridden countries.

Studies that address questions such as these will provide a far stronger foundation for understanding the complex relationships amongst resources, violence, and peace.

## APPENDIX

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We model the government as a unitary, perfectly rational actor who maximizes the present discounted value of utility over an infinite time horizon. The per period utility function for the government is defined over net revenue, where net revenue at period  $t$  is the residual from total revenue in that period after the government has invested in: (1) tax capacity  $k$  in each sector of the economy, (2) coercive capacity  $q$ , and (3) social welfare  $w$ . In keeping with our theoretical framework, we assume that the profile of a mineral economy consists of both lootable  $l$  and nonlootable  $n$  resources that may be extracted through either artisanal  $A$  or industrial  $I$  modes. We further assume that investment in tax capacity serves to increase future revenue, whereas investments in coercive capacity and social welfare serve to prevent the loss of future revenue by reducing societal dissent. The specific question addressed in this model concerns how the government allocates tax revenue amongst alternative uses, given the existence of societal discontent.

At the beginning of each period  $t$ , the government makes choices for the next period. It must spend  $k_{A,t+1}$  to develop tax capacity in the artisanal sector,  $k_{I,t+1}$  to develop tax capacity in the industrial sector,  $q_{t+1}$  to develop coercive capacity, and  $w_{t+1}$  on social welfare, thereby

61. See Parunak, Savit, and Riolo (1998) for a comparison of equation-based and dynamic agent-based modeling.

62. See Snyder (2004) for an effort to explain the contrasting political consequences of lootable wealth by focusing on the motives, strategies, and power of rulers and private economic actors.

determining net revenue  $g_t$ . Together with revenue from the government's choices in period  $t - 1$ , these determine the government's net expenditure  $c_t$ :

$$c_t = k_{A,t+1} + k_{I,t+1} + q_{t+1} + w_{t+1}.$$

We assume that all capital investments fully depreciate within the period. This implies that there can be no accumulation of the ability to collect taxes or of coercive capacity. We further assume that all artisanal extraction is lootable but that some industrial extraction is nonlootable. Therefore, we write the amount of taxable income generated by artisanal extraction as  $Y_A$  but differentiate between industrial extraction that is lootable  $Y_{I,l}$  and nonlootable  $Y_{I,n}$ . To simplify, we introduce a variable  $Y$  that is the sum of  $Y_A$ ,  $Y_{I,l}$ , and  $Y_{I,n}$ .

### THE GOVERNMENT'S BUDGET CONSTRAINT

Actual government revenue in any period  $t$  is determined by the difference between, on one hand, the maximum potential tax revenue that can be obtained given the level of production and tax capacity in each sector and, on the other hand, the loss of revenue due to societal discontent with the rulers. The maximum potential tax revenue the government can get from artisanal extraction in period  $t$  is therefore determined by  $Y_A k_{A,t}^{\alpha_A}$ , where  $0 < \alpha_A < 1$ , and the maximum potential tax revenue from industrial extraction at period  $t$  is similarly determined by  $(Y_{I,l} + Y_{I,n}) k_{I,t}^{\alpha_I}$ , where  $0 < \alpha_I < 1$ .

In keeping with our argument that artisanal miners are harder to tax than industrial firms because their small size and "illegibility" make it difficult for governments to monitor them, we assume that a dollar invested in creating tax capacity in the industrial sector increases tax revenue by more than a dollar invested in creating tax capacity in the artisanal sector.<sup>63</sup> Hence, extractive effort generates less revenue for the government when applied to the artisanal instead of the industrial sector. This translates into the mathematical requirement that  $\alpha_I > \alpha_A$ . Thus, maximum potential revenue for the government is the sum

$$Y_A k_{A,t}^{\alpha_A} + (Y_{I,l} + Y_{I,n}) k_{I,t}^{\alpha_I}$$

Societal discontent with a ruler causes an outflow of revenue each period. We assume an exogenous parameter  $\varepsilon$  that captures the level of societal grievances. For the moment, we assume that the value of  $\varepsilon$  is constant over time and that the government's coercive capacity reduces this outflow, as does the level of welfare expenditure.<sup>64</sup> We posit a Cobb-Douglas production function of the form

$$Y \varepsilon q_t^{-\delta} w_t^{-\gamma}$$

where  $0 < \delta, \gamma < 1$ . Actual government revenue in period  $t$  is therefore given by

$$Y_A k_{A,t}^{\alpha_A} + (Y_{I,l} + Y_{I,n}) k_{I,t}^{\alpha_I} - Y \varepsilon q_t^{-\delta} w_t^{-\gamma}$$

and the expenditure side of the government's budget constraint is simply specified as

63. On "legibility" as an important constraint on state capacity, see Scott (1999).

64. Societal discontent with the rulers should, in principle, be determined endogenously in a general equilibrium model of the economy. For the moment, however, we focus on a partial equilibrium model of a ruler's response to an existing level of discontent, relegating the more general model to the realm of future research.

$$g_t + k_{A,t+1} + k_{I,t+1} + q_{t+1} + w_{t+1}.$$

Given the structure of our model, the budget constraint holds with equality and can be specified as

$$g_t + k_{A,t+1} + k_{I,t+1} + q_{t+1} + w_{t+1} = Y_A k_{A,t}^{\alpha_A} + (Y_{I,l} + Y_{I,n}) k_{I,t}^{\alpha_I} - Y \epsilon q_t^{-\delta} w_t^{-\gamma}.$$

**UTILITY MAXIMIZATION UNDER CONSTRAINTS**

The utility function of the government is given by

$$\sum_{t=0}^{\infty} \beta^t \ln g_t, 0 < \beta < 1$$

The problem for the government is, therefore, to select a sequence  $\{k_{A,t+1}, k_{I,t+1}, q_{t+1}, w_{t+1}\}_{t=0}^{\infty}$  that solves

$$\text{Max. } \sum_{t=0}^{\infty} \beta^t \ln g_t$$

subject to

(i) the budget constraint:

$$g_t + k_{A,t+1} + k_{I,t+1} + q_{t+1} + w_{t+1} = Y_A k_{A,t}^{\alpha_A} + (Y_{I,l} + Y_{I,n}) k_{I,t}^{\alpha_I} - Y \epsilon q_t^{-\delta} w_t^{-\gamma}$$

(ii) parametric restrictions:

$$0 < \beta < 1, 0 < \alpha_A, \alpha_I < 1, \alpha_I > \alpha_A, 0 < \delta, \gamma < 1 \text{ and } \epsilon > 0;$$

(iii) initial conditions:

$$k_{A,0}, k_{I,0}, w_0, q_0.$$

The Lagrangean for the problem is

$$L = \sum_{t=0}^{\infty} \beta^t \ln g_t + \sum_{t=0}^{\infty} \lambda_t [Y_A k_{A,t}^{\alpha_A} + (Y_{I,l} + Y_{I,n}) k_{I,t}^{\alpha_I} - Y \epsilon q_t^{-\delta} w_t^{-\gamma} - g_t - k_{A,t+1} - k_{I,t+1} - q_{t+1} - w_{t+1}].$$

The first order conditions are

$$\frac{\partial L}{\partial g_t} = \beta^t / g_t - \lambda_t = 0 \tag{1}$$

$$\frac{\partial L}{\partial k_{A,t+1}} = -\lambda_t + \lambda_{t+1} \alpha_A Y_A k_{A,t+1}^{\alpha_A - 1} = 0 \tag{2}$$



$$\frac{\partial L}{\partial k_{t,t+1}} = -\lambda_t + \lambda_{t+1} \alpha_I (Y_{t,l} + Y_{t,n}) k_{t,t+1}^{\alpha_I - 1} = 0 \tag{3}$$

$$\frac{\partial L}{\partial q_{t+1}} = -\lambda_t + \lambda_{t+1} \delta Y \epsilon q_{t+1}^{-\delta - 1} w_{t+1}^{-\gamma} = 0 \tag{4}$$

$$\frac{\partial L}{\partial w_{t+1}} = -\lambda_t + \lambda_{t+1} \gamma Y \epsilon q_{t+1}^{-\delta} w_{t+1}^{-\gamma - 1} = 0 \tag{5}$$

$$\frac{\partial L}{\partial \lambda_t} = Y_A k_{A,t}^{\alpha_A} + (Y_{t,l} + Y_{t,n}) k_{t,t}^{\alpha_I} - Y \epsilon q_t^{-\delta} w_t^{-\gamma} - g_t - k_{A,t+1} - k_{t,t+1} - q_{t+1} - w_{t+1} = 0 \tag{6}$$

From (1),  $(\beta^t/g_t)/(\beta^{t+1}/g_{t+1}) = \lambda_t/\lambda_{t+1}$  or  $(1/\beta)(g_{t+1}/g_t) = \lambda_t/\lambda_{t+1}$ .

If there were a steady state equilibrium, such an equilibrium would satisfy

$$g_{t+1}/g_t = k_{A,t+1}/k_{A,t} = k_{t,t+1}/k_{t,t} = q_{t+1}/q_t = w_{t+1}/w_t = 1,$$

so,

$$\lambda_t/\lambda_{t+1} = 1/\beta \tag{7}$$

In a steady state, we drop the time subscripts on variables for simplicity.

From (2) and (7),

$$\alpha_A Y_A k_A^{\alpha_A - 1} = 1/\beta$$

so the optimal level of government spending on tax capacity in the *artisanal* sector is given by

$$k_A^* = (1/\beta \alpha_A Y_A)^{1/(\alpha_A - 1)}$$

From (3) and (7),

$$\alpha_I (Y_{t,l} + Y_{t,n}) k_t^{\alpha_I - 1} = 1/\beta$$

so the optimal level of government spending on tax capacity in the *industrial* sector is given by

$$k_t^* = [1/\beta \alpha_I (Y_{t,l} + Y_{t,n})]^{1/(\alpha_I - 1)}$$

From (4) and (7),

$$\delta Y \epsilon q^{-\delta - 1} w^{-\gamma} = 1/\beta,$$

or

$$w^{-(\gamma+1)} = (\beta \delta Y \epsilon q^{-\delta - 1})^{-(\gamma+1)/\gamma}$$

Substituting the value of  $w^{-(\gamma+1)}$  into (5) yields

$$\gamma Y \epsilon q_t^{-\delta} (\beta \delta Y \epsilon q^{-\delta - 1})^{-(\gamma+1)/\gamma} = \lambda_t / \lambda_{t+1} = 1/\beta$$

from which we can determine

$$q^* = (\delta^{\gamma+1} \gamma^{-\gamma} Y \epsilon \beta)^{1/(\delta+\gamma+1)}$$

Given the optimal value of  $q$ , the optimal level of government spending on *social welfare* is thus determined as

$$w^* = (Y \epsilon \beta \delta^{-\delta} \gamma^{\delta+1})^{1/(\delta+\gamma+1)}.$$

The optimal value of *net government revenue*  $g^*$  can then be obtained by substituting the optimal values of the other variables into equation (6). One can then use our characterization of the steady state solution to do some comparative statics.

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