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Do Inaccessible and Lootable Natural Resources Influence the Incidence of Civil Conflicts?

Opportunities and Limits in the Study of the Resource Curse in Developing Countries

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Abstract: The literature on the so-called resource curse has provided evidence showing that third-world countries rich in natural resources tend to suffer from low levels of economic growth, poor political outcomes and severe intrastate conflicts. In particular, resource abundance is associated with more frequent and longer civil wars, especially in developing countries. Our study aims to assess how a specific mechanism may explain this pattern and ultimately be targeted to prevent the occurrence of hostilities in countries endowed with specific natural resources. The central hypothesis of our study holds that geographically inaccessible and easily exploitable natural deposits are used by rebel groups to finance military activities against central governments, eventually leading to the occurrence of civil conflicts. To test our theory, we set up a probit model and design a set of robustness checks to assess the sensitivity of our results. Our estimates eventually lead us to reject the original theory and motivate us to formulate different explanations to interpret our results. We conclude that researchers need to rely on more accurate and extensive data and adopt more comprehensive analytical specifications to better explain the frequency and the severity of intrastate wars in resource-rich developing countries.

Keywords: Resource Curse, Geographic Inaccessibility, Lootable Resources, Civil Conflict, Developing Countries

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1. Introduction

Natural resources have been often suspected to play a crucial role in the outbreak of violent conflicts around the world, especially in developing countries. From diamonds in Sierra Leone to gold in Indonesia, certain types of natural deposits have indeed been linked to state's instability and to the occurrence of civil wars that seriously harmed the economic development of third-world countries (Sachs and Warner 1995). As it has been the case for oil in Iraq and drugs in Colombia, the revenues stemming from natural resources have been indicated as a critical factor that makes civil wars last longer and account for terribly high death tolls among both combatants and civilians (Fearon 2004; Ross 2004b). In recent decades, researchers have been able to collect a large body of evidence as well as provide useful theoretical frameworks to explain these phenomena, managing to add some missing pieces to the broader puzzle of the resource curse literature. The idea that countries endowed with abundant resource deposits are likely to suffer from low economic performance, poor levels of democracy and, in extreme cases, civil conflicts, has been extensively tested by economists and political scientists. Although this branch of the literature emerged together with a subset of studies investigating the opposite phenomenon (i.e. the resource blessing), researchers have provided relatively more support for the alleged adverse consequences that an abundant stock of natural resource may have for developing countries.

Since the 80s, a growing system of theoretical frameworks and empirical results has led to the general acceptance of the resource curse theory and its implications. On the one hand, developing countries that could count on abundant mineral deposits have usually struggled to effectively use these resources to foster economic growth, principally due to the excessive dependence on these sources of revenues (De Soysa 2002b). On the other hand, revenues originating from natural deposits controlled by a restricted group of institutional actors have been linked to the spread of corruption and to instances of institutional degradation, two interconnected phenomena also correlated with the instauration of authoritarian regimes (Tsui 2011). Moreover, natural resource abundance may lead to even more extreme consequences by triggering mechanism that eventually cause the outbreak of violence. Countries rich in natural resources are in fact more likely to experience wars within their borders and these hostilities often tend to last longer compared to resource-poor countries (Fearon 2004). Moreover, specific studies have also shown that civil conflicts taking place in countries endowed with a large stock of natural resources tend to account for a higher number of casualties, both among civilians and military forces (Ross 2004b).

To explain these patterns, various hypotheses have been proposed to empirically assess the impact of certain natural deposits on the occurrence of intrastate wars. An argument that may explain this manifestation of the resource curse is the so-called feasibility hypothesis, i.e. the idea that a severe armed conflict will arise as soon as there are the necessary financial means to sustain it (Collier et al. 2009). Using an equivalent interpretation, the theory suggests that opposing factions will start hostilities as soon as a sufficient level of funding to sponsor military operations is reached, no matter the nature of the underlying motives for fighting. As we are going to discuss later, underlying reasons to engage in conflicts (may they be greed, grievance or other motives) have in fact been shown to play a secondary role in the outbreak of such hostilities. As the reader may have already imagined, funding for military activities is likely to come from the exploitation of natural resources. The extraction of oil, diamonds, gold, gemstones but also the cultivation of drug plantations can potentially generate enough revenues for both rebel and governmental forces to engage in military operations against each other. The literature has indicated that the revenues stemming from these natural deposits may in fact be used to hire soldiers and buy weapons, eventually making large-scale violent conflicts possible. Furthermore, researchers have suggested that some natural resources have a higher impact on this funding mechanism while others are likely to have a weaker link with the outbreak of civil wars (Le Billon 2005). As we are going to discuss later, a considerable amount of evidence has indeed highlighted that natural resources can trigger different processes depending on the specific characteristics of individual deposits (Lujala et al. 2005). More precisely, the different geological form and the heterogeneous geographic characteristic of deposits are believed to affect the likelihood of a civil conflict in different ways. Although a lot of research efforts have recently been devoted to explore these latter hypotheses, early findings do not provide a clear picture on their validity. However, the constant inflow of original data and the exploration of new analytical techniques are progressively shading more light on the nature of this interesting phenomenon.

Our study builds on and tries to expand the recent theoretical and analytical frameworks that have been used to explore the relationship between natural resource abundance and the outbreak of civil wars in developing countries. On the one hand, we felt the importance to analyze more accurately how specific types of natural resources may affect the likelihood that a country will be hit by a civil conflict. On the other hand, we wanted to investigate how the feasibility hypothesis manifests itself when considering the violent actions taken by rebel groups in countries plagued by civil wars. Until this point in time, the literature has in fact adopted a relatively broad approach to study this theory, mainly focusing on how the general abundance of resources is broadly linked to the occurrence of civil wars. What we are going to test in our study is instead the existence of a very specific phenomenon which we will refer to as the rebel funding mechanism. Drawing from recent findings, we hypothesize that a clearly identified set of natural deposits may provide the necessary funding to rebel groups to engage in a conflict against the central government. The underlying idea of the rebel funding mechanism is that natural resources translate into funding that rebels may use to either initiate a fight against the state's central authorities or to militarily respond to governments' offensives. Moreover, we hypothesize that only a set of specific natural resources is likely to provide the necessary financial resources to sponsor rebel groups' military operations. More precisely, we suggest that geographically inaccessible (also broadly referred as inaccessible) and easily exploitable (also broadly referred as lootable) natural deposits constitute a solid source of funding for the military operations of rebel forces. The foundation of this argument lies on the fact that rebel factions may have a competitive advantage in controlling deposits located in areas far from the government's influence, for instance in regions far from the state's capital and locations characterized by an impervious terrain. Moreover, we also speculate that rebel groups are more likely to benefit from resources that are relatively easy to extract and trade, especially if there are illegal markets for these goods. The main focus of our study is then to assess whether these types of natural resources actually increase the probability that a country will experience a civil conflict at a given point in time by providing rebel groups the necessary funding to sustain a large-scale conflict. As we will illustrate in the course of our analysis, we assume feasibility to be the primary driver of the incidence of conflicts while the previously proposed arguments of greed, grievances and additional factors (e.g. ethnic and/or religious fractionalization) only play a secondary role in these dynamics. Since the resource curse has been primarily affecting a restricted set of countries after the Second World War, we will restrict our research focus on developing states during the second half of the twentieth century. Another reason to choose this set of countries is that the potential insights we may obtain from such analysis are more likely to shape policy indications especially for developing states. In order to investigate properly the rebel funding mechanism, we will set up a probit model adopting a recently proposed country-year fixed effects[1] approach. We use this econometric specification to quantitively investigate how the variation in the number of geographically inaccessible and easily exploitable natural deposits affects the likelihood that a country will be affected by a civil war in a given year. According to the features of our theoretical framework, we will restrict our attention to diamond, gold and gemstone deposits as well as drug plantations since they are the types of natural resources that are more likely to generate funding for rebel groups. Consistently with our hypothesis, the picture we expect to obtain should support the idea that the availability of more inaccessible and lootable deposits would increase the likelihood of observing a civil conflict in a selected country in a given year.

Interestingly, by performing our analysis and conducting a series of robustness checks, we discover that our theory does not hold in practice. Starting from the outcome of our analysis, we will formulate a series of alternative explanations that may help us interpret the unexpected lack of evidence for our theory. First, it may be the case that relevant factors have not been taken into account in our theoretical framework for reason mainly related to data availability. Second, it may be possible that issues of reverse causality cannot be properly addressed given the available analytical methods and the data sources we have access to. Third, the lack of informative results could be driven by a series of misspecifications in our model and the impossibility to practically address them. We eventually conclude that data reliability and availability is the main obstacle that arises when studying the rebel funding

[1] Since applying classic fixed effects methods to a probit model can lead to severe bias, we will adopt a recent computational approach that corrects for this potential issue (Cruz-Gonzalez et al. 2017). We will discuss this approach in more detail in Section 5.

mechanism. Moreover, we also suggest that the currently available theoretical frameworks are too reductive to properly investigate the relationship between natural resource abundance and civil conflicts. However, this latter issue constitutes only a secondary problem since the adoption of more accurate empirical methods is conditional on the appropriate quality, quantity, and timeliness of data sources.

Our discussion is organized as follows. In the next paragraphs (Section 2), we are going to present a review of the existing literature investigating the resource curse. We will start our presentation by discussing what researchers have suggested regarding the role that resource abundance has on economic development, political outcomes and occurrence of civil wars. We will then focus on this latter aspect, illustrating the pieces of research that led us to formulate the rebel funding mechanism hypothesis. We will conclude this section by explaining how our study constitutes a relevant continuation of the research effort on this topic. Section 3 will be mainly devoted to the illustration of our hypothesis and to the discussion of the results we expect to obtain given our theoretical framework and previous findings. In Section 4, we will provide the reader with information about the data sources we have used to build our dependent variable, main independent variables and controls. In the concluding part of this section we will also discuss some relevant features of our summary statistics. We present our econometric model and our results in Section 5. This section will also report several robustness checks that we have performed to gain a better understanding of the rebel funding mechanism. In Section 6, we illustrate the possible reasons that may explain why the obtained results do not support our hypothesis. In the same section we will also highlight the most relevant obstacles that researchers in this field must be aware of when trying to investigate analogous phenomena. We conclude our presentation with Section 9, where we summarize the outcome of our study and propose some indication for further research.

2. Literature Review

2.1 The Resource Curse

For the most part of the history of economic thought, natural resource abundance was believed to be a key determinant of a country's prosperity. Since Adam Smith and David Ricardo, the idea that large oil and mineral reserves could sustain development and consolidate a state's institutional machine has been popular not only among economist and policy-makers, but it was also widely accepted by the general public. Starting from the second half of the twentieth century, a large body of literature has come up with evidence highlighting the positive impact a diversified natural resource endowment can have on a country's industrialization and economic growth (Boggs and Viner 1953; Lewis 1955; Drake 1972; Balassa 1980; Krueger 1980; Rostow 1990). However, as new analyses came in around the 80s, suspiciousness began to spread among researchers who then started to look more in detail at country-specific case studies. What economists eventually began to speculate about was that natural resource abundance may not guarantee a stable development path but possibly constitute a destabilizing factor threatening a country's economic, institutional and social progress. On the one hand, researchers were particularly puzzled by the negative economic performance that had made countries like Angola, Congo, Nigeria and Venezuela popular case studies in political science and economics. Although being rich in deposits of petroleum, gemstones and other minerals, these states have indeed struggled to transform such endowments into drivers for economic, political and social development. On the other hand, the same researchers were not able to explain intuitively how other developing countries like South Korea, Singapore and Hong Kong had been performing particularly well both from an economic and institutional perspective, despite lacking a generous stock of natural resources within their borders. Motivated by these observations, the literature eventually advanced and began to support the hypothesis that states that are highly reliant on their natural resource deposits (and on the revenues stemming from them) are likely to suffer from low levels of socio-economic development.

Partially drawing from the Dutch disease theory developed around the same period (Corden and Neary 1982; Corden 1984), a new branch of literature aiming to explain the resource curse paradox began to take shape. As more evidence was brought up and as the scientific community showed more interest for this phenomenon, the term "resource curse" began to be widely used to label the new research path that had been opened (Auty 1993). Almost three decades after the birth of the theory, the possibility that natural resource endowments are likely to be associated with poor economic and development performances is now widely acknowledged by researchers and officials around the world. However, the reader must be aware that a parallel body of literature has also grown around the opposite hypothesis, i.e. the idea that natural resource deposits can also be a blessing for developing countries (Van der Ploeg 2011). Nonetheless, we must recognize that researchers struggled to support this latter claim with empirical results. For this reason, economists and political scientists have tended to focus more on the adverse role natural riches play in developing countries, finding a large and convincing amount of evidence as well as proposing various countermeasures to tackle this phenomenon.

Starting from the 80s, the quest to understand the resource curse has produced a large amount of studies investigating the various effects that resource abundance may have on a country's social and economic development. Today, economists believe that the resource curse may negatively impact a country's development path on three different dimensions (Rosser 2006): 1) harming its economic growth, 2) facilitating the instauration of autocratic political regimes and 3) making civil conflicts more likely. Given the focus of our thesis, we will start our presentation by briefly exploring these first two dimensions, in order to help the reader to form an idea about the general literature framework. After this introductory discussion, we will present in more detail how researchers have addressed the relationship between natural resource abundance and intrastate wars.

A significant amount of research effort has been invested to clarify the connection between natural resource abundance and economic stagnation. When considering either natural deposits from a broad perspective or analyzing specific resources like oil or minerals, economists have been able to successfully establish a causal link between the abundance of natural deposits and low levels of GDP growth and slower economic development (Sachs and Warner 1995; Leite and Weidmann 1999). Not surprisingly, this effect tends to manifest itself in a heterogeneous way across geographic regions. For instance, researchers have shown that the effects of the resource curse tend to be more severe in Sub Saharan African countries than in other states (Mildner et al. 2011). The existing literature has also stressed the fact that the abundance of oil and mineral deposits specifically impacts the level of income per capita, aggravating the problem of severe poverty in many developing countries (Auty 2001; Nili and Rastad 2007). A large stock of natural resources has also been linked to other development issues like the increased levels of within-state inequality and lower human capital development (Gylfason 2001; Ross 2003a; Hodler 2006; Iimi 2007; Deacon 2012). When considering these findings, we may reasonably conclude that natural resource abundance is a direct cause of poor development outcomes and almost a guarantee of economic stagnation for countries sharing this feature. However, we must note that economists have been generally careful when interpreting these pieces of evidence. While resource abundance may be in principle harmful for developing economies, researchers have been advancing the hypothesis that there may be other factors that can explain these outcomes or, at least, mitigate the negative impact the resource curse may have. One interesting set of studies has for instance taken into account the role that the institutional and the political environment plays in countries rich in natural resources. Not surprisingly, this branch of the literature has suggested that, from a broad point of view, the resource curse is likely to lead to negative impacts on a country's economy only if its institutions are weak (Boschini et al. 2013). Connected to this aspect, other studies have also shown that resource abundance can in principle be both a blessing or a curse depending on a set of specific country characteristics, especially institutional ones (Van Der Ploeg 2011).

The ways the resource curse can manifest itself are not limited to the adverse effects it may have on economic activity. A subset of the literature has indeed shown that natural resource abundance is also associated with undesirable political outcomes, for instance the rise and consolidation of authoritarian regimes (Wantchekon 2002). The literature suggests that the discovery and exploitation of oil deposits is linked to a significant decrease in the level of democracy and to the deterioration of civil rights through the activation of various vicious mechanisms (Ross 2001; Desai et al. 2009; Tsui 2011). Moreover, in the case of countries that have chronically suffered from political instability, the abundance of natural deposits also makes the transition to democracy slower and more volatile (Wantchekon 2002; Jensen and Wantchekon 2004). The inflow of revenues originating from government's resource rents has also been related to increased levels of corruption, a phenomenon that in turn leads to institutional disfunctions and state's instability (Hodler 2006; Iimi 2007; Vicente 2010; Arezki and Brückner 2011; Frankel 2012). As it was the case for economic development, institutional quality may also play an important role in mitigating and reversing the adverse effects of the resource curse. Economists have in fact shown that mineral abundance may have beneficial impacts on the level of democracy, depending on how resource rents are redistributed through institutional arrangements (Mehlum et al. 2006; Mavrotas et al. 2011). When we look at specific case studies, the institutional argument could in fact explain why some developing countries like Chile, Malaysia and Botswana managed to benefit from their natural endowments, using them to foster economic and social development (Stevens 2003). In other words, researchers generally agree that creating and maintaining a good institutional environment is a key element that can help avoiding the most vicious effects of the resource curse (De Soysa 2002b).

Before discussing the relationship between natural resource abundance and civil wars, we want to underline some potential concerns that have been raised when exploring the literature on this topic. To begin with, although empirical findings seem to highlight a clear causal mechanism, the resource curse may be just a symptom, not the cause, of underdevelopment. Moreover, as we pointed out when mentioning the impact of institutional factors, this phenomenon could still be the result of a broader interplay of social, economic and political forces (Rosser 2006). Another major issue emerging from the literature is the sensitivity of many analyses to different data sources and specifications. Many comparable studies have in fact reached contrasting explanations by using different data specifications while others were simply unable to replicate the results obtained by previous analyses (Humphreys 2005). These considerations suggest that we should always interpret carefully the evidence we encounter and be aware that the resource curse is still a complex and not fully understood phenomenon possibly resulting from a wide interaction of different factors.

2.2 Natural Resource Abundance and Civil Conflicts

Around the end of the 90s, economists and political scientists, motivated by the promising discoveries in the field of the resource curse, started to investigate the possible relationship between the abundance of natural resources and the incidence of civil conflicts. The research effort in this sub-set of the literature has mainly focused on two mechanisms through which natural resources can influence the outbreak of intrastate hostilities, namely resource scarcity and resource abundance. From a theoretical perspective, on the one hand resource scarcity may interact with population size and growth, leading people to fight over scarce means of existence and, in extreme cases, leading them to engage in violent conflicts (Homer-Dixon 1994; Hauge and Ellingsen 1998; Raleigh and Urdal 2007; Urdal 2008). This appealing explanation has however been challenged by many studies finding no significant evidence of this hypothesis (Bates et al. 2003; Binningsbøet al. 2007; Brown 2010). On the other hand, the idea that resource abundance may be linked to a higher incidence of civil conflicts has progressively found strong empirical support and consequently attracted more interest from researchers in recent years. Economists have recently shown that natural deposit abundance, measured as the share of resource exports of a country's GDP, is strongly linked to the onset of civil wars (Collier and Hoeffler 1998). Moreover, natural resource abundance has also been shown to lead to longer hostilities (Ross 2004a) and that its impact tends to be stronger in specific geographic regions like Sub Saharan Africa (Mildner et al. 2011). The literature has further highlighted that the abundance of oil and mineral deposits may have different consequences on different types of civil conflicts, more specifically they tend to be correlated with the outbreak of non-secessionist civil wars and non-ethnic intrastate conflicts (Collier and Hoeffler 2002; Reynal-Querol 2002). The literature has also shown that the presence of natural deposits on a country's territory undermines the success of peacebuilding activities after a civil conflict has ended (Doyle and Sambanis 2000).

When it comes to specific types of natural resources, oil seems to be the one causing the most adverse effects in terms of outbreak of intrastate violence. In many studies, the discovery and exploitation of oil deposits has been linked to a higher likelihood for a country to suffer from a civil war, especially from separatist civil conflicts (Fearon and Laitin 2003; Ross 2004b; Fearon 2005). Mineral deposits in general (i.e. oil, diamonds, gold and gemstones) have not only been associated with a higher incidence of civil war but also with a greater number of casualties during a period of conflict (Lujala 2005; Balestri 2012). Nevertheless, some studies have challenged these findings, advancing the hypothesis that, in some contexts, oil abundance has an insignificant or even a preventive effect on the outbreak of these events. Some researchers in fact indicate that oil revenues are likely to be invested in state's security and defense, which are elements potentially inhibiting the emergence of violence (Smith 2004). Other studies have also suggested that oil may not have an effect at all on the outbreak of conflicts, pointing at specific country experiences in the Middle East (Lujala 2005; Sørli et al. 2005). As we have mentioned before, a caveat on the interpretation of these findings still applies. Indeed, many of these results should be taken with a grain of salt since the underlying analyses tend to be highly sensitive to different data sources and econometric specifications that can easily lead to biased estimates of these effects (Tsui 2011).

Until this moment, we have seen how the empirical evidence suggests that natural resource endowments are linked to the outbreak of civil wars, longer conflicts and a higher number of casualties. One interesting question that may arise now is what are the underlying mechanisms that explain the outbreak of violence in most resource-rich countries. The literature has proposed a rich set of hypotheses and explored different causal channels that may simultaneously or exclusively explain this phenomenon (Ross 2004a). In the following paragraphs, we will provide the reader with a general summary of the theoretical frameworks that lie at the core of this research field.

When looking at intrastate wars from a broad perspective, one evident feature common to all these conflicts is the involvement of at least two actors, usually a state's central government and a rebel group. Both sides may have different reasons to engage in a conflict and both may benefit from available natural resource deposits in different and possibly asymmetric ways (Mildner et al. 2011). From a general point of view, either in peaceful times or during war periods, both governments and rebels may want to control and exploit natural resources for different reasons. The literature has suggested that governments usually exploit natural resources to increase their revenue inflows while rebels tend to rely on them to cover start-up costs for their activities (Thies 2010). These motives usually constitute the roots of different mechanisms that simultaneously and asymmetrically affect the behavior of central governments and opposing rebel factions.

It has been observed that, in various contexts, governments exerting control over a large amount of natural resources tend to progressively rely more on the revenues stemming from them. As we have observed before, this path has led in many occasions to instances of resource dependence which in turn have triggered mechanisms of corruption and institutional degradation. As an emergent consequence, abundance of natural deposits may weaken the state capacity and make central governments weak and unstable (De Soysa 2002a; De Soysa 2002b; Heller 2006). Simultaneously, natural resource abundance may hinder the functioning of the central state by making it reliant on a rent-based economy and also by lowering the incentives to promote paths of inclusive growth and reduced inequalities (De Soysa 2002b). The instability and the tensions originating from these phenomena may eventually make governments unable to effectively face discontent and internal oppositions. As the reader may have imagined, the state's inability to respond to these forces could lead, in the worst-case scenario, to the outbreak of violence and to emergence of severe civil hostilities (Fearon and Laitin 2003; Mildner et al. 2011). It is also important to observe that the weakening of the central state is not the only possible outcome associated with resource abundance. Part of the literature has pointed out that natural resource revenues may in fact strengthen the state's institutional machine by providing it the necessary funding for preventing civil violence (Auty 2001; Basedau and Lacher 2006). Known manifestations of this mechanism have been observed in Chad, Nigeria and Cote d'Ivoire, where oil revenues were devoted to expanding the state's military capacity and strengthenig its institutional control over the country's territories (Renner 2002; Ikelegbe 2006; Frank and Guesnet 2009; Guesnet et al. 2009). However, it is also likely that this form of control fueled by resource abundance may translate into the consolidation of authoritarian and repressive regimes that can engage in military operations aiming to subdue rebel factions (Ross 2015) as it happened for example in Angola with offshore oil (Prunier 2009). From a general perspective, it is critical for the reader to keep in mind that natural resource abundance may both prevent and facilitate civil conflicts and that these opposite mechanisms are usually difficult to disentangle. Moreover, as the literature suggests, these drivers can coexist at the same time, making their investigation even more complicated.

2.3 The Rebel Funding Mechanism

Natural deposits have usually played a key role in shaping the incentives rebels may face to engage in hostilities against a central government. Before exploring this topic any further, we believe it is relevant to identify which natural resources are more clearly associated with higher rebels' incentives to take part in a conflict. As the literature suggests, different forms of deposits and diverse types of natural resources may have heterogeneous impacts on the probability that a country will suffer from a civil war (Ross 2004b). A category of natural resources that is believed to be linked with a higher incidence of civil conflicts is the one of lootable resources or, in other words, resources that can be easily acquired, processed and traded on legal and illegal markets. In our discussion we will refer to these types of deposits either as "lootable" or as "easily exploitable". Examples of resources falling in this category are drugs, secondary[2] diamonds and secondary gold deposits. Other types of resources that also play a significant role in this context are illegal products like drugs (which cannot be traded by governments) and natural deposits located in geographic areas difficult to control for the central government (and hence easier to capture for rebels) (Ross 2004a).

As hypothesized by several studies, the main mechanism that drives rebels to take part in a conflict is that these groups can use natural resources' revenues to fund their military operations. Contrarily to the government's case, rebels have limited ability to extract oil, gold and other minerals on an industrial scale. Moreover, they have to compete with the central state, which is usually more financially capable, in order to control natural deposits. It is

[2] The literature refers to secondary deposits as those sources located in proximity of river beds and/or relatively closer to the earth's surface. In these locations, it is not necessary to rely on complex mining operations to extracted diamonds, gold and other valuable gemstones. Moreover, the extraction of resources found in this type of deposits does not require a skilled labor force.

then likely that rebel groups may aim to secure easily exploitable resources that are difficult to control for the government due to accessibility and exploitability reasons. Motivated by this reasoning and supported by the evidence coming from countries like Angola and Sierra Leone, researchers have suggested that lootable and illegal resources may be a relatively secure funding source for rebel groups' military activities, especially if these deposits are located in remote areas (Collier 2000; Collier and Hoeffler 2000; Collier and Hoeffler 2004; Auty 2004; Gilmore et. al 2005). Apart from constituting a potential cause of hostilities, lootable deposits may also make conflicts last longer by providing rebels the necessary means to sustain their operations over a long time (Ross 2003a; Ross 2003b; Ballentine 2003; Ross 2004a). Moreover, it has also been suggested that these types of natural resources may increase a war's intensity by exacerbating the violent attempts to control a territory with large deposits and, possibly, by attracting foreign military support for the rebel groups involved (Ross 2004a). This mechanism has often been observed in African countries characterized by rich natural deposits of diamonds and gemstones. A specific example comes from the civil war in Sierra Leone during the 90s, where lootable diamonds were the main financing tool for rebel groups. Another interesting case that has supported this hypothesis comes from the rebel's military activities in Congo during the same period, which were funded by revenues coming from the illegal trade of copper, coltan, gold and other gemstones.

When it comes to the literature's findings, there has been a large body of empirical evidence supporting this mechanism. It has been shown for example that civil wars in the second half of the twentieth century were more likely to occur and lasted longer in regions rich in onshore oil (in theory more easily accessible by rebels compared to offshore oil) and secondary diamond deposits (Lujala 2010). Similar studies have for instance linked the presence of drug plantations and lootable diamonds to the outbreak of civil conflicts. More in detail, in the case of opium and coca, it has also been shown that the presence of these plantations tends to make hostilities last longer, as it was the case for opium fields in Afghanistan (Ross 2004a; Fearon 2004). Focusing on diamonds, economists have also demonstrated that lootable diamonds are more likely to cause civil conflicts compared to primary diamonds (i.e. diamonds found in kimberlite deposits that require complex mining operations to extract), especially after the end of the Cold War (Lujala et al. 2005). This mechanism has been evident in Angola, where lootable diamonds have been used to finance rebels' military operations (Renner 2002; Ballentine 2003; Le Billon 2005).

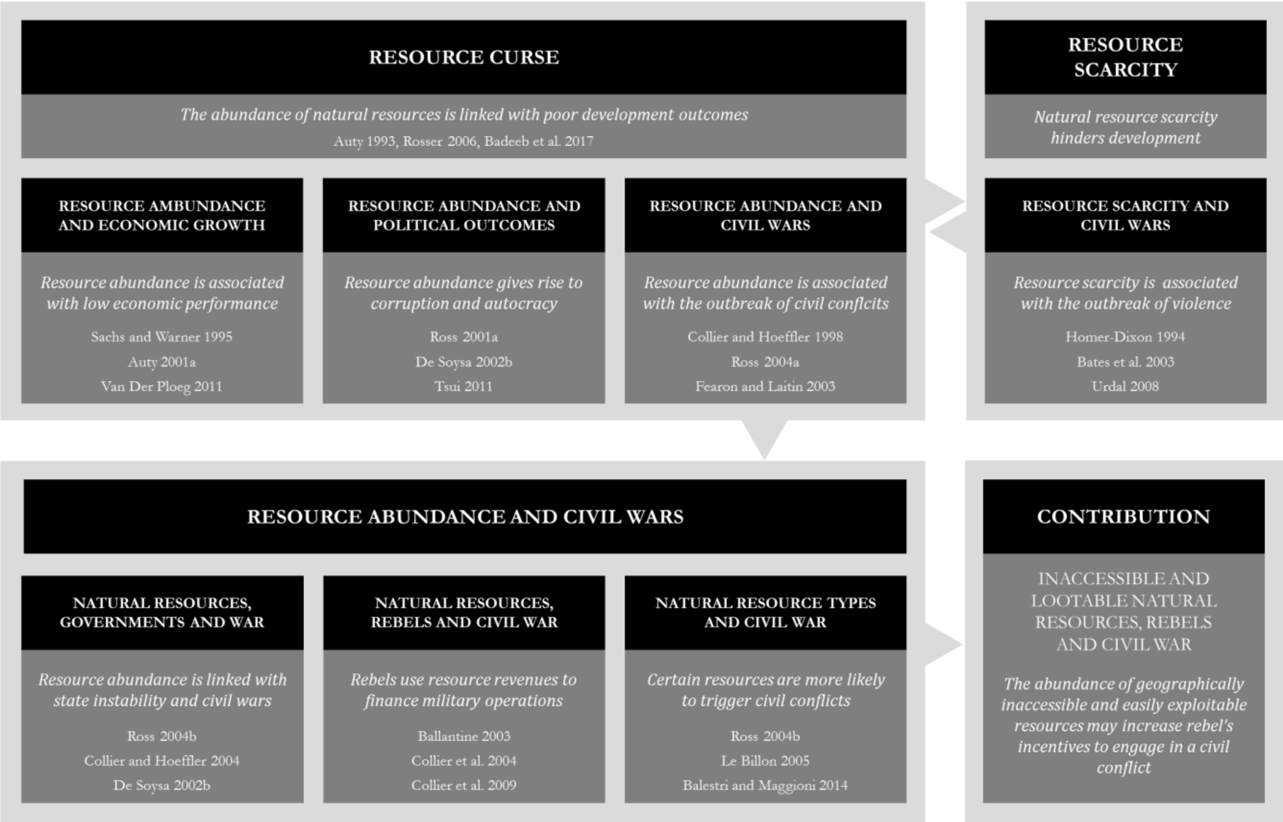
The process that we have just presented, which we will refer to as the rebel funding mechanism, has been recently indicated as the main factor pushing opposition groups to take part in conflicts against the central government. Nonetheless, this hypothesis can coexist with other forces that are likely to trigger and/or intensify intrastate wars. Originally, the most studied motives were the so-called greed and grievance hypotheses, i.e. the ideas that rebel and opposition groups may want to fight against inequalities or limited political rights (i.e. grievance) and/or to enrich themselves (i.e. greed) and their groups (Collier and Hoeffler 1998). Even if these two interpretations may in principle explain the pattern of incidence of civil wars in resource rich countries, researchers have recently accepted the fact that such forces only play a secondary role in the rise of intrastate conflicts. Many economists in fact have underlined that these factors alone are not able to significantly explain the actions that rebel groups usually take (De Soysa 2002b; Collier et al. 2009). Today, the general consensus is that the rebel's funding mechanism (or as the literature alternatively refers to it more generally, the feasibility hypothesis) is the main leading force that determines the initiation of civil wars by rebel factions (Collier et al. 2009). What researchers have indeed observed and proved is that rebels will engage in a conflict whenever there are the sufficient financial means to do so. According to the literature, there are at least two explanations to support this view. First, it is relatively safe to assume that individuals are always subjected to feelings of greed and grievance to some extent. Consequently, the key driver of large scale violence is only its material feasibility, i.e. the availability of financial resources to organize large-scale military operations to fight for those motives (Collier et al. 2009). Second, in case this assumption does not hold and only a share of the population is affected by motivations of greed and grievance, individuals may still self-select in groups that share these aims and use natural resource revenues to pursue them (Weinstein 2005). As a consequence, the critical determinant of the outbreak of civil war remains the feasibility of violence and the underlying motives are only likely to spill over into conflicts if they eventually take place.

Apart from deposits' lootability, there are other less studied resources' characteristics that may allow rebels to benefit more from certain types of deposits. For instance, it has been observed that resource extraction and military activities of rebel groups generally take place in regions where government control is relatively weaker (Ross 2004a). Moreover, it has also been suggested that these groups may benefit more from the trade of natural resources if it takes place in areas distant from government control, especially in the case of illegal resources like drugs and contraband diamonds (Le Billon 2005; Balestri and Maggioni 2014). One example of this phenomenon can be drawn again from Sierra Leone where rebel activates were concentrated in areas far from the state's capital that were characterized by abundant gold and diamond deposits (Guesnet et al. 2009). Apart from the distance to states' central power, the nature of the terrain where natural resources are located has also been indicated an important factor to understand the rebels' funding mechanism (Lujala 2005). Deposits' location and geographic accessibility has in fact recently attracted the attention of many researchers in the field. Relatively new analyses have started to consider the geographic dimensions that characterizes natural resources deposits by using spatial econometrics approaches and Geographic Information System processing (Rød and Buhaug 2010; Balestri and Maggioni 2014; Caselli et al. 2015). This new research frontier seems very promising since it could potentially unveil new dynamics and shed more light on the underlying mechanism of the resource curse.

2.4 Contribution

The literature investigating the phenomenon that got to be known as the resource curse has been reaching new and useful insights in recent decades. Researchers have clearly pinned down some key mechanisms explaining how natural resource abundance influences economic growth, political regimes and, ultimately, the outbreak of civil conflicts. Solid empirical results have shown that in certain contexts, natural resources are likely to be the cause of underdevelopment, consolidation of authoritarian regimes and important triggers of civil wars. In recent years, the literature has also moved from studying the general impact of natural resources on development outcomes to investigating the role of specific natural deposits like oil basins, diamond deposits and other mineral sources. This shift has allowed researchers to formulate and test more specific hypotheses, leading to the awareness that different resources in different forms may have heterogeneous impacts on economic and political variables, especially the outbreak of hostilities between governments and rebel factions. When it comes to civil conflicts, economists have unveiled how lootable and illegal resources significantly shape the incentives that rebel groups experience, suggesting that deposits that are easy to exploit are more likely to trigger civil wars. On a parallel line, a new interest has emerged for the geographic characterization of natural resource deposits and for the effect that this variable may have on the outbreak of intrastate wars. The latest studies have suggested that variables like the distance of natural resource deposits form the state central power and their geographic accessibility may play an important role in better defining the forces described above. Although these hypotheses have been precisely formulated, many of them have not been empirically tested yet. When considering the rebel funding mechanism, a natural expansion of the literature would be to analyze how resources' geological properties together with their geographic characteristics affect the outbreak of civil conflicts in countries rich in natural deposits, especially in developing ones. Given the availability of georeferenced data on different natural deposits and considered the extensive literature analyzing the mechanisms explaining their relationship with the incidence of civil war, we concluded that it was feasible and relevant to investigate this latter and empirically unexplored research path. **Scheme 1** summarizes the studies we have reviewed and shows how our planned contribution would fit in the existing literature.

Scheme 1 Current state of the resource curse literature and suggested contribution



Notes The literature on the resource curse, which is partly linked to the study of resource scarcity, has principally investigated the role of resource abundance on three dimensions: 1) economic growth, 2) political outcomes and 3) incidence of civil conflicts. Our research effort aims to expand this latter branch of the literature, building on previous insights on how governments' and rebels' incentives to engage in civil conflicts vary when natural deposits are abundant. In our study we will also take into account recent considerations on the accessibility of natural deposits as well as the geological form of some natural resources.

In the following sections, we will investigate how factors like the lootability of certain resources, the distance of deposits from central governmental power, their number and other geographic considerations (e.g. deposits' elevation and land cover) affect the probability that a country will experience a civil war. In addressing this question, we will assume that rebel groups will engage in violent conflicts by relying on natural resource revenues and using them to finance their military operations. In our analysis, we do not exclude that rebels may also be motivated by greed (desire to personally benefit from natural resource revenues) and grievance (desire to rebel against inequality and limited political rights). Nonetheless, we expect these motives to play a secondary role compared to the funding mechanism, following the evidence proposed by the recent literature. Furthermore, we are aware that also governments could initiate a war against a rebel group but, as we will specify later, we only consider conflicts where this latter actor was financially capable to military defend itself in a context of large-scale violence. As we mentioned in the previous paragraphs, one important concern is that the rebels funding hypothesis may be difficult to isolate given the number of other mechanisms that take place simultaneously, either affecting rebel's incentives or on the government's behavior. As we will clarify later, we will restrict our attention to a specific set of lootable and geographically inaccessible resources in order to isolate the rebel funding mechanism as much as possible.

We believe that following this research path could shed more light on how specific types of natural resources influence the probability that a country may face a civil conflict. Clearly identifying and quantifying the mechanism described above could lead us to understand better which countries may face a higher risk of experiencing hostilities due to the presence of inaccessible resources and hence help prevent such events. In the case our analysis had been successful in capturing this mechanism, our study would have pointed to specific prevention practices as well as new tools to ensure the sustainability of peace building initiatives in countries affected by the resource curse. As it turs out, we have eventually confronted with the alternative scenario in which we do not find evidence to support the existence of this mechanism. Given this result, we will be able nonetheless to provide useful guidance for future studies on how to better approach and isolate the mechanisms that we are trying to explain.

3. Theoretical Framework

The main difficulty that arises when exploring the rebel funding hypothesis is that its underlying mechanism is likely to overlap with other forces affecting the incidence of civil wars (De Soysa 2002b). As we have argued before, rebel groups are not the only beneficiaries of natural resources since they are usually engaged in a race against the central government to control and exploit natural deposits. As the literature has pointed out, while natural resources unambiguously push rebels to engage in a conflict by providing them with the necessary financing tools, they may simultaneously act as a preventive element or a trigger of instability for central governments (Auty 2001; De Soysa 2002b). In principle, these contemporaneous and contrasting drivers make the study of the rebel funding hypothesis very challenging if we do not isolate each of these effects. To address this concern, we will focus on specific types of natural resources that, according to previous research, are more likely provide funding exclusively for rebels. This strategy would indeed help us explain how certain natural deposits make it more likely for a country to experience violent hostilities due to the mechanism we are about to describe. From a very broad perspective, the recent literature on the resource curse has pointed at two dimensions that make some natural resources more likely to trigger the rebel funding mechanism. In our study, we will refer to these dimensions as the geographic inaccessibility (or simply "inaccessibility") and the ease of exploitation (or simply "exploitability") of natural deposits.

Recent pieces of research have highlighted how natural resource deposits that are difficult to access are likely to play a key role in shaping rebels' and governments' incentives to control them (Ross 2004b; Lujala 2005). In general, given the asymmetric nature of the financial capabilities of governmental institutions and rebel groups, natural deposits that are in proximity of a state's central power tend to be secured first by the state's authorities. In other words, the central state is better equipped to control natural deposits with respect to rebel groups when these are located closer to the state's capital, which is assumed to be the center of governmental power. On the other side, resources that are geographically difficult to reach offer a lower incentive for governmental exploitation and hence rebels are more likely to use these deposits for funding purposes (Le Billon 2005). To avoid confusion, for the rest of our analysis we will always refer to geographic inaccessibility with respect to the central government, bearing in mind that inaccessible resources for central states are more easily controlled by rebel groups.

At this point of the discussion, the reader may ask what factors exactly characterize a natural resource deposits as inaccessible. As briefly noted above, geographic inaccessibility may take two different characterizations, either in the form of distance from the central state's power (i.e. capital) or in the form of the difficulty to access the areas where deposits are located due to terrain features. More specifically, we will label a natural deposit as difficult to access and control if it is located far away from the central capital and/or it is located on an impervious terrain. As we will discuss in Section 4, we define a terrain as impervious if it is characterized by an inaccessible land cover (e.g. thick forestry or wetland) or if it is located in a mountainous region (i.e. located above 600 meters above the sea level).

The second dimension that may explain why some natural resources are more closely linked to the rebel funding mechanism is related to how easy they are to extract and trade in markets, may they be official or contraband ones (Ross 2003b; Fearon 2004; Ross 2004b). As we are going to illustrate soon, we assume that certain types of resources are more challenging to exploit than others both for governments and rebel factions. However, given the two sides' asymmetric financial and organizational capabilities, we expect that a particular subset of deposits will be relatively less exploitable for rebel groups. Oil extraction, for instance, requires significant investments in exploration, dedicated machinery and infrastructure. Rebel groups will likely struggle to benefit from these types of deposits and will tend to exploit resources that are relatively more convenient to extract and trade (Ross 2003b; Ross 2004b). Secondary[3] diamond and gold deposits for example do not need complex mining processes to be collected and are relatively easy to transport and trade. We consequently assume that rebel groups will find it

[3] The characteristics of secondary deposits will be discussed in Section 4.

comparatively easier to extract these resources compared to central governments. Furthermore, the exploitability dimension is not only limited to the ease of extraction but also to the trading exclusivity of particular goods. Rebel factions are indeed more likely to have access to marketplaces not officially covered by central governments, i.e. contraband and illegal markets (Fearon 2004). In theory, this fact gives rebels privileged access to the trade of contraband diamonds, gold and gemstones and eventually lets them turn these resources into financial means. Other rebel-exclusive resources like opium poppy, coca bushes and cannabis plantations are also likely to be used in an analogous way, especially if we consider that governments are forbidden to participate in illegal drug markets. To avoid confusion, from now on we will not refer to ease of exploitability relative to rebel factions and not in general terms.

As the reader may have already realized, the geographic inaccessibility of natural resource deposits with respect to governments and their ease of exploitability for rebels must be taken in account simultaneously when studying the rebel funding mechanism. Based on the existing evidence, we expect that the interplay of these two dimensions is likely to trigger contrasting forces that may either prevent or make a civil conflict more likely. Given our classification of natural deposits either in terms of geographic accessibility/inaccessibility and ease/difficulty of exploitation, we can imagine four possible interactions that may differently shape the probability of the occurrence of civil wars. As illustrated in **Scheme 2**, we can visualize the following mix of these two dimensions: 1) Resources that are geographically accessible with respect to the central government and relatively more difficult to extract and/or trade for rebel groups, 2) resources that are geographically accessible with respect to the central government and relatively easier to extract and trade for rebel groups, 3) resources that are geographically inaccessible for central governments and relatively difficult to extract and/or trade for rebels and 4) resources that are geographically inaccessible for governments and relatively easier to extract and/or trade for rebels. In the following paragraphs, we will discuss how, according to the existing literature, these four categories may affect the outbreak of civil conflict and how one of them can clearly explain the rebel funding mechanism.

Scheme 2 Deposits' characteristics and incidence of civil conflicts

GEOGRAPHIC ACCESSIBILITY / EASE OF EXPLOTABILITY	**DIFFICULT TO EXPLOIT** *Deposits' extraction requires a substantial amount of capital. Moreover, these resources are mostly traded in official and global markets.*	**EASY TO EXPLOIT** *These deposits are lootable or in general easy to exploit. Moreover, these resources can be traded in unofficial and contraband markets.*
ACCESSIBLE *Natural deposits located close to the state's capital and/or on an accessible terrain*	**Impact on the probability that a civil war will occur:** the government can exploit the resource revenues and either be strengthened or weakened (+,-). At the same time, rebels will not benefit much from these resources (-). The resulting direction of the effect is unknown. **ΔPr(CW[1])=?** **Examples:** oil deposits, primary diamond deposits, primary gold deposits and primary gemstone deposits close to the state's capital and/or located on an accessible terrain.	**Impact on the probability that a civil war will occur:** the government can exploit the resource revenues and either be strengthened or weakened (+,-). At the same time, rebels can use resources for conflict funding (+). The resulting direction of the effect is unknown. **ΔPr(CW)=?** **Examples:** secondary (i.e. lootable) diamond, gold and gemstone deposits as well as drug plantations close to the state's capital and/or located on an accessible terrain.
INACCESSIBLE *Natural deposits located far from the state's capital and/or on an impervious terrain*	**Impact on the probability that a civil war will occur:** the government may have a small incentive to use these resources (+,-). At the same time, rebels will not benefit much from them. The resulting direction of the effect is unknown. **ΔPr(CW)=?** **Examples:** oil deposits, primary diamond deposits, primary gold deposits and primary gemstone deposits far from the state's capital and/or located on an impervious terrain.	**Impact on the probability that a civil war will occur:** the government has a low incentive to use these resources. At the same time, rebels will use them for funding military operations (+). The resulting direction of the effect is expected to be positive. **ΔPr(CW)>0** **Examples:** secondary (i.e. lootable) diamond, gold and gemstone deposits as well as drug plantations far from the state's capital and/or located on an inaccessible terrain.

Notes Natural deposits' geographic accessibility/inaccessibility and ease/difficulty of exploitation simultaneously and ambiguously affect the probability that a civil conflict may emerge in a given country. By focusing on geographically inaccessible and easily exploitable natural resources, we expect to clearly isolate the rebel funding hypothesis. Moreover, we expect the underlying mechanism to unambiguously increase the probability of the occurrence of a civil conflict.

(1) The abbreviation *CW* stands for *Civil War*.

Resources that are easy to access for state authorities due to geographic features and that also require large investments for their exploitation are likely to be secured exclusively by governments. From a theoretical point of view, rebels do not dispose the financial resources neither to compete for their control nor to trade them in the market. These types of resources include for instance offshore and onshore oil deposits, primary diamond deposits, primary gold deposits and gemstones deposits that are located in proximity of a state's capital. Since the government is going to be the only beneficiary of these natural riches, we expect that only the mechanisms that link the central state to the outbreak of civil war will materialize. As the literature has pointed out, on the one hand the government may either use the revenues stemming from these resources to reinforce their military capability and to better secure its control over the state's territory. However, on the other hand it is also possible that this source of income may trigger processes leading to institutional weakening and to the spread of corruption. These phenomena can in turn destabilize the central power and inhibit its ability to prevent the potential outbreak of violence. Therefore, the effect that this category of natural resources may have on the incidence of intrastate hostility is mixed since two overlapping and opposite forces are simultaneously present.

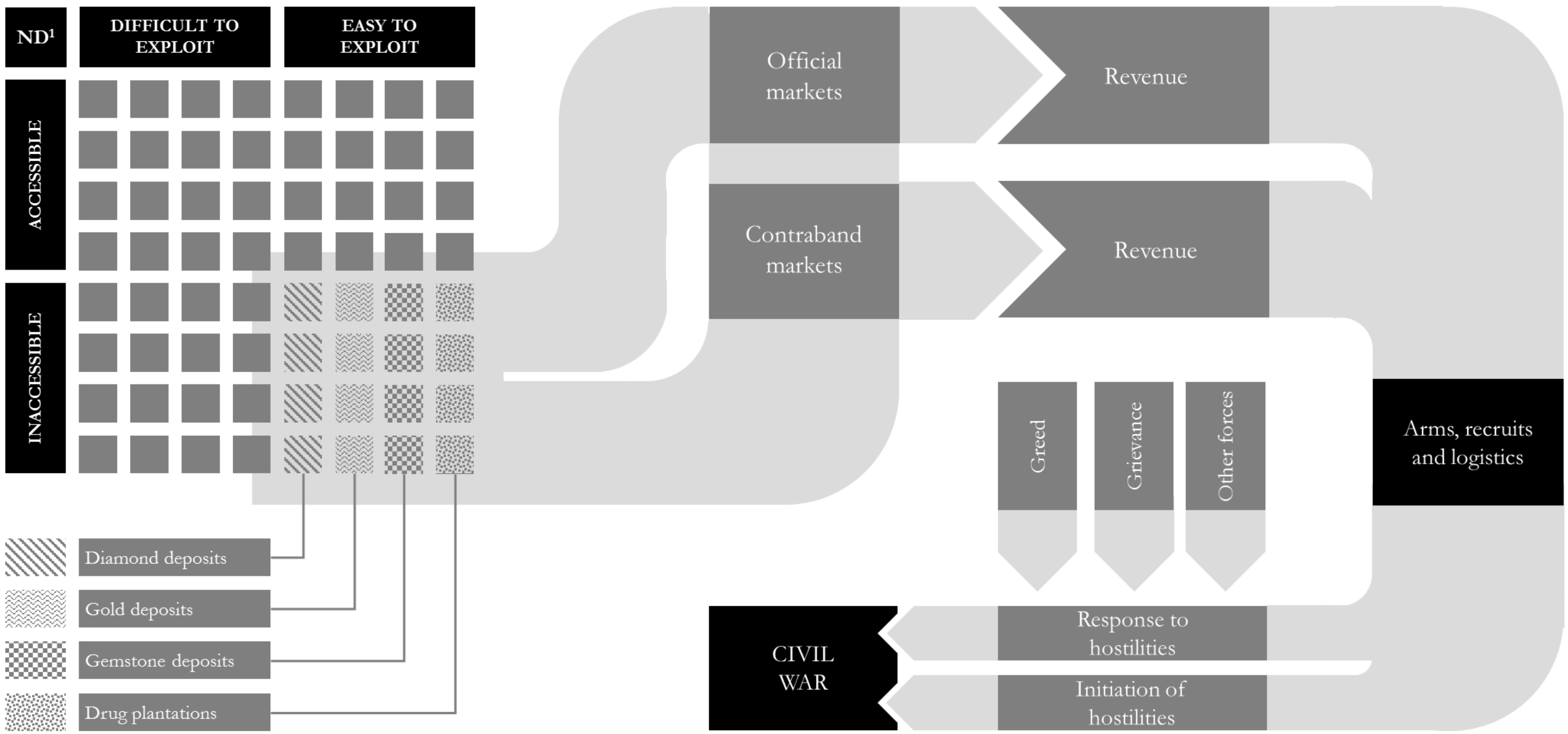
If we consider the analogous case but focusing instead on natural resources that are easy to exploit and/or trade in official and contraband markets, we expect rebel groups to come into the picture and compete for their control. Nonetheless, as we have just mentioned, the proximity to state's central power is likely to deter rebels and leave the central government as the main beneficiary of the revenues stemming from these reserves. The weakening and strengthening effects that natural resources revenues may have on government's power as well as the rebels' willingness to partially exploit these deposits may give rise to ambiguous effects. In this case, it would be particularly difficult to isolate the rebel funding mechanism as well as identifying whether these deposits make civil conflict more or likely or not to occur. As a consequence, we are not able to state *a priori* if the impact of those resources on the incidence of civil conflict will be positive or negative.

When we focus on natural resources that are both geographically inaccessible for the central governments and prohibitive to extract and trade, we are still unable to form a clear expectation on how they may relate to the occurrence of civil conflicts. If any actor at all has an incentive to control these deposits, the only likely beneficiary of their revenues is going to be the central state. Again, rebel forces are assumed to have limited amount of financial capabilities to exploit this type of deposits. As we explained before, the central state could use the resulting revenues to strengthen its control over the country's territory but also be weakened by the resulting corruption and institutional degradation that may be triggered by resource revenues. In some isolated cases where deposits are located far away from a state's control, it is also likely that rebel groups may try to capture the state-built infrastructure to extract these resources, as it happened recently in the case of South Sudan (De Waal 2014). Even taking this possibility into account, as in the previous scenario, it would be difficult to assess whether this category of natural resources will make a civil conflict more or less likely or if it will have an effect at all.

When it comes to natural resources that are geographically difficult to access for governments and relatively easier to exploit and trade for rebels, it becomes easier to identify an unambiguous force driving the outbreak of civil conflicts. Since natural deposits located far away from the capital and on an impervious terrain are difficult to control for central governments, rebels may face an incentive to secure and use them to generate revenue and finance their military operations. Moreover, this incentive may be strengthened if resources are also easy to extract and trade. This may indeed be the case because they are lootable and/or there exist contraband markets where they can be traded. Since the government is likely to be cut out form the use of these resources, rebel groups would be the exclusive beneficiaries of these natural riches.

The next logical step lies in the functioning of the feasibility hypothesis proposed by previous studies. We recall that the literature suggests that rebels have an unambiguous positive incentive to engage in a war when they dispose enough funding to do so. In this context, we argue that the availability of inaccessible and lootable natural deposits may fuel rebels' attempts to initiate a war against a government or to militarily respond to government's offensive actions. Connected to this, we also consider rebels' military initiative to be the most important determinant of the outbreak of civil conflicts. Since virtually all states maintain standing armies and are constantly able to engage in both offensive and defensive actions, we clearly see that the outbreak of a civil war is solely conditional on the existence of a nongovernment military force (Collier et al. 2009). However, such a military capability can only be sustained if there is the necessary funding to fuel it and natural resource revenues can easily provide this financing. For this mechanism to work, we finally need to assume that the availability of funding is the primary driver of the occurrence of wars while motives like greed, grievance and other forces only play a secondary role (See Section 2). The literature has in fact highlighted that all individuals are likely to share feelings of greed or grievance to some extent. In case this assumption does not hold strictly, individuals may still self-select in groups that share these motives and use natural resource revenues to pursue them (Weinstein 2005). Even in this case, we see that the feasibility of violence remains the key determinant of its eventual occurrence. **Scheme 3** summarizes all these considerations and illustrates functioning of the rebel funding system.

Scheme 3 Illustration of the rebel funding mechanism



Notes The rebel funding mechanism is fueled by the availability of inaccessible and lootable natural deposits. These resources may in fact be traded by rebels in both legal and illegal markets, in turn generating revenues for these groups. The financial resources consequently obtained may be employed to build a military capacity that can be used to either initiate a conflict or respond to an aggression from the central government. In our framework, do not exclude that secondary mechanisms like greed, grievance and other motives play a role in the outbreak of intrastate wars. However, as shown by the literature, we believe them to play only a secondary role in our picture. Oil deposits are not considered in our analysis since we assume them to be relatively difficult to exploit given the elevated costs and complexities (i.e. not easily exploitable) associated with oil extraction, transportation and trade.

(1) The abbreviation *ND* stands for *Natural Deposits*.

After this general overview on how diverse types of natural resource deposits may influence the occurrence of intrastate conflicts, we are now ready to formulate our main hypothesis. Building on the findings of the recent literature and on our previous considerations, we expect that:

> *(H) The availability of geographically inaccessible and easily exploitable natural deposits provides the necessary financing means for rebels to take part in a civil conflict. Consequently, we expect that the discovery and the utilization of deposits that are far away from the state's capital, inaccessible due to terrain characteristics, easy to exploit and/or illegal in nature will unambiguously increase the probability that a country may suffer from a civil war.*

Moreover, we expect this mechanism to hold both when rebel groups are the initiators of such hostilities and when it is the government to militarily attack these former groups. We indeed assume that also in this latter case, rebels would need a sufficient amount of financial means to appropriately respond to governments' offensives, eventually leading to large-scale violence that may turn into a civil conflict. Thanks to our focus on a specific set of resources, we expect that this mechanism will not overlap with other dynamics described by the literature. In other words, we believe that considering solely inaccessible and lootable resources will make the rebel funding hypothesis easy to isolate and quantify.

The types of resources that we have selected to conduct our analysis are diamonds, gold, gemstones and drugs. In the following sections, we will focus our attention on a particular category of natural sources, namely lootable ones (i.e. deposits where minerals are relatively easy to extract). As mentioned above, secondary[4] diamonds and secondary gold fall in this category. With respect to gemstone deposits, the existent datasets do not differentiate between lootable and non lootable deposits. However, there are reasons to recognize these sources as relatively lootable as we will see in the next section. We decide to include these latter deposits in our analysis but focus more on how their geographic inaccessibility plays a role in the rebel funding mechanism. Finally, all types of drug harvests (i.e. opium poppy, coca bushes and cannabis plants) are in general considered lootable by the literature. For all these natural resources, we will simultaneously consider two ways in which their geographic inaccessibility affects the likelihood of civil conflict. In particular, we will take in account the deposits' distance from the state's capital and the imperviousness of the terrain on which they are located. As we will specify soon, a terrain is broadly defined as impervious if it is characterized by a certain type of land cover (e.g. thick forest, desert land, wet soil and so on) or located in a mountainous region (i.e. 600 meters above the sea level). To conclude, the reader may wonder why we did not cover the most studied natural resource in the literature, namely oil. Although data is publicly available, we do not consider petroleum basins since we assume that their exploration and exploitation is costly and complex and hence out of the reach of rebels' financial possibilities. As a consequence, oil does not enter in the rebel funding mechanism, at least from a theoretical perspective.

Given our previous considerations, we expect the abundance of inaccessible and easily exploitable resources to have an unambiguous positive effect on the probability that a country will experience an armed conflict within its borders. We believe in fact that using these specifications, i.e. targeting these specific natural deposits, will allow us to clearly identify and quantify the rebel funding mechanism and explain partially what has been observed in many developing countries. In terms of empirical results, we would expect the coefficients associated to selected natural resources to be significant and positive, suggesting a positive influence of inaccessible and lootable deposits on the incidence of civil conflicts (see Section 5).

Nonetheless, we cannot guarantee that restricting our attention to these specific natural resources will lead to the desired results. Unclear outcomes could indeed arise for several reasons. First, it is possible that alternative mechanisms explored by the literature will still overlap with the rebel funding hypothesis and lead to mixed results. Second, it could also be the case that revenues originating from the trade of natural resources are not sufficient or less preferred to finance any kind of rebel military activity. In such a scenario, it is indeed possible that the rebel funding mechanism is nonexistent in the first place, suggesting that other forces exclusively explain the occurrence

[4] The characteristics of secondary deposits will be discussed in Section 4.

of civil war in developing countries. Additionally, as researchers have already pointed out, we may still be exposed to the risk of omitted variable bias and reverse causality. This could potentially result from the influence of unobserved factors and/or the potential two-way relationship between the occurrence of civil conflict and natural deposit discovery and availability. Finally, even if available data can be considered relatively extensive and reliable, there is still considerable room for it to be unsuitable for our analysis. Measurement errors, missing observations for both conflicts and resource deposits and the usually short time span of datasets can in principle lead to inaccurate estimates. The limited level of detail of certain data sources (e.g. the unavailability of geolocated data for violent events for a sufficiently long period) can also pose a major obstacle to the investigation of our hypothesis. As it turns out, data issues indeed are a driver of inconclusive results and are likely to constitute the principal issue when trying to answer our research question. To conclude this section, we remind the reader that we will address all these possibilities in detail after reporting the results of our analysis.

Note on the inclusion of drug plantations One thing that may strike the reader at this point is the fact that we choose to consider drug harvests as natural resources. Although agricultural products (including drugs) can be broadly classified as such, we must note that there are important factors that sets them apart from typical mineral resources. One evident aspect is that drug plantations are usually not present ex-ante in a given territory and, consequently, they need to be cultivated. Contrarily to mining operations that can only be performed in specific geologic areas, drug cultivation is flexible from a geographic perspective although it still remains constrained by weather conditions. With respect to this consideration, we must also observe that drug harvesting substantially differs from mining since climatic shocks can significantly affect the output of plantations. Moreover, drug cultivation requires different inputs compared to mining. The most relevant differences with this respect are the larger requirement for labor and the relatively lower need for capital.

Contrarily to mineral resources, the intensity of cultivation of drug plants is highly susceptible to a specific set of variables. As we have just mentioned, climate conditions highly influence the size of harvests while they virtually do not affect mining operations. Among other factors, the degree of government control can also influence the likelihood that drug plantations will start in a given territory (i.e. the more an area is under control of the central government, the less likely it is for locals to cultivate drug plantations). From a general perspective, the partial lack of exogeneity that characterizes the presence of drug plantations may be critical for the results of our analysis. Moreover, in the absence of relevant data sources, there are not suitable specifications that we can implement to effectively mitigate this issue. To partially counter this problem, we will however consider lagged values for the intensity of drug cultivation and we will be particularly careful in interpreting the coefficients associated to this type of natural resource.

Although the previous considerations may favor the exclusion of drug plantations from the scope of our study, there are several other factors that may motivate us to consider this particular type of resource. First, drug harvests highly resemble mined minerals in terms of value per weight ratio. Market prices for most drugs have been indeed in line with prices for gold and other precious metals. For this reason, drugs are likely to generate significant streams of revenues comparable to those stemming from diamonds, gold and gemstones. Moreover, there is a wide literature of case studies that have documented how drug trafficking has been an important source of revenue source for groups, especially in Southern American and in the Middle Eastern civil conflicts.

We must recall that the existing literature has been very careful when considering drug plantations and agricultural products as examples of natural resources. However, given the potential influence these resources may have on the mechanisms explaining the resource curse, most researchers have included them in their empirical analyses (Ross 2004b; Lujala 2005; Rosser 2006). With respect to the scope of our study, we acknowledge the fact that such a choice remains risky and that the resulting empirical estimates must be interpreted very cautiously. However, given the potential influence drugs may have on the rebel funding mechanism, we decide to include them in our analysis.

4. Data Sources and Summary Statistics

In this section we will present the data sources we have relied on to investigate the hypothesis we have just formulated. We will initially discuss how we used publicly available information to construct our dependent and independent variables, also mentioning the methodology adopted by the respective authors to build the original datasets. We will then present the data sources we employed to construct our control variables and the methodology used to specify them. Furthermore, we will also explain the motivations that led us to include these controls in our empirical analysis. Lastly, we will provide the reader with some general summary statistics in order to give her a better understanding of the characteristics of these data sources.

4.1 Data Sources

Referring to the core of our analysis, we will first present data sources on civil conflicts and natural sources, restricting our attention to diamond, gold and gemstone deposit as well as drug plantations. With respect to this latter category, we will further explain how we collected and classified information about resources' geographic accessibility and exploitability. In the concluding section, we will list and discuss the data sources we have used to build our main control variables and to perform our robustness checks. We want to note that, for the rest of our discussion, we will fixate our attention to natural resource deposits located in developing countries. This choice originates form the fact that the resource curse has indeed been a phenomenon occurring in this precisely identified group of nations. Moreover, the results of this study are most likely to serve as tool to tackle the resource curse in this specific subset of countries while they would be of little use for already developed nations, broadly defined as the OECD members (Wheeler 1984; Collier and Hoeffler 2000). The geographic regions we will restrict our attention to will be Africa, Central and South America, Middle East and South-East Asia. Independent countries enter our dataset with an observation for every year from 1945 to 2007 or, in case they became independent after 1945, they enter from the year of their independence up to the year 2007. Our country-year observations will be limited to this specific period since it is the longest time window after the Second World War that can be covered with available data for both our dependent and independent variables. Additionally, focusing on such a long time-span results in the utilization of enough observations to ensure that our study has a high statistical power. In our analysis, we will exclude small states (i.e. those whose area is below the 10'000 km^2 threshold), isolated countries (e.g. countries in the Pacific Region), nations for which there is a limited availability of observations due their recent independence history (e.g. ex USSR countries) and countries with no information about natural resource deposits at all (i.e. China). The complete list of countries included in our study is presented in **Table A1** (See Appendix).

4.1.2 Civil Conflicts

We obtained data on civil conflicts form Correlates of War (COW). The Correlates of War Project is the result of a common effort to provide detailed and accurate information to researchers in the field of peacebuilding and conflict resolution. Since 1963, the project has been collecting historical data on wars among and within states, providing comprehensive and reliable information that has become widely adopted for its standards of accuracy, reliability and transparency. Among the different datasets provided by COW, we have focused on the Intra-State Wars v.4.0 dataset, which documents known civil wars from 1945 to 2007 (Sarkees and Wayman 2010). The authors have primarily addressed wars that took place within the territory of an officially recognized state, where the central government was engaged in military operations against at least one internal opposition group. Hostility between governments and rebel groups has been by far the most frequent manifestation of intrastate violence and researchers have not yet reported civil conflicts involving rebel groups exclusively. As other publicly available sources, the COW Intra-State Wars dataset relies on a rigorous methodology to classify events of civil violence as proper civil conflicts. According to the COW war topology, to be classified as such, a civil war must involve sustained combat between two or more armed groups which results in at least 1000 battle-related combatant fatalities within a period of one year. Additionally, this classification requires civil conflicts to involve factions that are capable of effectively resist the attacks of their opponents, a specification that allows to filter out episodes of one-sided violence like massacres, ethnic cleansing and violent riots. More precisely, the capability of effective resistance requires the opposing groups to be organized and able to militarily face their respective opponent. To effectively be documented as a civil war, the weaker side's operations must cause at least a number enemies' casualties equal to 5% of the fatalities reported by the stronger side for the whole duration of the conflict. For each civil war, the COW dataset reports its start and end date, location (i.e. country), participating sides and the estimated number of casualties for each conflict. As we will explain later on, we will define our dependent variable as the occurrence of a civil conflict for each country×year observation entering in our dataset. More precisely, our variable will be a dummy that takes the value of 1 if a civil war was documented in a selected country in a given year and 0 otherwise.

4.1.2 Natural Deposits

In this section, we will briefly present the sources we have used to build our dataset. We will provide the reader with information on the original datasets we used to study diamond, gold and gemstone deposits as well as drug plantations. Additionally, we will briefly discuss the comparability of these datasets.

Diamond deposits Data on worldwide diamond deposits is obtained from the DIADATA dataset, a comprehensive and geocoded list of diamond deposits providing information on their geological form and their discovery date. The dataset covers deposits whose existence and discovery date were known from 1945 to 2005. This data source is the result of the work of independent researchers affiliated with the Peace Research Institute of Oslo (PRIO) which has made this dataset publicly available (Gilmore et al. 2005; PRIO 2017). From a methodological point of view, diamond deposits are more generally identified and documented as diamond occurrences, i.e. recorded observations are mainly sites with known activity related to extraction and production and/or with confirmed diamonds discovery. One useful feature of this dataset is that it labels diamond deposits according to their geological form. Diamonds can in fact be found in kimberlitic structures[5] (primary diamonds) or in alluvial deposits[6] (secondary diamonds), i.e. locations in proximity of river beds or sedimentary deposits close to the earth surface. This distinction is indeed important since it will allow us to differentiate between primary diamonds that are difficult to extract and secondary diamonds that are easier to collect and trade for rebel forces. In our empirical analysis, we will include the number of geographically inaccessible and easily exploitable diamond deposits by creating a variable that expresses the number of available deposits located in a selected country in a given year. For the reasons mentioned in our theoretical framework, we will use this independent variable lagged by one year with respect to our observations for the occurrence of civil conflicts.

[5] Kimberlitic structures, also referred as kimberlite pipes, are geological formations usually containing diamonds that are located between 140 and 200 kilometers below the earth's surface. Kimberlite deposits formed approximately two billion years ago in the earth's mantle were the high pressure allowed for the formation of diamonds. Due to the cyclical movements of the mantle, these formations slowly reached the earth's crust where they can be accessed through complex mining operations.

[6] Alluvial deposits form from the erosion of primary deposits whose content is transported by water flows over time. Rivers' currents transport diamonds far away from their primary deposits and eventually let them sediment in geological structures close to the earth's surface. Sedimentary structures are easier to mine given their porosity and their proximity to the surface.

Gold deposits Data on gold deposit is obtained from the GOLDATA dataset which is the result of an independent research effort to record a list of known gold deposits around the world and provide useful information on their geological nature (Balestri 2013). The dataset covers gold deposits known or discovered from 1945 to 2013 and follows the same methodology adopted by PRIO researchers when building the DIADATA dataset. As for DIADATA, information that compose GOLDATA includes geographic location, date of discovery and geological form of gold deposits. Gold deposits are either classified as primary[7] (i.e. deep gold veins that need to be extracted using complex mining operations) and secondary[8] (i.e. alluvial and surface deposits that are easier to exploit). Again, this distinction makes it easy for us to consider the different impact that primary (i.e. non-lootable) and secondary (i.e. lootable) gold deposits may have on the outbreak of intrastate wars. As we have briefly mentioned, an important feature of this dataset is that it closely follows the same methodology and geological specifications on which DIADATA is based on. This feature makes the classification of primary and secondary deposits very similar between the two datasets, making them easily comparable. Analogously to the specification used for diamond deposits, in our regressions we will use a one-year lagged variable that expresses the number of inaccessible and lootable deposits located in a selected country in a given year.

Gemstone deposits The GEMDATA datasets provides information on known gemstone deposits locations, discovery and their geological characteristics from 1945 to 2009 (Lujala 2009). The dataset records known deposits of ruby, sapphire, emerald, topaz, quartz and other precious minerals and excludes gold and diamond sources. The methodology used to compile this data source follows the standards adopted by DIADATA and GOLDATA, making them easily comparable. Differently from these latter two data sources, GEMDATA does not provide any characterization in terms of primary and secondary gemstone deposits. Unfortunately, the lack of this information did not allow us to differentiate between lootable and non-lootable gemstones. As a consequence, this limitation will prevent us from studying how easily exploitable gemstones influence the incidence of civil conflicts. However, as the author of the dataset points out, gemstone deposits can be considered relatively lootable for one specific reason (Lujala 2009). Natural resources that enter the GEMDATA dataset have in fact a lower value per weight ratio compared to gold and diamonds, making the mining of primary gemstone deposits (i.e. deep deposits) usually not profitable. Therefore, most of the gemstone deposits that have been exploited either by government or rebel forces are secondary in nature (i.e. relatively easy to extract) and hence lootable to some extent. Although this argument may appear convincing, we will nonetheless be careful in the interpretation of our results when considering the impact that gemstones may have on the rebel funding mechanism. Similarly to diamonds and gold deposits, we will create a variable expressing the one-year lagged number of inaccessible gemstones sources, reporting the levels of such deposits for each country×year observation in our dataset.

Drug plantations Information regarding drug plantations come from the DRUGDATA dataset which reports the geographic location as well as the cultivation period of coca bush, opium poppy, and cannabis (Buhaug and Lujala 2005). The dataset gathers areas where drug cultivation activities were known to occur between 1945 and 2005 and records them as polygons on a world map in a GIS environment. Since previously presented datasets specifically document the exact location of deposits as a single latitude-longitude entry for each observation, we disaggregated the plantation polygons to obtain single latitude-longitude points on the earth's surface. More in detail, we created a 1.0×1.0-degree grid on a GIS framework and recorded every node of the grid overlapping with these polygons as a drug plantation location. As the author of the dataset pointed out, drug harvests are highly lootable, especially when considering classic drug plantations like opium, coca and cannabis. The fact that these products are highly lootable is not the only interesting characteristic of this type of resource. Drug harvests are also interesting for the scope of our analysis because rebels can exclusively benefit from their illegal trade, an

[7] Primary gold is usually found in quartz veins that formed in the earth's mantle and slowly emerged towards the terrestrial crust. Due to the low concentration of gold in these geological formations, its extraction is not always economically viable. Moreover, being embedded in compact and deep quartz formations, gold extraction usually requires dedicated and expensive infrastructure as well as a skilled labor force.

[8] See note 3.

activity that governments are in principle forbidden to pursue. In our analysis, we will take into account the number of geographically inaccessible drug plantations by creating a variable that expresses the number of these sources located in a selected country in a given year. As we will do for diamond, gold and gemstone deposits, the number of active drug plantations will be lagged by one year with respect to our dependent variable.

4.1.3 Geographic Accessibility

In order to analyze the role of geographic inaccessibility of natural resources, we needed to match the individual natural deposits we obtained from our data sources to their geographic characteristics. As the reader may recall, the features we are interested in are the deposits' distance from the state capital and the characteristics of the terrain on which they are located. The interest for these specific dimensions is inspired by previous studies that have highlighted how distance from central power, land cover and terrain elevation may be relevant factors in the study of the resource curse (Fearon and Laitin 2003; Balestri and Maggioni 2014).

Concerning the distance from the state's central power, we computed the shortest curve between the capital and the deposits' coordinates along the surface of a mathematical model of the earth. More precisely, starting from each state's capital and deposit's latitude and longitude, we used Vincenty's equations to calculate the ellipsoidal distance between these points using the WGS 84 (abbreviation of World Geodetic System 1984) reference system (Vincenty 1975; Snay and Soler 2000). As the reader will observe further on, we mainly focus on three specifications of distance from the state's central power, alternatively considering deposits that are 250, 500 or 750 kilometers beyond the capital's range. Regarding the terrain features that may characterize an area around a natural deposit as inaccessible, we identified two main geographic dimensions, namely the terrain land cover and the deposit's elevation. More specifically, land cover characteristics as the presence of thick forestry and wet surfaces like swamps, are likely to make certain natural resource deposits difficult to access. The same reasoning applies to natural deposits found in mountainous regions, which we consider as areas whose elevation surpasses the threshold of 600 meters above the sea level (Whittow 1984). For each deposit entering in the diamonds, gold, gemstones and drugs datasets, we extracted its land cover characteristics from the Land Cover CCI Project developed by the European Space Agency (Defourny et al. 2012). We then classified a given area as difficult to access if it is covered by more than 50% by thick vegetation (i.e. forest), located in a desert area and/or if it is flooded for the most time of the year. We want to note that we did not observe any time varying pattern in terms of change of land cover for the selected areas and hence we considered the historical land cover type of each location. To extract the altitude of the deposits' locations, we used the Google Maps Elevation API, an open source platform to obtain location's elevation starting from its geographic coordinates (Google Inc. 2017). In practical terms, we simply matched the latitude and longitude of each natural resource deposit to its corresponding altitude. We then classified deposits as geographically inaccessible if they are located far away from the state's capital and if they are found in impervious areas, i.e. if they are characterized by an unfavorable land cover or if they are located in a region above 600 on the sea level. As suggested before, in our analysis we will only consider deposits that match this definition of geographic inaccessibility and drop those that do not fulfill this specification. To avoid confusion later on, we remind the reader that we will usually refer to geographically inaccessible deposits as simply "inaccessible" deposits.

4.1.4 Data Sources and Construction of Control Variables

To test the robustness of our analytical framework, we will make use of additional data to complement and validate our results. Since time and country-invariant variables will be separately taken into account, we will focus on time and country-varying factors that the literature has indicated as relevant (Cotet and Tsui 2013). As we will illustrate later, all our control variables will be lagged by one-year period with respect to our dependent variable, a choice we make to control for the influence of reverse causality and the deferred effect these variables are assumed to have.

Two important variables that we will choose as controls are population size and income per capita (Feenstra and Inklaar 2016; World Bank 2017a). Upward changes in population size could in principle affect the available per capita stock of resources and lead people to fight over the necessary means of survival. In the plausible scenario where individuals have relatively less resources to sustain themselves due to an increasing population, people may start to fight over land, food and other resources to sustain themselves. Therefore, the mechanisms triggered by an increase of population size may possibly lead to a country's instability and, as an extreme consequence, to civil conflict (Schwartz 2000). A similar argument can be proposed to justify the inclusion in our analysis of per capita income. A shrinking per capita income could in principle create an incentive for individuals to fight over the resources to compensate for the decrease of individual wealth (Collier and Hoeffler 2004). Additionally, when income per capita is low, the opportunity cost of joining a rebel group is also low. (Collier et al. 2009). We further expect the effect of shrinking population and/or increasing individual income to have the opposite effect, hence acting as a preventive factor with respect to the outbreak of violence. As the reader may expect, these mechanisms may in principle influence the outbreak of civil conflicts through channels that are unrelated to the rebel funding mechanisms, which constitutes the reason why we will use them as controls. Moreover, both variables will be considered in their logarithmic form to take into account their potential nonlinear behavior and to better interpret our coefficients later on.

As the literature has suggested, we may want to control for factors that may lead to state instability through other mechanisms. The rationale between this argument is that not controlling for weakly exogenous factors affecting a country's stability would not allow us to clearly isolate the rebel funding mechanism. As we have mentioned before, an unstable and weak state is indeed more likely to suffer from civil conflicts for many reasons, including the fact that rebels' incentives to engage in a civil conflict would be higher. Consequently, by not controlling for these forces, we would not exclusively capture the effect of inaccessible and lootable natural deposits on intrastate war. The first aspect we want to take into account is the manifestation of natural resource dependency. We measure it starting from the share of a country's oil products export over GDP, which we will use to build an index for a country's dependence on natural resource revenues. As indicated by previous research, this choice is targeted to take into account countries highly reliant on oil exports since they tend to suffer more by civil conflicts and low development performance in general (Ross 2004; Fearon 2005). Oil exporting states in our dataset will then be identified by creating a dummy that takes the value of 1 if, in a given year, revenues from petroleum products have accounted for more than 30% of a country's GDP. Information about this indicator is taken from the dataset used by Fearon and Laitin and complemented with data obtained from World Bank (Fearon and Laitin 2003; World Bank 2017b). Connected to this aspect, we will also consider the fact that trade openness levels may in principle aggravate or alleviate the negative effects of the resource curse by making a state more or less reliant on natural resource revenues. As for high shares of oil exports, low levels of trade openness may in principle make countries more unstable and likely to be affected by internal conflicts (De Soysa 2002a). In the attempt to control also for this effect, we will include trade openness as the ratio of imports and exports over GDP and collect this data from the World Bank (World Bank 2017c). The main reason that motivates this choice is that natural resource exports and openness to trade may affect the systemic risk a country faces to become unstable and eventually experience a civil conflict. In other words, controlling for these two aspects may help us to isolate and better understand the rebel funding mechanism we have presented above.

As we will explain later, we may want to include additional controls to check the robustness of our results once we obtain our preliminary estimates. To do so, we will consider how the preexistent level of democracy or autocracy may affect the outbreak of civil war and partially explain our results (Fearon and Laitin 2003; Tsui 2011). To control for this variable, we will consider the level of democracy as defined by the Polity IV Project (Marshall et al. 2002). The Polity index expresses the democracy level with a scale from -10 (most authoritarian regime) to 10 (most democratic state) and we normalize it using a scale from 0 to 20. As other studies have pointed out, we will also consider how adverse climate conditions may facilitate the outbreak of violence (Hendrix et al. 2007; Raleigh and Urdal 2007). To do so, we will add controls for temperature (starting from average daily temperature in Celsius degrees) and rainfall (starting from millimeters of rain per day), obtaining this data from the World Bank Climate Change Portal (World Bank 2017d). Both temperature and rainfall will be measured as yearly deviations from the country's historical mean.

In addition to these factors, we also want to control for path dependency and spillover effects connected to the outbreak of civil wars. In other words, we want to take into account the possibility that the incidence of civil war in a given year may be partially explained by an ongoing civil conflict in the previous year. Moreover, we also wish to control for the fact that conflicts in neighboring countries may increase the probability that a state will as well experience a civil war due to spillover effects. To account for these two possible mechanisms, we will add controls for conflicts in the previous year both in the same state and in neighboring countries separately, extracting these data from the COW datasets. We will include these two factors as dummy variables taking the value of 1 if a civil war was recorded in a neighboring country or in the selected country respectively.

Moreover, as noted by the previous literature, we will take in account the fact that countries that recently gained their independence may suffer from greater instability. This argument originates form the fact that independence is usually accompanied by a power vacuum that negatively affects newly-formed states for the first years of their history (Feron and Laitin 2003). In practical terms, we will check the robustness of our results adding a dummy variable that takes a value of 1 if a country-year observation is recorded up to two years after the country has gained independence.

As we will point out later on in our analysis, we want to stress the fact that all our controls, together with our main independent variables, will be one year lagged with respect to our independent variable. On the one hand, this widely adopted specification aims to reflect the time lag that in theory stands between the availability of natural resources and their effective transformation into revenues to fund military operations. We believe in fact that the transmission process that links natural resources to the occurrence of intrastate wars is not immediate and we assume that one-year period is the necessary amount of time we need to wait for seeing the manifestation of the rebel funding mechanism. On the other hand, a similar argument motivates the inclusion of lagged terms for our control variables since their effect is also assumed to be deferred in time by one year. As the reader will observe later in our robustness checks, we will relax this assumption by allowing these transmission processes to take two or three years. We want to stress that using lagged terms has also the benefit to limit the possible effect of reverse causality patters. To some extent, our choice indeed allows us to control for the possibility that intrastate wars affect the level of our independent variables.

As mentioned above, we will also attempt to test the robustness of our results by using a different specification for civil conflicts. To do so, we will test our model with data for intrastate wars between 1945 and 2015 obtained from the Uppsala Conflict Data Program (Gleditsch et al. 2002). Contrarily to COW, the UCDP classification sets a lower threshold to classify different types of hostilities as conflicts. More in detail, its methodology recognizes a violent event as a proper conflict if there is evidence of the use of armed force between two parties, of which at least one is the government of a state, which results in at least 25 battle-related deaths in a calendar year. We will include this specification to see if our results are also robust to other definitions of civil conflict built on alternative data sources. As we did for COW data, we define our alternative dependent variable as the occurrence of a civil conflict for each country×year observation entering in our dataset. More specifically, our variable is a dummy that takes the value of 1 if a civil war was documented in a selected country in a given year.

4.2 Summary Information

In the following paragraphs, we will present summary information for our dependent and main explanatory variables. We will first provide the reader with a broad idea on the incidence, severity, length and time distribution of civil conflicts in developing countries. We will proceed by analyzing the geographic distribution, the abundance and the discovery path of geographically inaccessible and easily exploitable natural deposits. In the concluding part of this sub-section, we will compare all world countries with selected developing countries with respect to the incidence of intrastate wars and their endowment of natural resources.

4.2.1 Civil Conflicts

Since the end of the Second World War, developing countries in all geographic regions have been constantly plagued by civil conflicts (**Table 1**). If we restrict our attention to the period between 1945 and 2007, i.e. the time window covered by the COW dataset, we count a total of 161 individually identified events that match the Correlates of War's specifications of civil conflict. Almost half of these intrastate wars have occurred in the African continent, with Sub Saharan Africa being the theatre of almost 40% of civil wars in the selected period. The situation has been less severe in Asia, the Middle East and Latin America, at least in terms of absolute number of civil conflicts that have been documented in these regions. However, when looking at civil wars at the country level, African states have not suffered as much as Asian countries which have on average been hit by three conflicts in a period of 62 years. However, we must note that the variation of the number of conflicts experienced by single countries is significant, mainly due to the presence of several outliers across all geographic areas. Countries that have suffered from an exceptionally high number of uniquely identified civil wars are Indonesia, Iraq and Nigeria.

Table 1 Documented individual civil conflicts in developing countries

	Number of civil conflicts	Percentage of recorded conflicts	Mean number of civil conflicts per country	Median number of civil conflicts per country	Standard Deviation
All selected countries	161	100%	1.660	1	2.110
Africa	73	45%	1.553	1	2.030
Sub Saharan Africa	70	43%	1.667	1	2.101
Asia	39	24%	3.000	3	2.542
Central and South America	14	9%	0.737	0	0.909
Middle East	35	22%	1.944	1	2.321
Top 3 countries for number of conflicts:					
Indonesia	9	6%			
Iraq	9	6%			
Nigeria	8	5%			

Notes Summary information for the period 1945-2007. Data for recorded civil conflicts is obtained from the Correlates of War Project (COW). The table reports information on episodes of violence that involved sustained combat between two or more armed groups which resulted in at least 1000 battle-related combatant fatalities within a period of one year. To be considered as civil conflict, a violent event must involve a central government and antagonist faction(s) that are both capable of effectively resist the attacks of their opponents.

The picture becomes even more dramatic when looking at the number of years that developing countries have spent experiencing internal fighting (**Table 2**). When looking at the number of war-years, Africa still remains the continent that has suffered the most, recording as much as three times the number of war-years that Latin America and the Middle East have experienced. When looking at country averages, these two latter regions have performed relatively well compared to the rest of the developing world while Asian countries have tended to spend on average more than fifteen years fighting internally. Once again, variation across states remains substantial, especially in Asia, possibly due to the presence of countries that have suffered from a disproportionate number of war-years like the Philippines and Indonesia.

Table 2 Documented number of war-years in developing countries

	Total number of war-years	Percentage of total war-years	Mean war-years per country	Median war-years per country	Standard Deviation
All selected countries	657	100%	6.773	2	9.399
Africa	282	43%	6.000	1	8.669
Sub Saharan Africa	270	41%	6.405	2	8.415
Asia	196	30%	15.077	13	12.946
Central and South America	85	13%	4.474	0	7.680
Middle East	94	14%	5.222	2.5	6.097
Top 3 countries for number of conflicts					
Philippines	41	6%			
Indonesia	31	5%			
Sudan	30	5%			

Notes Summary information for the period 1945-2007. Data for documented civil conflicts is obtained from the Correlates of War Project (COW). The table considers the number of years individual countries were affected by episodes of violence that involved sustained combat between two or more armed groups which resulted in at least 1000 battle-related combatant fatalities within a period of one year. To be considered as civil conflict, a violent event must involve a central government and antagonist faction(s) that are capable of effectively resist the attacks of their opponents.

The picture becomes more balanced when moving from the war-years specification to the scrutiny of individual civil conflicts (**Table 3**). Uniquely identified civil wars tend to last approximately four years on average and they appear to last longer in Asia and in Central and South America while they are normally less persistent in the Middle East. Once again, the variation across countries and regions is high possibly due to the inclusion of very long civil wars like the one between the Government of the Philippines and the NPA (New People's Army), the First Sri Lankan Tamil War and the Eight Colombian War.

Table 3 Average duration of documented civil conflicts in developing countries

	Mean duration of a civil conflict (years)	Median duration of a civil conflict (years)	Standard Deviation
All selected countries	4.000	3	3.886
Africa	3.936	3	3.326
Sub Saharan Africa	3.933	3	3.344
Asia	4.875	4	4.776
Central and South America	4.762	3	4.975
Middle East	2.606	2	2.436

Top 3 conflicts by duration:	Total war duration in years
Philippines-NPA	21
First Sri Lanka Tamil	20
Eighth Colombian	19

Notes Summary information for the period 1945-2007. Data for documented civil conflict is obtained from the Correlates of War Project (COW). The table considers the duration in years of individual episodes of violence connected to conflicts involving sustained combat between two or more armed groups which resulted in at least 1000 battle-related combatant fatalities within a period of one year. To be considered as civil conflict, a violent event must involve a central government and antagonist faction(s) that are capable of effectively resist the attacks of their opponents.

Apart from the regional dimension, civil conflicts tend to be unevenly distributed also across time (**Table 4**). African countries have especially been plagued by intrastate conflicts in the 90s, which were possibly triggered by the outcomes of the Rwandan Genocide that have possibly triggered the so-called Africa's World War (Prunier 2009). Latin America and the Middle East have recorded a spike in the number of conflict in the 70s, a period characterized by the highest tensions originating from the Cold War. Interestingly, the Asian continent shows a more constant pattern of incidence of civil wars across the decades following the end of the Second World War.

Table 4 Number of ongoing civil conflicts in developing countries by decade

	40s	50s	60s	70s	80s	90s	00s
All selected countries	5	12	24	45	39	60	36
% of World conflicts [1]	*2%*	*5%*	*11%*	*20%*	*18%*	*27%*	*16%*
Africa	0	0	11	13	15	42	20
% of conflicts in Africa [2]	*0%*	*0%*	*11%*	*13%*	*15%*	*42%*	*20%*
Sub Saharan Africa	0	0	10	13	14	41	20
% of conflicts in Sub Saharan Africa	*0%*	*0%*	*10%*	*13%*	*14%*	*42%*	*20%*
Asia	1	6	7	10	10	8	11
% of conflicts in Asia	*2%*	*11%*	*13%*	*19%*	*19%*	*15%*	*21%*
Central and South America	3	4	2	9	6	4	1
% of conflicts in Central and South America	*10%*	*14%*	*7%*	*31%*	*21%*	*14%*	*3%*
Middle East	1	2	4	13	8	6	4
% of conflicts in Middle East	*3%*	*5%*	*11%*	*34%*	*21%*	*16%*	*11%*

Notes Summary information for the period 1945-2007. Data for documented civil conflict is obtained from the Correlates of War Project (COW). The table considers the number of years individual countries were affected by episodes of violence that involved sustained combat between two or more armed groups which resulted in at least 1000 battle-related combatant fatalities within a period of one year. To be considered as civil conflict, a violent event must involve a central government and antagonist faction(s) that are capable of effectively resist the attacks of their opponents.

(1) Number of ongoing conflict in a selected decade divided by total number of recorded conflicts

(2) Number of ongoing conflict in Africa in a selected decade divided by total number of recorded conflicts in Africa. The same logic is adopted to compute the percentage number of conflicts in other geographic regions.

4.2.2 Natural Deposits

Given the scope of our analysis, in the following paragraphs we will mainly compare natural resource deposits that are relatively easy to exploit and difficult to access due to their geographic characteristics. The main focus of this sub-section is to provide the reader with a general picture about the distribution of natural resources across geographic regions, taking into account the different specifications considered in our analysis. Before looking at our summary statistics, we want to quickly review our classification of geographic inaccessibility and ease of exploitation. Starting from this latter dimension, we generally restrict our attention to those deposits that are considered lootable, i.e. those who can be exploited without recurring to complex mining operations which normally require substantial investments in infrastructure and in human capital. Turning to geographic inaccessibility, we classify deposits as inaccessible if they are located in areas characterized by an impervious land cover (e.g. thick forest or wetland) or located in a mountainous terrain (i.e. 600 meters above the sea level). To be geographically inaccessible, we further require deposits to be located far away from a state's capital. We allow this latter dimension to be relatively flexible by alternatively considering deposits located beyond 250, 500 and 750 kilometers from the venue where the central government resides. To give a picture as understandable as possible, unless otherwise specified, we will consider all natural deposits discoveries that have been documented until the present moment. For an analogous reason and for the remainder of this section, we will consider diamonds, gold gemstones and drug plantations separately. **Tables 5.1** to **5.4** and **Table 6** summarize data about the natural resources we have selected. An expanded version of this latter table is reported in the Appendix (**Table A3**).

Diamonds deposits by the year 2007, the total number of diamond deposits discovered in the selected countries was 948 (**Table 5.1**). When considering sources located beyond 250 kilometers from the state's capital, approximately half of them have been classified as geographically inaccessible and easily exploitable. If we look at diamond sources located 500 and 750 kilometers beyond the capital's range, the share of inaccessible and easily lootable deposits becomes approximately one third and one fourth of the total number of deposits respectively. Undifferentiated diamond deposits are almost equally split between African and Latin American countries but the majority of inaccessible and easily exploitable ones is concentrated in this latter region. Asian countries account for a very small proportion of documented diamond deposits while Middle Eastern countries have no diamond sources located within their borders. As presented in **Table A2** (See Appendix), the three richest countries in terms of inaccessible and lootable diamonds are Brazil, Venezuela and Angola.

Table 5.1 Distribution of diamonds deposits in developing countries

	Lootable and geographically inaccessible deposits			All deposits in selected countries
	Beyond 250 Km from the capital	Beyond 500 Km from the capital	Beyond 750 Km from the capital	
All selected countries	416	314	216	948
% of all deposits in selected countries [1]	*44%*	*33%*	*23%*	
Country Average [2]	*4.33*	*3.27*	*2.25*	*9.88*
Africa	137	81	54	441
% of I&L deposits in selected countries [3]	*33%*	*26%*	*25%*	*47%*
Country Average	*2.91*	*1.72*	*1.15*	*9.38*
Sub Saharan Africa	137	81	54	439
% of I&L deposits in selected countries	*33%*	*26%*	*25%*	*46%*
Country Average	*3.26*	*1.93*	*1.29*	*10.45*
Asia	12	10	6	36
% of I&L deposits in selected countries	*3%*	*3%*	*3%*	*4%*
Country Average	*0.80*	*0.67*	*0.40*	*2.40*
Central and South America	267	223	156	471
% of I&L deposits in selected countries	*64%*	*71%*	*72%*	*50%*
Country Average	*14.05*	*11.74*	*8.21*	*24.79*
Middle East	0	0	0	0
% of I&L deposits in selected countries	*0%*	*0%*	*0%*	*0%*
Country Average	*0.00*	*0.00*	*0.00*	*0.00*

Notes Summary information for the year 2007. Data for diamond deposits is obtained from the DIADATA dataset provided by the Peace Research Institute of Oslo (PRIO). The table considers all discovered deposits of diamonds (i.e. exhausted ones included) up to the year 2007. Deposits are broadly defined as diamond occurrences, i.e. sites with known activity related to extraction and production and/or with confirmed diamonds discovery.

(1) Inaccessible and lootable deposits divided by all deposits located in the selected countries.

(2) Due to the large variation across countries, we do not report the median and standard deviation for the number of deposits given the little additional information they would provide.

(3) Inaccessible and lootable deposits in the region divided by all inaccessible and lootable deposits in the selected countries. The abbreviation "I&L" stands for inaccessible and lootable.

Gold deposits turning to gold, the most striking aspect we note is that a relatively small share of sources is classified as inaccessible and lootable, i.e. less than 10% of the total for all our distance specifications (**Table 5.2**). Although Africa accounts for 17% of general gold deposits, none of them is classified as geographically inaccessible and easily exploitable. As it was the case for diamonds, Central and South America registers the largest number of inaccessible and lootable gold deposits, accounting for almost three quarters of all the gold sources we have focused on in the selected countries. Another interesting observation is that relatively few gold sources are located in the Middle East and in Asia. Peru is the richest country in terms of all types of gold deposits, followed by Argentina and Mexico. In terms of inaccessible and lootable gold deposits, Brazil, Argentina and Bolivia are the countries accounting for most observations with respect to this natural resource (**Table A2**).

Table 5.2 Distribution of gold deposits in developing countries

	Lootable and geographically inaccessible deposits			All deposits in selected countries
	Beyond 250 Km from the capital	Beyond 500 Km from the capital	Beyond 750 Km from the capital	
All selected countries	78	63	39	1089
% of all deposits in selected countries[1]	*7%*	*6%*	*4%*	
Country Average[2]	*0.81*	*0.66*	*0.41*	*11.23*
Africa	0	0	0	186
% of I&L deposits in selected countries[3]	*0%*	*0%*	*0%*	*17%*
Country Average	*0.00*	*0.00*	*0.00*	*3.96*
Sub Saharan Africa	0	0	0	180
% of I&L deposits in selected countries	*0%*	*0%*	*0%*	*17%*
Country Average	*0.00*	*0.00*	*0.00*	*4.29*
Asia	5	3	2	89
% of I&L deposits in selected countries	*6%*	*5%*	*5%*	*8%*
Country Average	*0.33*	*0.20*	*0.13*	*5.93*
Central and South America	72	59	37	808
% of I&L deposits in selected countries	*92%*	*94%*	*95%*	*74%*
Country Average	*3.79*	*3.11*	*1.95*	*42.53*
Middle East	1	1	0	6
% of I&L deposits in selected countries	*1%*	*2%*	*0%*	*1%*
Country Average	*0.07*	*0.07*	*0.00*	*0.43*

Notes Summary information for the year 2007. Data for gold deposits is obtained from the GOLDATA dataset, which is the result of an independent research effort (Balestri 2013) conducted following PRIO's methodology. The table considers all discovered deposits of gold (i.e. exhausted ones included) up to the year 2007. Deposits are broadly defined as gold occurrences, i.e. sites with known activity related to extraction and production and/or with confirmed gold discovery.

(1) Inaccessible and lootable deposits divided by all deposits located in the selected countries.
(2) Due to the large variation across countries, we do not report the median and standard deviation for the number of deposits given the little additional information they would provide.
(3) Inaccessible and lootable deposits in the region divided by all inaccessible and lootable deposits in the selected countries. The abbreviation "I&L" stands for inaccessible and lootable.

Gemstones deposits almost 40% of gemstones deposits are classified as geographically inaccessible and easily exploitable if we consider locations beyond 250 kilometers from the capital's range (**Table 5.3**). It is interesting to note that this share drops significantly when we use stricter thresholds for remoteness. When considering gemstone sources located beyond 500 and 750 kilometers from the state's capital, only 22% and 11% of these deposits are classified as inaccessible and lootable respectively. Uncategorized gemstone deposits are more evenly distributed across geographic regions compared to gold and diamonds. Asia accounts for the most number of this mineral resources, especially when we restrict our attention to geographically inaccessible and easily exploitable ones. At the country level, Brazil is once again the richest country in terms of inaccessible and lootable gemstones, followed by India and Madagascar.

Table 5.3 Distribution of gemstones deposits in developing countries

	Lootable and geographically inaccessible deposits			All deposits in selected countries
	Beyond 250 Km from the capital	Beyond 500 Km from the capital	Beyond 750 Km from the capital	
All selected countries	274	155	74	694
% of all deposits in selected countries [1]	*39%*	*22%*	*11%*	
Country Average [2]	*2.85*	*1.61*	*0.77*	*7.15*
Africa	108	43	11	189
% of I&L deposits in selected countries [3]	*39%*	*28%*	*15%*	*27%*
Country Average	*2.30*	*0.91*	*0.23*	*4.02*
Sub Saharan Africa	108	43	11	151
% of I&L deposits in selected countries	*39%*	*28%*	*15%*	*22%*
Country Average	*2.57*	*1.02*	*0.26*	*3.60*
Asia	89	57	45	249
% of I&L deposits in selected countries	*32%*	*37%*	*61%*	*36%*
Country Average	*5.93*	*3.80*	*3.00*	*16.60*
Central and South America	63	54	18	160
% of I&L deposits in selected countries	*23%*	*35%*	*24%*	*23%*
Country Average	*3.32*	*2.84*	*0.95*	*8.42*
Middle East	14	1	0	96
% of I&L deposits in selected countries	*5%*	*1%*	*0%*	*14%*
Country Average	*1.00*	*0.07*	*0.00*	*6.86*

Notes Summary information for the year 2007. Data for gemstone deposits is obtained from the GEMDATA dataset provided by the Peace Research Institute of Oslo (PRIO). The table considers all discovered deposits of gemstones (i.e. exhausted ones included) up to the year 2007. Deposits are broadly defined as gemstones occurrences, i.e. sites with known activity related to extraction and production and/or with confirmed gemstones discovery.

(1) Inaccessible and lootable deposits divided by all deposits located in the selected countries.

(2) Due to the large variation across countries, we do not report the median and standard deviation for the number of deposits given the little additional information they would provide.

(3) Inaccessible and lootable deposits in the region divided by all inaccessible and lootable deposits in the selected countries. The abbreviation "I&L" stands for inaccessible and lootable.

Drug plantations drug cultivations have mostly been documented in Africa and Asia, where they respectively account for 31% and 32% of total registered drug plantations (**Table 5.4**). Slightly fewer cultivations are located in Central and South America and in the Middle East. Nonetheless, Latin American and Middle Eastern countries account for more inaccessible drug plantations than other states, also with respect to all our distance specifications. Regardless the type of drug cultivation, the countries counting the largest number of geographically inaccessible drug plantations are Iran, Mexico and Brazil. More in detail, Iran and Mexico register the largest number of opium plantations while Brazil accounts for the largest area cultivated with cannabis.

Table 5.4 Distribution of drug plantations in developing countries

	Lootable and geographically inaccessible plantations			All plantations in selected countries
	Beyond 250 Km from the capital	Beyond 500 Km from the capital	Beyond 750 Km from the capital	
All selected countries	288	170	88	536
% of all deposits in selected countries[1]	*54%*	*32%*	*16%*	
Country Average[2]	*3.000*	*1.771*	*0.917*	*9.639*
Africa	65	29	13	166
% of I&L deposits in selected countries[3]	*23%*	*17%*	*15%*	*31%*
Country Average	*1.383*	*0.617*	*0.277*	*3.532*
Sub Saharan Africa	59	28	13	155
% of I&L deposits in selected countries	*20%*	*16%*	*15%*	*29%*
Country Average	*1.405*	*0.667*	*0.310*	*3.690*
Asia	67	34	12	172
% of I&L deposits in selected countries	*23%*	*20%*	*14%*	*32%*
Country Average	*4.467*	*2.267*	*0.800*	*11.467*
Central and South America	88	59	37	123
% of I&L deposits in selected countries	*31%*	*35%*	*42%*	*23%*
Country Average	*4.632*	*3.105*	*1.947*	*6.474*
Middle East	68	48	26	75
% of I&L deposits in selected countries	*24%*	*28%*	*30%*	*14%*
Country Average	*4.857*	*3.429*	*1.857*	*5.357*

Notes Summary information for the year 2007. Data for drug plantations is obtained from the DRUGDATA dataset provided by the Peace Research Institute of Oslo (PRIO). The table considers all areas where drug cultivation has occurred (i.e. abandoned cultivations included) up to the year 2007. Plantations are broadly recorded as nodes on a 1.0×1.0 degree grid that overlaps with areas delimited by polygons where drug cultivation is known to have occurred at some point in time.

(1) Inaccessible and lootable deposits divided by all deposits located in the selected countries.

(2) Due to the large variation across countries, we do not report the median and standard deviation for the number of deposits given the little additional information they would provide.

(3) Inaccessible and lootable deposits in the region divided by all inaccessible and lootable deposits in the selected countries. The abbreviation "I&L" stands for inaccessible and lootable.

Time trends of discoveries focusing now on the historical dimension, the observed time trend of discoveries appears to be nonlinear across decades and heterogeneous over different resources (**Table 6** and **Table A3**). Most diamond deposits have been discovered in the 70s and in the 90s, with geographically inaccessible and lootable sources being found mostly in the 90s. The discovery of gold deposits has followed a very different trend compared to diamonds, with 66% of uncategorized deposits and 86% inaccessible sources being discovered before the 50s. A still different pattern characterizes gemstone deposits, with most findings being documented either before the 50s or in the beginning of the 21st century, when approximately 40% of them were found. While opium poppy, coca bushes and marijuana plants have been extensively cultivated during the first half of the 20th century, these plantations saw a boom in their farming during the 80s and the 90s, especially in geographically inaccessible regions within developing countries. Fewer new drug plantations were recorded starting from the 2000s. When it comes to the actual exploitability of natural deposits, i.e. when we take into account the fact that deposits get exhausted over time, we note that on average 90% of discovered sources were exploitable in every decade we focus on. The share of disposable deposits has been relatively stable for diamonds while it tended to fluctuate relatively more volatile for other types of natural resources. One interesting aspect is that the proportion of exhausted gold deposit has steadily increased over time while a similar trend is not perceivable for other resources.

Table 6 Deposits' discovery by decade in developing countries

	Before 50s		50s		60s		70s		80s		90s		00s	
	All	I&L 500+[1]	All	I&L 500+	All	I&L 500+	All	I&L 500+	All	I&L 500+	All	I&L 500+	All	I&L 500+
Panel 1 Diamond deposits														
% of net discoveries	20%	24%	4%	3%	10%	6%	14%	13%	4%	4%	34%	48%	10%	2%
Cumulative % of total discoveries	20%	24%	24%	27%	34%	33%	49%	46%	55%	50%	90%	98%	100%	100%
% of cumulative exploitable deposits	89%	92%	89%	93%	90%	92%	92%	93%	91%	92%	92%	95%	91%	95%
Panel 2 Gold deposits														
% of net discoveries	66%	86%	5%	3%	13%	6%	7%	3%	5%	0%	4%	2%	0%	0%
Cumulative % of total discoveries	66%	86%	71%	89%	84%	95%	91%	98%	95%	98%	100%	100%	100%	100%
% of cumulative exploitable deposits	97%	93%	92%	93%	91%	93%	90%	92%	93%	90%	87%	86%	84%	83%
Panel 3 Gemstone deposits														
% of net discoveries	27%	37%	1%	1%	7%	3%	4%	5%	3%	1%	17%	12%	40%	41%
Cumulative % of total discoveries	27%	37%	28%	38%	35%	41%	39%	46%	43%	48%	60%	59%	100%	100%
% of cumulative exploitable deposits	85%	89%	80%	86%	81%	84%	79%	81%	81%	81%	82%	80%	89%	87%
Panel 4 Drug plantations														
% of net new plantations	23%	43%	10%	1%	1%	1%	6%	5%	20%	20%	38%	30%	2%	0%
Cumulative % of total discoveries	23%	43%	33%	44%	34%	45%	40%	50%	60%	70%	98%	100%	100%	100%
% of cumulative exploitable deposits	88%	100%	89%	97%	87%	97%	81%	86%	83%	85%	88%	87%	87%	85%

Notes Summary information for the year 2007. Data for diamond and gemstone deposits as well as drug plantations is obtained from the Peace Research Institute of Oslo (PRIO). Data for gold deposits is obtained by independent work conducted by Balestri (2013). The table separately considers total and exploitable discovered deposits of diamonds, gold, gemstones and total and active drug plantations in selected decades. Deposits are broadly defined as occurrences, i.e. sites with known activity related to extraction and production and/or with confirmed diamonds, gold and gemstones discovery. Plantations are broadly recorded as nodes on a 1.0×1.0 degree grid that overlaps with areas delimited by polygons where drug cultivation is known to have occurred at some point in time.

(1) The abbreviation "I&L 500+" stands for geographically inaccessible (shortly, inaccessible) and easily exploitable (shortly, lootable) that are located beyond 500 km from the state's capital. We report summary statistics also for inaccessible and lootable deposits located beyond 250 and 750 km from the state's capital in Table A3 (see Appendix).

4.2.3 Cross-Country Comparison

As stressed more than once, our analysis aims to capture the effect that natural deposits have on the outbreak of civil conflicts in developing countries. For the scope of our presentation, it may be useful to provide the reader with a broader outlook that may help her understand the choice to adopt this particular focus. On the one hand, we want to recall that the resource curse is a phenomenon affecting mainly third-world countries, especially when it comes to the occurrence of civil wars. On the other hand, it is interesting to note that natural resources are relatively more abundant precisely in African, Latin American, Asian and Middle Eastern developing countries. By combining these two observations, we may eventually suspect that there may be a link between natural resource abundance and civil conflicts. **Table 7** provides a more detailed picture highlighting this correlation. Using a comparative approach, we see that almost two thirds of documented civil conflicts between 1945 and 2007 took place in the selected states. These conflicts accounted for a large share of documented civil wars in recent decades and lasted on average longer than all conflicts recorded on a global level. Quite interestingly, most natural deposit discoveries (gold excluded) and drug cultivations took place in Africa, Central and South America, Asia and in the Middle East. From a broad perspective, the apparent relationship between these two facts is exactly what made us interested in the topic in the first place.

Table 7 Comparison between developing countries and all world countries

	Developing countries	All countries	*% observations of in developing countries*
Panel 1 Civil conflicts			
Number of civil conflicts	161	248	*65%*
Total war-years	657	887	*74%*
Average civil conflict duration	4.000	3.577	-
Ongoing civil wars in the selected decade:			
40s (1940-1949)	5	13	*38%*
50s (1950-1959)	12	12	*100%*
60s (1960-1969)	24	35	*69%*
70s (1970-1979)	45	53	*85%*
80s (1980-1989)	39	39	*100%*
90s (1990-1999)	60	71	*85%*
00s (2000-2007)	36	42	*86%*
Panel 2 Natural deposits			
Total discoveries of:			
Diamond deposits	948	1176	*81%*
Gold deposits	1089	2969	*37%*
Gemstone deposits	694	878	*79%*
Drug plantations	536	706	*76%*

Notes Summary information for the period 1945-2007. Data for documented civil conflict is obtained from the Correlates of War Project (COW). Data for diamond and gemstone deposits as well as drug plantations is obtained from the Peace Research Institute of Oslo (PRIO). Data for gold deposits is obtained by independent work conducted by Balestri (2013). The methodology adopted to construct these data sources is described in Section 4. The table compares the countries we have selected, broadly defined as developing countries, with all world countries.

5. Analysis

Now that we have defined our theoretical framework and presented our data sources, we will continue by investigating whether there is an empirical evidence of the rebel funding mechanism in the selected group of developing countries. Our current hypothesis claims that the abundance of specific natural resource deposits, i.e. the availability of deposits that are geographically inaccessible and easy to exploit, can provide the necessary funding to rebel groups to initiate an armed conflict or to militarily respond to central state's offensive. More precisely, we expect rebel groups to engage in a conflict whenever it is financially feasible, expecting that revenues stemming from the trade of natural resources may satisfy this condition (Collier et al. 2009). Again, we consider rebels' military initiative to eventually be the key trigger of a civil conflict since virtually all governments maintain a standing military force. We want also to note that, in the past decades, researchers have gathered a good amount of information on both civil conflicts and natural resources deposits, making it possible to investigate this mechanism in detail. What we expect to find in our study is that the presence of certain natural deposits (i.e. inaccessible and lootable) will unambiguously increase the probability that a country will experience a civil conflict within its borders in a given period of time. In this section, we will first discuss the analytical framework we have used to investigate the existence of this mechanism. We will present first a probit model that maps the number of selected natural resource deposits to the occurrence of a civil conflict. We will proceed by linking our results to our hypothesis in order to assess to which extent our theory holds. We will conclude our analysis by inspecting the results of different robustness checks that we have performed in order to test the consistency of our findings.

5.1 Econometric Model

The main interest of our research is to assess how a country's likelihood to suffer from a civil conflict is affected by the rebel funding mechanism which, according to our hypothesis, is fueled by the availability of geographically inaccessible and easily exploitable natural deposits. To test this theory, we set up a probit model including country and year fixed effects to control also for unobserved country-specific characteristics and unobserved global time trends. From an econometric point of view, using a traditional fixed effects approach in a probit setup is incorrect since it would potentially bias our estimates due to incidental parameter bias. However, in our analysis we adopt a recent application that allows us to run this model using fixed effects and to correct for this issue[9] (Cruz-Gonzalez et al. 2017). We argue that the probit model is a suitable tool to capture the effect that the number of exploitable natural sources has on the probability of observing a civil conflict. Referring to our theoretical framework, we indeed expect that a conflict is more likely to occur/continue if it is financially sustainable, a condition that can be met by converting natural resources into revenues. Therefore, on the one hand, we expect that the probability of observing an intrastate war will be low when a country has few inaccessible and lootable deposit. On the other hand, we expect the same probability to be higher if there are more available deposits. According to the rebel funding mechanism, a substantial stock of inaccessible and lootable deposits potentially translates into a considerable amount of revenues (which remains unobserved). In turn, higher natural resource revenues can be devoted to fund military operations and hence lead to a higher probability of the occurrence of a civil conflict. The same logic applies when considering the scarcity of deposits which is theoretically associated with lower revenues and a lower chance of observing an intrastate war. For these reasons, we believe that the probit specification is particularly suited to study the binary outcome of war/peace and analyze the marginal effect that natural resources have on the probability that an intrastate war materializes.

[9] This method allows to apply fixed effects to a probit model by using the analytical and jackknife bias corrections derived in Fernandez-Val and Weidner (2016) for panels where the two dimensions (in our case country and year) are moderately large.

Turning to our model specification, on the one hand we take as the dependent variable the occurrence of civil war in a selected country at a given time period. On the other hand, we select as the main independent variable the number of a country's available deposits of diamonds, gold, gemstones and drugs that respect our conditions for geographic inaccessibility and ease of exploitability. As proposed by previous studies, we will use the lagged values (1-year lag) of our explanatory variables with respect to our dependent variable (Collier and Hoeffler 1998; Fearon and Laitin 2003). A reason to adopt this specification is that we assume the funding process to be prior to the occurrence of a conflict. In other words, we expect that the process of transforming natural resources into revenues and using them to recruit soldiers, buy weapons and organize military operations requires a discrete amount of time to take place. As we will illustrate at a later stage of our discussion, we also control for additional time varying characteristic of the selected countries, as indicated by the existing literature. The model specification we will use is the following:

$$Pr(civil\_conflict_{it}=1\,|\,X_{it},\ \delta_i,\ \gamma_t)=F(X'_{it}\beta+\ \delta_i+\gamma_t)$$

Where *Pr* denotes probability and $F(\cdot)$ the standard normal cumulative distribution function for the probit model. Unobserved country and year fixed effects are denoted by δ_i and γ_t respectively. Our dependent variable is:

$civil\_conflict_{it}$: occurrence of a civil conflict in a country i at year t as defined by the COW methodology. This variable takes a value of 1 if there was an ongoing civil conflict in country i at year t.

The set of explanatory variables X_{it} includes the following:

$il\_diamond\_deposits_{it-1}$: number of known non-exhausted diamond deposits in country i at year t-1 that are geographically inaccessible (far from the capital and located in an impervious area) and easy to exploit (lootable). The abbreviation *il* stands for inaccessible and lootable.

$il\_gold\_deposits_{it-1}$: number of known non-exhausted gold deposits in country i at year t-1 that are geographically inaccessible and easy to exploit. The abbreviation *il* stands for inaccessible and lootable.

$i\_gemstone\_deposits_{it-1}$: number of known non-exhausted gemstone deposits in country i at year t-1 that are geographically inaccessible. Gemstone deposits are considered easy to exploit to some extent. The abbreviation *i* stands for inaccessible.

$i\_drug\_plantations_{it-1}$: number of known productive drug plantations in country i at year t-1 that are geographically inaccessible. Drug plantations are generally considered easy to exploit by the literature. The abbreviation *i* stands for inaccessible.

$controls_{it-1}$: time and country-varying controls measured at t-1.

Although the construction of our variables has already been illustrated in Section 4, we would like to remind the reader about some important features they entail. One first relevant aspect to note is that we take into account inaccessible and easily exploitable deposits that are not exhausted, i.e. deposits that can practically generate revenues. Secondly, we want to stress the fact that we are considering only those deposits that are easily exploitable, especially for rebel groups (i.e. lootable deposits). We also want to recall that we only use deposits that are difficult to access due to the characteristics of their land cover and elevation. As the reader may recall, we have also used another dimension to describe geographic inaccessibility of deposits, namely their distance from the state's capital. In the following part of our analysis, we will simultaneously consider three different subsets of inaccessible and lootable resources with respect to their distance to the government's central power: 1) deposits beyond 250 kilometers from the capital's range, 2) deposits beyond 500 kilometers from the capital's range and 3) deposits beyond 750 kilometers from the capital's range. The main reason we use these three alternative specifications is that we do not have any indication on the distance threshold that makes a location difficult to access by governmental authorities. Since the literature does not provide any guidance with this respect, we decided to explore these three alternatives in order to get a better insight on how geographic inaccessibility affects the occurrence of civil wars. However, we are aware that there may be other specifications we could use to better see the effect of the rebel funding mechanism, at least from a theoretical point of view. For instance, one alternative specification could be to use bins of 250 kilometers in order to investigate more in detail the inaccessibility dimension. In other words, we could disaggregate our independent variables in subgroups of progressively more inaccessible deposits with respect to distance to the state's capital. The main drawback that we would face by adopting this specification is that the variation in the level of deposits would be considerable across separated bins. Given the nature of our data sources, we would indeed have bins accounting for too few observations which would consequently lead to uninformative coefficients. For this reason, we will stick with this aggregate specification for geographically inaccessible and easily exploitable deposits.

To avoid any confusion later in our discussion, we want to stress one important characteristic of our econometric setup. Our model is built to capture the link between the number of available natural deposits present in a given country at a certain point in time to the probability of the occurrence of civil war. In other words, we exploit the variation across time of the number available diamond, gold and gemstone deposits as well as in the number of drug plantations to estimate their impact on the incidence of intrastate wars. The resulting estimated coefficients should be then interpreted as the impact of an additional deposit of a certain resource on the chance that a given country at a given time may experience a civil conflict. We think it is important to use the level and not net number of deposit discoveries since the funding originating from available natural sources depends on the total amount of exploitable resources, not on newly found one exclusively. In other words, using level of deposits instead of discoveries allows us to precisely capture the effect which is at the core of the rebel funding mechanism.

As we have already mentioned, we assume that a time lag exists between the availability of natural resources and their effective transformation into funding for military operations. The transmission process that links natural resources to the occurrence of intrastate wars is indeed likely to be deferred in time. Previous studies have suggested to model this aspect by assuming that the rebel funding mechanism requires a one-year lag to manifest itself. To reflect this logic, the levels of natural deposits as well as the values of our control variables refer to the year before the period potentially affected by a civil conflict. An additional aspect worth noting is that this specification lets us partially rule out the influence of reverse causality. As an illustrative purpose, let us consider how the occurrence of civil war may affect the stock of available natural resources or the level of democracy in a given state. It is likely that military operations may in fact damage existing deposits, making them not usable (i.e. reducing the availability of resources) or turn the region where they are located into a dangerous environment to operate in (i.e. reducing the access to resources). Considering our second example, the outbreak of war may quickly weaken democratic institutions and make the instauration of military rule more likely, consequently decreasing democracy levels. From a general perspective, in the case we considered simultaneous observations of dependent and independent variables, there would be in fact a high chance of our estimates to be biased by similar reverse causality patterns. This reasoning applies to all other control variables as well, namely population, income per capita, oil exporting country, trade openness and the additional controls we will use for our robustness checks. As the reader may imagine, an immediate fix that may help us partially exclude reverse causality is indeed the use of lagged observations for independent variables.

Given the outline of our theoretical framework, we can formulate a series of expected outcomes with respect to our coefficients of interest. From a broad perspective, the rebel funding mechanism suggests that revenues originating from natural resources are used to fund an armed conflict whenever these revenues are enough to do so. By exploiting the variation of the level of selected natural resources, our model should be able to capture the positive impact that inaccessible and lootable deposits have on the probability that a civil war occurs in a given country at a given time. Therefore, we would expect the coefficients associated with natural resource deposits to be positive and significant for all our specifications of distance, i.e. in the case we consider deposits beyond 250, 500 and 750 kilometers from the state's capital. We nonetheless would expect larger coefficients as we increase the capital's distance threshold. In other words, we suppose that coefficients obtained using the 250 kilometers specification will be positive and significant but smaller than those obtained with the 500 and 750 kilometers specification.

Before presenting our results, we want to note that we tested the presence of multicollinearity as well as autocorrelation in our data to make sure that our model is correctly applied at every stage. Since all our tests give negative results, we will avoid stressing this fact for every regression output but remind the reader about it now. To estimate our model, we use a Maximum Likelihood Estimation method and apply a bias correction technique that effectively allows us to use a fixed effect in a probit model (Cruz-Gonzalez et al. 2017). Moreover, the estimation method allows for error heteroskedasticity. In our regression tables, corrected standard errors (i.e. estimated with this alternative procedure) are reported in parenthesis.

5.2 Main Results

Table 8 reports the coefficients of the estimated probit model we have illustrated above. The first column presents the estimated coefficients when considering natural resource deposits that are: 1) located beyond 250 kilometers from the state's capital, 2) located in an area characterized by an inaccessible land cover or located above 600m from the sea level and 3) easily exploitable, i.e. lootable. The second and third columns use the same specifications except that they account only for those deposits located beyond a range of 500 and 750 kilometers from the state's capital. A total of 96 countries over the period 1945-2007 is used, corresponding to 4888 country×year observations. As we have discussed before, we introduce additional control variables as suggested by the existing literature. These controls are namely the logarithm of both population and income per capita, a dummy for oil exporting countries and trade openness, all of them measured in the previous period (i.e. lagged by one year). Looking at our results, we observe that when we use inaccessible and lootable resources not excessively far from the state's capital (Column 1; *250+ km*), none of our coefficients of interest are significant at the 5% level. Moreover, the signs associated with them are all negative except the one for gemstone deposits. One interesting result to note is that the control variable for oil export takes a significant and negative value, suggesting that oil exporting countries are, in general, less likely to suffer from civil conflicts. This interesting result, which will be a recurring feature of all our regression outputs, matches the findings presented by part of the literature (Smith 2004).

This preliminary output could indicate two things. First, it could be the case that these deposits are still too close to capitals for us to see the rebel funding mechanism in action. Second, given the unexpected sign of most coefficients, this result could be a preliminary indication that our hypothesis does not hold or that our setup is not well suited to isolate the rebel funding mechanism. To explore these possibilities, in the second column (*500+ km*) we restrict our attention to those deposits that are located beyond the 500 kilometers range from the state's capital. The first result we note is that, except for drug plantations, coefficients for natural deposits are now larger. Secondly, coefficients for diamond and gemstone deposits are highly significant. Unexpectedly, the coefficient for diamond deposits is negative, in principle suggesting that geographically inaccessible and lootable diamond deposits are associated with a lower incidence of civil conflicts.

From a general perspective, the output we have just obtained remains ambiguous, indicating that the rebel funding mechanism may not hold once we look at empirical results. Nonetheless, it could still be the case that we need to consider deposits that are even farer away from capitals in order to better study our hypothesis. To explore this alternative, we further restrict the number of selected deposits by considering only those located at least 750 kilometers away from the state's capital. We report the estimated coefficients for this case in the third column (*750+ km*). The first element we note is the negative and still significant coefficient associated with diamond deposits. Second, while most coefficients do not change in term of size and significance, the one for gold deposits becomes positive, significant and way larger than in the previous specifications. Just to give an idea, when we look at the average marginal effect of gold deposits, this coefficient translates into an increase of 83% of the probability of having a civil conflict in a given year for a country that discovers a new inaccessible and lootable gold deposit on its soil. This specific result is obviously suspicious and, as we will discuss later (Section 8), it is likely driven by the very small number of remaining gold deposits in countries with a relative long history of civil conflicts.

When looking at all three columns, we clearly do not find a consistent pattern that may support the rebel funding hypothesis. If we focus on deposits located beyond 500 and 750 kilometers from the state's capital, the only result that matches our expectations is the positive and significant effect of geographically inaccessible gemstone deposits. However, this result is not sufficient to prove the validity of our theoretical mechanism, especially if we consider the unexpected coefficients we obtain for diamond deposits and gold deposits. This general outcome may suggest that: 1) the rebel funding mechanism does not take place in reality, 2) our theoretical setup does not isolate this mechanism from other unobserved overlapping forces or 3) the data we use does not reach an adequate quality standard to analyze our specific hypothesis. In the following paragraphs, we will provide some robustness checks that we have formulated *ex ante* to see how our results would have changed with stricter and more extended specifications. By doing so, we hope to obtain some indications on the reasons why our expectations were not met.

Table 8 Geographically inaccessible and easily exploitable deposits and occurrence of civil conflict

	Dependent variable: Occurrence of civil conflict - COW data		
	250+ Km[1]	500+ Km[2]	750+ Km[3]
Main independent variables[4]:			
Diamond deposits	-0.050 *	-0.071 ***	-0.091 **
	(0.027)	(0.025)	(0.036)
Gold deposits	-0.234	-0.448	3.783 ***
	(0.835)	(0.854)	(0.332)
Gemstone deposits	0.005	0.053 ***	0.056 ***
	(0.030)	(0.015)	(0.014)
Drug plantations	-0.025	0.014	0.017
	(0.019)	(0.048)	(0.037)
Control variables[4]:			
Log population	-0.557	-0.531	-0.518
	(0.662)	-(0.031)	(0.662)
Log income per capita	-0.042	-0.031	-0.032
	(0.028)	(0.030)	(0.031)
Oil exporting country	-0.686 **	-0.644 **	-0.640 **
	(0.274)	(0.251)	(0.250)
Trade openness	-0.004	-0.004	-0.004
	(0.004)	(0.004)	(0.004)
Number of observations	4888	4888	4888
Pseudo R-squared	0.210	0.209	0.210
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Number of countries	96	96	96
Period	1945-2007	1945-2007	1945-2007

Notes Estmates for a probit model using country and year fixed effects. The independent variable is the occurrence of civil conflict in a given year that is expressed as a dummy variable taking the value of 1 if there was an ongoing intrastate war in the corresponding year in a selected country (COW data). The main independent variables are the number of non-exhausted geographically inaccessible and easily exploitable diamond, gold, gemstone and drug deposits/plantations available in the selected country in a given year. Control variables are populazion size (in its logarithmic form), income per capita (in its logarithmic form), oil exporting country and trade openness. Independent countires considered as developing enter the sample as country×year observations from 1945 to 2007 when they have become officially

Significance level and SE * p<0.10, ** p<0.05, *** p<0.01, corrected standard errosrs are reported in parenthesis.

(1) The abbreviation *250+* indicates that we run our model using geographically inaccessible (shortly, inaccessible) and easily exploitable deopsits (shortly, lootable) that are specifically located beyond 250 km from the state's capital.

(2) The abbreviation *500+* indicates that we run our model using inaccessible and lootable deopsits located beyond 500 km from the capital's range.

(3) The abbreviation *750+* indicates that we run our model using inaccessible and lootable deopsits located beyond 750 km from the capital's range.

(4) All independent variables are one year lagged.

5.3 Robustness Checks

In the following paragraphs, we are going to explore wheatear the ambiguous picture we obtained from our initial regressions remains the same, assessing whether we can safely disprove the hypothesis of the rebel funding mechanism. The first aspect that we will check is whether the inclusion of additional controls will affect the size, the sign and the significance of our coefficients. Secondly, we will investigate whether the rebel funding mechanism can be explained by using a different specification for civil conflict, i.e. by using UCDP data instead of COW data for intrastate wars. Third, we will try to restrict our dataset in order to work with a more balanced panel and see whether focusing on a smaller group of states over a more recent time period will change our results. Fourth, we will run the original regressions using explanatory variables lagged by more than one year, relaxing the assumption that the tested mechanism takes only one period to manifest itself. Fifth, we will drop gold deposits given the suspicious coefficient we obtained from our main regression and see how the picture changes when we do so. Finally, we are going to test the exogeneity of the discovery of natural resources with respect to sates' capitals. We perform this check to assess whether deposits close to the capital are discovered before more remote sources, which is a dynamic that would bias our results. Additionally, we will briefly discuss additional checks we have formulated following the existing literature's suggestions.

Additional controls In the past decades, the literature has come up with different suggestions on the determinants of civil conflict, especially in the context of developing countries affected by the resource curse. Among others, political variables have usually been used to explain the incidence of civil wars (Ross 2001; Tsui 2011). Partially connected to this aspect, researchers have also suggested that controlling for a country recent independence may also be important to investigate better our hypothesis (Fearon and Laitin 2003). Moreover, as we have illustrated when discussing our data sources, the occurrence of civil conflict in a given country could lead to spillover effects in neighboring states thus increasing the probability that they will experience an intrastate conflict as well (Caselli et al. 2015). Furthermore, we cannot exclude the possibility that the occurrence of civil wars could be path dependent or, in other words, that a country experiencing a civil war in a given year is more likely to suffer from it also in the following period (Fearon and Laitin 2003). Finally, additional factors that have been usually included in previous analyses are climatic variables that may in principle threaten a country's economic environment, a phenomenon that could in turn lead to civil wars (Balestri 2012; Balestri and Maggioni 2014). To summarize, we include the following additional controls in our regressions: democracy level (Polity IV Index), recent independence, conflict in a neighboring country, conflict in the previous year and deviations from average yearly temperature and rainfall. Both due to reverse causality problems and deferred effects, all controls (except recent independence and conflict in the previous period) will be included as variables lagged by one year.

We report the coefficients of our model when including these additional controls in **Table 9**. As it happened for our original regressions, focusing our attention on geographically inaccessible and easily exploitable resources located beyond 250 kilometers from the state capital does not allow us to clearly test our hypothesis. While we do not obtain coefficients significant at the 5% level for these deposits, restricting our attention to more distant sources may provide us with more insights. For the *500+ km* and *750+ km* specifications, we find positive and significant coefficients for gemstone deposits as it was the case for our original analysis. Inaccessible and lootable gold deposits are associated with a positive and significant coefficient but we remain still suspicious about its size. By including additional controls, the coefficient associated with diamond deposits is no longer significant, but its sign remains negative. While we could argue that the rebel funding mechanism may hold for gemstones, we still cannot prove our general hypothesis given the persistent and unexpected behavior characterizing the coefficients of diamond and gold deposits.

As we would have guessed, spillover effects and path dependency play an important role in determining the likelihood that a country will experience a civil conflict at a given point in time. The influence of these variables is evident when observing the coefficients we have obtained for the occurrence of a civil war and the presence of a conflict in a neighboring country in previous periods. Both coefficients are positive and significant at the 5% level and suggest that these forces actually play an important role in shaping the general phenomenon we are analyzing.

On average, the prior occurrence of a conflict in the same country and in any neighboring state make a country 18% and 5% respectively more likely to suffer from a civil war in a given year[10]. Interestingly, deviations from average rainfall levels are also significant across all distance specifications, although their absolute impact is rather small.

[10] Average marginal effects are computed using the results obtained with the *500+ km* specification, i.e. using the regression output when considering inaccessible and lootable natural deposits located beyond 500 kilometers from the state's capital.

Table 9 Geographically inaccessible and easily exploitable deposits and occurrence of civil conflict with additional controls

	Dependent variable: Occurrence of civil conflict - COW data		
	250+ Km[1]	500+ Km[2]	750+ Km[3]
Main independent variables[4]:			
Diamond deposits	-0.043	-0.058	-0.075
	(0.037)	(0.040)	(0.050)
Gold deposits	-0.109	-0.289	3.616 ***
	(0.721)	(0.775)	(0.422)
Gemstone deposits	0.010	0.055 ***	0.057 ***
	(0.027)	(0.013)	(0.012)
Drug plantations	-0.035 *	-0.002	0.016
	(0.020)	(0.058)	(0.051)
Control variables[4]:			
Log population	-0.449	-0.431	-0.418
	(0.607)	-(0.008)	(0.601)
Log income per capita	-0.018	-0.008	-0.008
	(0.039)	(0.039)	(0.040)
Oil exporting country	-0.760 ***	-0.738 ***	-0.731 ***
	(0.290)	(0.259)	(0.254)
Trade openness	-0.001	-0.001	-0.001
	(0.004)	(0.004)	(0.004)
Democracy level	0.004	0.000	0.000
	(0.020)	(0.021)	(0.021)
Civil war in previous year	0.945 ***	0.922 ***	0.918 ***
	(0.134)	(0.141)	(0.142)
Civil war in neighbouring country	0.270 **	0.236 *	0.245 **
	(0.129)	(0.121)	(0.121)
Recently independent country	-0.219	-0.253	-0.234
	(0.311)	(0.310)	(0.317)
Temperature	0.021	0.030	0.035
	(0.091)	(0.094)	(0.094)
Rainfall	0.004 **	0.004 **	0.004 **
	(0.002)	(0.002)	(0.002)
Number of observations	4888	4888	4888
Pseudo R-squared	0.2697	0.2657	0.2665
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Number of countries	96	96	96
Period	1945-2007	1945-2007	1945-2007

Notes Estmates for a probit model using country and year fixed effects. The independent variable is the occurrence of civil conflict in a given year that is expressed as a dummy variable taking the value of 1 if there was an ongoing intrastate war in the corresponding year in a selected country (COW data). The main independent variables are the number of non-exhausted geographically inaccessible and easily exploitable diamond, gold, gemstone and drug deposits/plantations available in the selected country in a given year. Control variables are populazion size (in its logarithmic form), income per capita (in its logarithmic form), oil exporter country, trade openness, democracy level, occurrence of civil war in neigboring countries and in the selected country in the previous period, recent independence, average yearly rainfall and average yearly temperature. Independent countires considered as developing enter the sample as country×year observations from 1945 to 2007 when they have become officially independent.

Significance level and SE * p<0.10, ** p<0.05, *** p<0.01, corrected standard errosrs are reported in parenthesis.

(1) The abbreviation *250+* indicates that we run our model using geographically inaccessible (shortly, inaccessible) and easily exploitable deopsits (shortly, lootable) that are specifically located beyond 250 km from the state's capital.
(2) The abbreviation *500+* indicates that we run our model using inaccessible and lootable deopsits located beyond 500 km from the capital's range.
(3) The abbreviation *750+* indicates that we run our model using inaccessible and lootable deopsits located beyond 750 km from the capital's range.
(4) All independent variables are one year lagged except *civil war in previous year* and *recently independent country*.
(5) Both temperature and rainfall are measured as deviations from long term country's averages.

UCDP Specification One interesting fact pointed out by the literature is that the results of studies like ours are highly sensitive to different specifications and classifications of civil conflicts (Ross 2004a). To see whether we find the same ambiguous pattern for our coefficients when using a different specification for the occurrence of intrastate conflicts, we will use the Uppsala Conflict Data Project (UCDP) specification instead of the one proposed by Correlates of War (COW). As mentioned in Section 4, UCDP data is assembled using a lower threshold for classifying outbreaks of violence as civil conflicts. More precisely, within this alternative dataset, a violent event is considered as a conflict if there is evidence of the use of armed force between two parties, of which at least one is the government of a state, which has resulted in at least 25 battle-related deaths in a calendar year.

In **Table 10**, we present the estimated coefficients of our original model when adopting this different civil war classification. Similarly to our previous findings, we find no significant coefficient for geographically inaccessible and easily exploitable deposits located beyond 250 kilometers from the state's capital. When looking at deposits located beyond 500 from a state's capital, the coefficient for diamond deposits is significant at the 10% level but still shows a negative sign, thus going against our hypothesis. When adopting the *750+ km* specification, the coefficient for diamond deposits remains significant and negative while the one for gold deposits becomes positive. Once again, the coefficient for gold deposits becomes very large when moving from the *500+ km* specification to the *750+ km* specification (See Section 8). Moreover, when using UCDP data, our coefficients sensibly change in size. Although this may seem alarming, we could expect this result since more conflicts enter the UCDP dataset given the lower threshold used to classify violent events as a war. Going back to our estimates, the unexpected negative sign associated with the coefficient of diamond deposits does not change and the coefficient for gold deposit still remains suspiciously large and significant. Compared with the results obtained with COW data, we also note that the coefficient for gemstone deposits loses its significance when using this new civil war specification, shading more doubt on the validity of the rebel funding mechanism. From a general point of view, although we would have expected different coefficient sizes due to different classification standards, using UCDP data interestingly affects the significance and the direction of the estimated effects. Although these findings do not help us to better investigate our hypothesis, at least they confirm the literature's finding that many similar studies have highly sensitive results when using different war specifications.

Table 10 Geographically inaccessible and easily exploitable deposits and occurrence of civil conflict - UCDP data

	Dependent variable: Occurrence of civil conflict - UCDP data		
	250+ Km[1]	500+ Km[2]	750+ Km[3]
Main independent variables[4]:			
Diamond deposits	-0.025 (0.033)	-0.090 * (0.054)	-0.125 *** (0.036)
Gold deposits	-0.643 (0.785)	-0.696 (0.737)	4.493 *** (0.325)
Gemstone deposits	0.007 (0.024)	0.008 (0.025)	0.003 (0.025)
Drug plantations	0.028 (0.018)	0.039 (0.048)	-0.001 (0.063)
Control variables[4]:			
Log population	-0.386 (0.619)	-0.353 -(0.031)	-0.392 (0.610)
Log income per capita	-0.025 (0.034)	-0.031 (0.035)	-0.032 (0.035)
Oil exporting country	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)
Trade openness	-0.006 (0.004)	-0.006 (0.004)	-0.006 (0.004)
Number of observations	4888	4888	4888
Pseudo R-squared	0.340	0.340	0.340
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Number of countries	96	96	96
Period	1945-2007	1945-2007	1945-2007

Notes Estmates for a probit model using country and year fixed effects. The independent variable is the occurrence of civil conflict in a given year that is expressed as a dummy variable taking the value of 1 if there was an ongoing intrastate war in the corresponding year in a selected country (UCDP data). The main independent variables are the number of non-exhausted geographically inaccessible and easily exploitable diamond, gold, gemstone and drug deposits/plantations available in the selected country in a given year. Control variables are populazion size (in its logarithmic form), income per capita (in its logarithmic form), oil exporter country and trade openness. Independent countires considered as developing enter the sample as country×year observations from 1945 to 2007 when they have become officially independent.

Significance level and SE * p<0.10, ** p<0.05, *** p<0.01, corrected standard errosrs are reported in parenthesis.

(1) The abbreviation *250+* indicates that we run our model using geographically inaccessible (shortly, inaccessible) and easily exploitable deopsits (shortly, lootable) that are specifically located beyond 250 km from the state's capital.

(2) The abbreviation *500+* indicates that we run our model using inaccessible and lootable deopsits located beyond 500 km from the capital's range.

(3) The abbreviation *750+* indicates that we run our model using inaccessible and lootable deopsits located beyond 750 km from the capital's range.

(4) All independent variables are one year lagged.

Balanced Panel the original dataset we have assembled and used to perform our analysis is composed of country×years observations for independent countries. In other words, observations enter the dataset when a country has officially become independent, meaning that for some states we do not have observations from 1945 to the year they become politically autonomous. As a consequence, our panel is by construction unbalanced. While the computational methods we used take this factor into account, we could still obtain slightly biased results that would mislead our previous interpretations. To avoid this possibility, we decide to shrink our dataset in order to have a balanced panel. To do so, on the one hand we focus on three progressively shorter time periods (1960-2007,1965-2007 and 1970-2007) that allow us to consider more independent countries compared to the period 1945-2007. On the other hand, we also drop countries that have not obtained their independence by 1960, 1965 and 1970 respectively, in order to have a fully balanced panel. We decide to pick these time windows since the years between 1960 and 1970 are the ones when the most number of selected countries obtained their independence. Consequently, this adaptation makes it easier to have a good trade-off between the number of countries included in the dataset and the length of the time window analyzed. To give a more precise idea, 49% of the selected countries became independent by 1960, 76% obtained it by 1965 and 84% did so by 1970. The number of observations for the new datasets is 2349 for the period 1960-2007, 3182 for 1965-2007 and 3078 for 1970-2007. An interesting feature of this test is that it also lets us consider whether the availability of certain natural deposits has a different impact on the occurrence of civil wars in more recent periods.

We report the coefficients obtained by estimating the original model using the newly built datasets in **Table 11**. As we did before, we still consider geographically inaccessible and easily exploitable natural deposits that are located beyond 250, 500 and 750 kilometers from the state's capital. As the regression output tells us, we are not able to gain any satisfactory insight on the rebel funding mechanism by balancing our panel. The coefficients for diamond deposits, gold deposits and drug plantations are highly sensitive to these new specifications and their signs and sizes tend to change sensibly across different time windows. Although we cannot find a consistent pattern for diamonds, gold and drugs, the only coefficient that shows some consistency with the previous regressions outputs (except the ones with UCDP data) is the one for gemstone deposits. Even if we may still conclude that gemstones can be the source of funding for rebel groups who can in turn use them to finance conflicts, the behavior of all the other coefficients remains too volatile to safely support our hypothesis.

Table 11 Geographically inaccessible and easily exploitable deposits and occurrence of civil conflict - balanced panels

	Occurrence of civil conflict, COW specification								
	Panel 1 period 1960-2007			**Panel 2** period 1965-2007			**Panel 3** period 1970-2007		
	250+ Km[1]	500+ Km[2]	750+ Km[3]	250+ Km	500+ Km	750+ Km	250+ Km	500+ Km	750+ Km
Main independent variables[4]:									
Diamond deposits	0.070	-0.069	-0.124	0.040	-0.014	-0.058	0.056	0.010	-0.039
	(0.062)	(0.122)	(0.190)	(0.052)	(0.081)	(0.090)	(0.064)	(0.098)	(0.100)
Gold deposits	-0.452	2.909	2.526	-0.006	0.638	0.490	-0.018	-0.959	-0.981
	(0.664)	(2.512)	(2.346)	(0.632)	(2.243)	(2.227)	(0.771)	(2.657)	(2.609)
Gemstone deposits	0.045	0.061 ***	0.057 ***	0.001	0.050 ***	0.054 ***	-0.005	0.047 ***	0.051 ***
	(0.032)	(0.016)	(0.015)	(0.030)	(0.015)	(0.014)	(0.031)	(0.016)	(0.016)
Drug plantations	0.006	0.105 *	0.433	-0.012	0.050	0.186	-0.018	0.023	0.084
	(0.019)	(0.057)	(0.308)	(0.016)	(0.059)	(0.306)	(0.018)	(0.070)	(0.326)
Control variables[4]:									
Log population	-0.755	-0.905	-0.801	-0.115	-0.080	-0.024	0.312	0.317	0.362
	(0.984)	-(0.040)	(0.955)	(0.910)	-(0.078)	(0.935)	(1.061)	-(0.024)	(1.086)
Log income per capita	-0.048	-0.040	-0.047	-0.080 *	-0.078 *	-0.082 *	-0.021	-0.024	-0.027
	(0.047)	(0.047)	(0.047)	(0.042)	(0.042)	(0.042)	(0.069)	(0.075)	(0.075)
Oil exporting country	-1.069 ***	-1.023 ***	-1.020 ***	-0.786 ***	-0.709 ***	-0.710 ***	-0.870 ***	-0.734 ***	-0.720 ***
	(0.305)	(0.294)	(0.294)	(0.211)	(0.205)	(0.204)	(0.269)	(0.273)	(0.275)
Trade openness	0.000	-0.001	0.000	-0.001	-0.002	-0.002	-0.002	-0.003	-0.003
	(0.005)	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Number of observations	2349	2349	2349	3182	3182	3182	3078	3078	3078
Pseudo R-squared	0.177	0.183	0.180	0.166	0.169	0.169	0.179	0.180	0.181
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	49	49	49	74	74	74	81	81	81
Period	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007

Notes Estmates for a probit model using country and year fixed effects. The independent variable is the occurrence of civil conflict in a given year that is expressed as a dummy variable taking the value of 1 if there was an ongoing intrastate war in the corresponding year in a selected country (COW data). The main independent variables are the number of non-exhausted geographically inaccessible and easily exploitable diamond, gold, gemstone and drug deposits/plantations available in the selected country in a given year. Control variables are populazion size (in its logarithmic form), income per capita (in its logarithmic form), oil exporter country and trade openness. Independent countires considered as developing enter the sample as country×year observations from 1945 to 2007 when they have become officially independent.

Significance level and SE * p<0.10, ** p<0.05, *** p<0.01, corrected standard errosrs are reported in parenthesis.

(1) The abbreviation *250+* indicates that we run our model using geographically inaccessible (shortly, inaccessible) and easily exploitable deopsits (shortly, lootable) that are specifically located beyond 250 km from the state's capital.
(2) The abbreviation *500+* indicates that we run our model using inaccessible and lootable deopsits located beyond 500 km from the capital's range.
(3) The abbreviation *750+* indicates that we run our model using inaccessible and lootable deopsits located beyond 750 km from the capital's range.
(4) All independent variables are one year lagged.

Exploring the impact of different time-lags Until this point, we have assumed that the level of natural resource deposits at time t-1 influences the likelihood that a country will experience a civil conflict at time t. This setup was chosen since we suppose that rebel groups need time to invest revenues stemming from natural resources to finance military operations. Even if the literature has usually considered the time lag between the exploitation of resources and initiation of a conflict to be of one year, we cannot exclude the possibility that this effect may take more time to materialize. For this reason, we want to investigate how the number of natural resource deposits two or three years prior to a year marked by a civil war may influence the rebel funding mechanism. Since we want to test how much it actually takes for rebels to transform natural deposits into military capability, we use different lag specifications singularly, i.e. we do not take into account different lags in the same regression. Moreover, we also modify the time lag for our control variables to consistently take into account also their alternative deferred impact.

In **Table 12**, we report the coefficient estimates of our model when considering the number of natural deposits present in a country at one (original case), two or three years prior given country×year observation. As it happened in the original case, when considering natural deposits located beyond 250 kilometers form the capital's range, our coefficients of interest are not significant at the 5% level. When we focus on the stricter case of geographically inaccessible and easily exploitable resources located beyond 500 and 750 kilometers from the state capital, the coefficients we got for the two and three years lag specifications are very similar to those obtained with the original one-year lag specification. Quite surprisingly, coefficients across different time lag specification are very similar in size and significance level. According to our previous discussion, we would have expected coefficients to vary significantly when using two and three-years time lags. Assuming the one-year lag specification was correct, we would have at least expected that the level of natural deposit farer in the past influenced less the incidence of civil conflict in the present. Alternatively, in case one of the other two specifications was better suited to capture the rebel funding mechanism, we would have expected to see less significant coefficients for the remaining two specifications. Clearly, these results constitute a piece of evidence suggesting that our model is not capturing the existence of the rebel funding mechanism either because it overlaps with other forces or because it is not present at all. Even if we do not report the results here, the same results can be found when including additional controls or using UCDP data.

Table 12 Geographically inaccessible and easily exploitable deposits and occurrence of civil conflict - longer lags

	Occurrence of civil conflict, COW specification								
	Panel 1 1-year lag (original sepcification)			**Panel 2** 2-years lag			**Panel 3** 3-years lag		
	250+ Km[1]	500+ Km[2]	750+ Km[3]	250+ Km	500+ Km	750+ Km	250+ Km	500+ Km	750+ Km
Main independent variables[4]:									
Diamond deposits	-0.050 *	-0.071 ***	-0.091 **	-0.047 *	-0.067 ***	-0.084 *	-0.048	-0.069 **	-0.084 *
	(0.027)	(0.025)	(0.036)	(0.028)	(0.026)	(0.044)	(0.034)	(0.034)	(0.044)
Gold deposits	-0.234	-0.448	3.783 ***	-0.246	-0.467	3.969 ***	-0.190	-0.332	3.969 ***
	(0.835)	(0.854)	(0.332)	(0.853)	(0.874)	(0.338)	(0.863)	(0.930)	(0.338)
Gemstone deposits	0.005	0.053 ***	0.056 ***	0.009	0.066 ***	0.059 ***	0.002	0.055 ***	0.059 ***
	(0.030)	(0.015)	(0.014)	(0.032)	(0.019)	(0.017)	(0.033)	(0.019)	(0.017)
Drug plantations	-0.025	0.014	0.017	-0.027	0.013	-0.041	-0.032 *	-0.007	-0.041
	(0.019)	(0.048)	(0.037)	(0.019)	(0.049)	(0.040)	(0.018)	(0.051)	(0.040)
Control variables[4]:									
Log population	-0.557	-0.531	-0.518	-0.546	-0.528	-0.553	-0.558	-0.551	-0.553
	(0.662)	-(0.031)	(0.662)	(0.707)	-(0.051)	(0.720)	(0.724)	-(0.053)	(0.720)
Log income per capita	-0.042	-0.031	-0.032	-0.061 **	-0.051 *	-0.052 *	-0.063 **	-0.053 *	-0.052 *
	(0.028)	(0.030)	(0.031)	(0.025)	(0.027)	(0.029)	(0.026)	(0.028)	(0.029)
Oil exporting country	-0.686 **	-0.644 **	-0.640 **	-0.521 *	-0.471 *	-0.520 *	-0.560 *	-0.531 **	-0.520 *
	(0.274)	(0.251)	(0.250)	(0.297)	(0.273)	(0.265)	(0.292)	(0.267)	(0.265)
Trade openness	-0.004	-0.004	-0.004	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Number of observations	4888	4888	4888	4820	4820	4820	4752	4752	4752
Pseudo R-squared	0.210	0.209	0.210	0.211	0.210	0.211	0.212	0.210	0.211
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	96	96	96	96	96	96	96	96	96
Period	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007	1945-2007

Notes Estmates for a probit model using country and year fixed effects. The independent variable is the occurrence of civil conflict in a given year that is expressed as a dummy variable taking the value of 1 if there was an ongoing intrastate war in the corresponding year in a selected country (COW data). The main independent variables are the number of non-exhausted geographically inaccessible and easily exploitable diamond, gold, gemstone and drug deposits/plantations available in the selected country in a given year. Control variables are populazion size (in its logarithmic form), income per capita (in its logarithmic form), oil exporter country and trade openness. Independent countires considered as developing enter the sample as country×year observations from 1945 to 2007 when they have become officially independent.

Significance level and SE * p<0.10, ** p<0.05, *** p<0.01, corrected standard errosrs are reported in parenthesis.

(1) The abbreviation *250+* indicates that we run our model using geographically inaccessible (shortly, inaccessible) and easily exploitable deopsits (shortly, lootable) that are specifically located beyond 250 km from the state's capital.
(2) The abbreviation *500+* indicates that we run our model using inaccessible and lootable deopsits located beyond 500 km from the capital's range.
(3) The abbreviation *750+* indicates that we run our model using inaccessible and lootable deopsits located beyond 750 km from the capital's range.
(4) All independent variables are one year lagged in Panel 1, two years lagged in Panel 2 and 3 years lagged in Panel 3.

Excluding gold deposits in all our previous estimations, we have seen how the coefficient of gold deposits for all specifications remains suspiciously high compared to other coefficients. The reasons that may explain this unexpected behavior are explored in more detail in the discussion presented in Section 8. To investigate how misleading this variable may be for our analysis, we exclude it from our model. By doing so, we expect the coefficients of the remaining resource deposits to give a more informative idea on the rebel funding mechanism. **Table 13** summarizes the result of this latter specification. As we note from the table, the new coefficients for diamond deposits, gemstone deposits and drug plantations do not change significantly when excluding gold deposits from the analysis. Although this may appear reassuring, the size, sign and significance of our remaining coefficients still do not support the rebel funding hypothesis.

Table 13 Geographically inaccessible and easily exploitable deposits and occurrence of civil war - excluding gold deposits

	Dependent variable: Occurrence of civil conflict - COW data		
	250+ Km[1]	500+ Km[2]	750+ Km[3]
Main independent variables[4]:			
Diamond deposits	-0.050 *	-0.070 ***	-0.091 **
	(0.027)	(0.025)	(0.035)
Gemstone deposits	0.005	0.053 ***	0.055 ***
	(0.030)	(0.015)	(0.014)
Drug plantations	-0.025	0.011	0.029
	(0.019)	(0.046)	(0.035)
Control variables[4]:			
Log population	-0.555	-0.528	-0.513
	(0.662)	-(0.031)	(0.662)
Log income per capita	-0.041	-0.031	-0.032
	(0.028)	(0.030)	(0.031)
Oil exporting country	-0.687 **	-0.646 **	-0.640 **
	(0.274)	(0.250)	(0.250)
Trade openness	-0.004	-0.004	-0.004
	(0.004)	(0.004)	(0.004)
Number of observations	4888	4888	4888
Pseudo R-squared	0.210	0.209	0.210
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Number of countries	96	96	96
Period	1945-2007	1945-2007	1945-2007

Notes Estmates for a probit model using country and year fixed effects. The independent variable is the occurrence of civil conflict in a given year that is expressed as a dummy variable taking the value of 1 if there was an ongoing intrastate war in the corresponding year in a selected country (COW data). The main independent variables are the number of non-exhausted geographically inaccessible and easily exploitable diamond, gold, gemstone and drug deposits/plantations available in the selected country in a given year. Control variables are populazion size (in its logarithmic form), income per capita (in its logarithmic form), oil exporter country and trade openness. Independent countires considered as developing enter the sample as country×year observations from 1945 to 2007 when they have become officially independent.

Significance level and SE * $p<0.10$, ** $p<0.05$, *** $p<0.01$, corrected standard errosrs are reported in parenthesis.

(1) The abbreviation *250+* indicates that we run our model using geographically inaccessible (shortly, inaccessible) and easily exploitable deopsits (shortly, lootable) that are specifically located beyond 250 km from the state's capital.

(2) The abbreviation *500+* indicates that we run our model using inaccessible and lootable deopsits located beyond 500 km from the capital's range.

(3) The abbreviation *750+* indicates that we run our model using inaccessible and lootable deopsits located beyond 750 km from the capital's range.

(4) All independent variables are one year lagged.

Checking the exogeneity of natural resource deposits discovery It may be possible that the date of discovery of natural resource deposits is causally linked with their distance from the state's capital. Intuitively, exploration efforts may be stronger in the area surrounding the capital in the beginning or even before a country's independent history. According to the same logic, it is possible that resource deposits located farer away are discovered later in time because the state prioritizes the exploration in the vicinity of the capital. If this theory was true, the year of discovery of a new deposit would not be exogenous and this fact could highly bias our estimates and mislead the interpretation of our results. To exclude this possibility, we test the hypothesis mentioned above by regressing the year of discovery of a given deposit on the distance from the state's capital. For every resource included in our analysis we also include country fixed effects in our regressions to control for country-specific characteristics. We obtain insignificant coefficients for each resource we have included in our analysis so far. We conclude that our explanatory variables can still be considered exogenous and theoretically good predictors of the outbreak of civil conflicts in a given country at a given time. Although the results we have obtained with previous tests go against our hypothesis, it is important to be aware that our explanatory variables are not shaped by a similar dynamic.

Checking for other specifications In this paragraph, we will briefly mention some additional tests we carried out to investigate the validity of the rebel funding mechanism. The first test we tried to perform was to reduce the time dimension by considering the occurrence of civil wars and the presence of natural resource in periods of 5 years (Collier and Hoeffler 2000). We chose this approach since we suspected that using periods of one year would have made our results too volatile. Second, we tried to combine similar natural resources in one variable, e.g. precious minerals (diamonds and gold) and all minerals (diamonds, gold and gemstones). Although we excluded the possibility that rebels could benefit from oil deposits due to the high extraction and trade costs associated with this resource, we nonetheless relaxed this assumption by including them in our analysis. Third, we tried to disaggregate drug cultivations according to the nature of the plantations. More precisely, we separately analyzed the effect of opium poppy, coca bushes and cannabis plantations to see whether the rebel funding mechanism could hold for some subset of drug harvests. Concerning drug plantations, we also tried to disaggregate the cultivation polygons in the DRUGDATA dataset using a denser grid of 0.5×0.5-degrees. Finally, we also investigated how the picture may change when restricting our attention to deposits farer than 750 kilometers (i.e. farer than 1000 kilometers, 1250 kilometers, 1500 kilometers and so on) and deposits classified as geographically inaccessible only because their land cover or elevation exclusively. All these tests did not shade additional light on the rebel funding mechanism as the resulting coefficients showed a similar inconclusive pattern as the one reported in the original analysis. Moreover, using a logit or a linear probability approach gives very similar estimates of our coefficients of interest, excluding the possibility that our results could have been driven by the specific choice of using the probit model.

6. Discussion

At this moment of our presentation, it is natural to ask ourselves why we did not find the expected evidence that may have supported the rebel funding mechanism. Our hypothesis held that the abundance of geographically inaccessible and easily exploitable natural resources deposits is linked to a higher likelihood that a country will experience a civil conflict. The underlying assumption that sustains this relationship is that rebel groups may indeed use natural resources' revenues to finance military operations directed against the central state, eventually leading to the outbreak of civil war. As we have shown in the previous sections of our paper, the estimated coefficients of our regressions did not match the pattern that would have proven this hypothesis. In other words, our coefficients did not highlight an unambiguous positive effect of some specific natural deposits on the incidence of civil war in a selected country at a given time. To understand why our analysis did not bring us the desired results, we have formulated a series of alternative hypotheses that may help explain why we did not find empirical evidence for the existence of the rebel funding mechanism.

From a broad perspective, the different explanations we came up with can be grouped into four general categories. Starting from a broad perspective, the first alternative hypothesis is that the rebel funding mechanism may coexist with other unobserved forces that also influence the likelihood that a civil conflict may occur. More precisely, we believe that there may be other important factors that interact with the rebel funding mechanism or that may alone explain the insurgence of intrastate wars. This broad set of explanations is connected with the more general issue of omitted variable bias, which has been extensively highlighted by the previous literature. A second problem that we potentially face is reverse causality, i.e. the possibility that our dependent variable (occurrence of civil conflict) influences our main independent variables (number of natural deposits) and controls, which in turn may lead us to obtain unclear results. Although this link may seem counterintuitive, it is in fact likely that such a relationship is impactful and persisting, even when adopting a lagged variable approach to counter this possibility. Third, we cannot exclude that the specifications of our econometric model are not suited to effectively study the rebel funding hypothesis. It may indeed be the case that the construction of our variables, especially the independent ones, is not appropriate for addressing our question. We will consider this possibility by reviewing how we built our model and suggesting possible improvements that could be implemented. Finally, some important criticalities may hide in the data we have collected and used to perform our analysis. In fact, we contemplate the possibility that issues related to data collection and data reliability may have negatively impacted the accuracy and the significance of our results. In the following paragraphs, we are going to briefly discuss each of these problems and try to provide some guidance for further research in this field. At the end of this summary, **Scheme 4** gives an overview of how these issues may have simultaneously affected our analysis.

Unobserved factors From a theoretical perspective, it could easily be the case that our analytical framework is not able capture all the forces that influence a country's likelihood to suffer from an intrastate war. As the literature has suggested, there may be several additional factors, mostly unquantified and unobserved, that can explain the emergence of civil conflicts in developing countries (Ross 2004a). As the reader may imagine, the failure to pin down these forces could have potentially compromised the results of our analysis and the goodness of the insight we may have obtained from them. To highlight this possibility, in the following paragraph we will summarize the variables we have not been able to address ether because of the limitations of data or because of the lack of indication in the literature.

To begin with, in our framework we have implicitly assumed that natural resources, measured as the number of available deposits, are the only source of funding for rebel military activities. One first issue with our specification is that, when considering natural deposits, we have only taken in account their number and ignored, among other features, their size. Furthermore, we have not considered the market value of the selected resources and, consequently, we have not really looked at the potential revenue they could have generated at different points in time. Connected to this consideration, it may also be the case that the types of resources we selected do not provide enough funding for military operations at all. From a broader perspective, we cannot exclude that a set of alternative channels may in reality explain the emergence of civil conflicts. For instance, we could assume that natural resource revenues are specifically used to recruit armed forces and buy weapons, two elements that eventually constitute the ingredients for the outbreak of large-scale violence. This intermediate step that we have not considered (and that we have not instrumented) could in fact be another cause of the unexpectedness of our results. Turning to other explanations, it is not difficult to imagine that rebel groups could potentially benefit from other sources of financing unrelated to the abundance natural deposits. Funding could in fact originate from a variety of other sources, for instance human trafficking, looting, preexistent accumulated capital or financial support from foreign states. Interestingly, this latter dynamic has in fact been documented during the years of the Cold War, when US and USSR governments sponsored African rebel groups to strengthen their influence over the continent (Prunier 2009). On a complete different ground, it could be possible that institutional factors play the most significant role by either preventing or making conflicts more likely. Although in our regression we have included controls for level of democracy, it could be necessary to adopt more informative institutional dimensions. Furthermore, despite the fact that there is not enough evidence for that, forces like greed, grievance and ethno-religious fragmentation could still significantly explain part of the observed reality, although still in a secondary way (Reynal-Querol 2002; Collier et al. 2009). The interplay of these alternative but not necessarily exclusive mechanisms make the overall picture relatively complex and difficult to analyze. More specifically, the presence of overlapping forces makes the task of isolating the rebel funding mechanism particularly challenging even when reliable data is available. From a theoretical point of view, it may be still feasible to take into account all these factors but the lack of reliable and detailed data for a relatively extended period of time make this task extremely difficult, if not practically impossible, to accomplish.

Finally, we want to remark an additional consideration on the particular nature of certain natural deposits. Contrarily to mineral resources, the intensity of cultivation of drug plants is highly susceptible to a specific set of variables. As we have just mentioned, climate conditions highly influence the size of harvests while they virtually do not affect mining operations. Among other factors, the degree of government control can also influence the likelihood that drug plantations will start in a given territory (i.e. the more an area is under control of the central government, the less likely it is for locals to cultivate drug plantations). From a general perspective, the partial lack of exogeneity that characterizes the presence of drug plantations may be critical for the results of our analysis. Moreover, in the absence of relevant data sources, there are not suitable specifications that we can implement to effectively mitigate this issue. To partially counter this problem, we will however consider lagged values for the intensity of drug cultivation and we will be particularly careful in interpreting the coefficients associated to this type of natural resource.

Reverse causality As researchers have often been worried about, another critical issue affecting this kind of study is the likely influence of reverse causality patterns (Ross 2004a). In our analysis, we have assumed that natural deposits have an impact on the probability of the occurrence of civil war but not the other way around. However, it could still be the case that civil wars may affect the number of exploitable deposits within a country's territory. As we have mentioned in the previous section, there may be many reasons why this relationship may hold, at least in theory. A country at war is by definition characterized by an unstable environment both in social, economic and political terms. Widespread instability and uncertainty could in principle limit the exploration of new natural deposits, which in turn affects their number. Moreover, military operations are destructive in their nature and do not only bring damage to populations and to the natural environment but also to infrastructure. It is indeed possible that hostilities could damage the tools used for resource extraction, in turn reducing the number of usable deposits. This hypothesis emerges from observing the dynamics that characterized civil wars in the Middle East where oil rigs were repeatedly destroyed to prevent opponent factions to benefit from them. From an opposite perspective, we also cannot exclude that a reverse mechanism may take place. Military operations are generally expensive and all factions involved in a conflict could potentially face an incentive to find additional financial resources to sustain their activities. Potentially undiscovered natural deposit could then be a target for both governments and rebels that could use them to accumulate additional funding for their operations. If this theory holds, the direct consequence would be that relatively more natural deposit will be discovered within a country affected by a civil conflict. Moreover, we should not forget that the reverse causality problem may also take place between civil conflicts and our additional control variables. Take for instance democracy level. It is likely that the outbreak of a war may worsen the institutional quality, making authoritarian regimes more likely to take control of a given country. Similar reasonings can also be applied to trade openness, population and income per capital levels, which are variables that are likely to be significantly affected during war times. As the reader may have guessed, we will never be able to completely rule out these possibilities, not even by using lagged values for our independent variables. We must in fact be aware that it remains difficult to completely isolate the selected mechanisms, even by using an instrumental variable approach, especially due to data availability, reliability and timeliness.

As we have just discussed, it is easy to imagine different theoretical mechanisms that may link large-scale violence to the change in the number of available natural deposits. It is important to note however, that such mechanisms could differ quite substantially, especially between mineral (i.e. diamonds, gold and gemstones) and non-mineral resources (i.e. drug plantations). When it comes to drug plantations, the reverse causality problem is, at least in theory, more complex. From one point of view, drug cultivations are affected by analogous forces with respect to mineral deposits. As we have previously explained, it is possible that the outbreak of civil violence may limit the possibility to cultivate drug plantations and, in some cases, it is likely that military operations may destroy existing harvests. As it is the case for mineral deposits, it is also possible that the need for military funding may push rebel groups to increase the number of cultivations in order to accumulate more revenues.

However, there are many ways in which drug harvest differ from mining products when considering reverse causality mechanisms. First, drug cultivations can be more easily displaced in regions not affected by violence, assuming that other suitable territories are available. Secondly, plantations are more easily damaged by military operations compared to mineral deposits. Finally, the time required to recover from destructive events connected to war is longer for plantations, especially given the amount of time farmers must wait before harvesting the final product. These considerations show that additional channels may lead to reverse causality for this type of resource. Moreover, it remains particularly difficult to assess the net contribution of each of these forces to the reverse causality problem for drugs. As we are going to explain later, this issue cannot be appropriately addressed with the available data sources.

Issues with model specifications The misleading nature of our results could in principle originate from various misspecifications in our econometric model. We are in fact conscious that many of the assumptions we have implicitly made could be challenging for the scope of our study. Although many of our restrictions were made to deal with the nature of our data, this does not mean that they are necessarily well suited for addressing our question. In this paragraph, we are going to present some of the criticalities we are aware of and try to justify them and suggest possible improvements.

To begin with, our model is based on the hypothesis that rebel factions will engage in hostile operations that may escalate to civil conflicts as soon as they are financially sustainable. One immediate question we may pose is whether rebel groups will always find it rational to engage in a military conflict in order to fight for their causes or defend themselves. Indeed, it could be plausible that rebels may seek other ways to pursue their goals, may they be independence, higher autonomy or more civil rights. One possible solution would be to pursue the path of contracting with the central governments and fight on the political ground if there is a sound institutional environment that allows it. As a consequence, it is not guaranteed that more financial wealth, either originating from natural resources or somewhere else, will lead to severe violent conflicts.

A second possibility is that our analytical setup may not be sufficiently well suited to isolate the rebel funding mechanism from other forces. One indication that this may be the case is, for instance, the recurring negative sign associated with the coefficient of diamond deposits. According to our hypothesis, we would have in fact expected a positive coefficient for this type of natural resource, indicating that geographically inaccessible and easily exploitable diamond deposits are associated with a higher probability observing a civil conflict. Since we have documented the opposite result, we suspect that our model is unable to isolate well the rebel funding mechanism. Additionally, such an estimate would also suggest that other forces are driving the unexpected direction of the hypothesized effect. For instance, we could explain this result if we assume governments to have a higher incentive to control natural resources that are located farer away. Contrarily to what the literature suggests, states may in principle be aware that inaccessible resources are more difficult to control and hence they will devote proportionally more resources to ensure their stability, in turn lowering the probability of triggering hostile actions from rebel groups. We did not consider this mechanism in our study since it would have been difficult to choose a suitable econometric specification. Furthermore, such a choice would also have altered the original scope of our investigation.

An additional issue with our analysis may lie in the selection of countries as observational units. Indeed, we cannot exclude that the rebel funding mechanism may take place exclusively in more restricted geographic areas, for example at the country's regional level. The reader may legitimately wander why we did not choose to focus on a regional dimension in order to assess the effect of geographical inaccessibility of natural resources on civil wars. A quick answer to this criticism is that geolocated data for conflict and natural resources is available at the regional level but it does not cover a sufficiently long period of time.

Another problem associated with our framework is that we assume natural resources to be easily tradable and convertible into revenues. This consideration implicitly entails two assumptions. On the one hand, we think that different resources are equally and significantly profitable across time. On the other hand, we also assume that rebels have access to well-functioning markets for these goods. We must admit that these considerations are hard to believe when we look at the contingency of the real world. Diamonds, gold, gemstones and drugs have been in fact subjected to significant price fluctuations that have made them more or less profitable at different points in time. Moreover, for historical and geographical reasons, there may be many regions where there is not a stable access to market for these resources.

One additional assumption we have made throughout our analysis is that the presence of more natural deposits has a linear effect on the probability that a civil war occurs. We have in fact excluded the possibility that the effect of natural deposits is nonlinear since it made our analysis easier to perform. However, we are aware that some pieces of research have suggested that the relationship we study may be nonlinear. Although ignoring this possibility lets us work with a simpler and more parsimonious framework, we remain aware that sticking to our approach is likely to bias our results (Ross 2004b).

Finally, given the nature of the data we have collected, we have decided to classify resource geographic accessibility using land cover characteristics, elevation and the ellipsoidal distance of deposits from the state's capital. Although we have not found any guidance in the previous literature, we are aware that these newly chosen criteria could be slightly inappropriate. The reader may in fact ask why we have not used other indexes of accessibility like the capital's distance relative to the country's size or road distance between the capital and natural resource deposits. One immediate answer is that data availability and reliability did not allow us to use different specifications. Nonetheless, we are aware that having adopted these definitions may have seriously harmed the quality of our estimates.

To conclude, most of the simplifications implemented in our model were made for two reasons. First, some specifications have been adopted to remain consistent with our original research question. Second, our modelling choices have been partially shaped by the restricted availability of relevant and reliable data. Although several doubts may arise when looking closely at our analytical framework, we want to remind the reader that eventual limitations mainly stem from the limited availability of information and the need to work with a parsimonious setup.

Data issues To conclude the list of the causes that have possibly led us to reject our hypothesis, we briefly discuss the issue of data availability, reliability and timeliness. Data availability is potentially the most critical requirement and the biggest obstacle when addressing the link between natural resource deposits and civil conflicts. Many of the assumptions and specifications we have adopted in our model have in fact been crafted to deal with limited and heterogeneous data sources.

One first problem we encounter is that, although geolocated data is available for many resource deposits for an extended amount of time, geocoded information for civil conflict does not have the same desirable characteristic. In particular, when considering intrastate wars, we are forced to use data aggregated at the country level which, although reliable, tends to be relatively undetailed. When it comes to data for natural deposits, the major issue we normally encounter is that these sources are basically a conglomerate of different preexistent publications that, despite being comparable in terms of reporting standards, may not be characterized by the same level of reliability. More specifically, data reliability constitutes a major problem when it comes to the geographic coordinates of deposits and, most importantly, to the time information associated with them (i.e. discovery date and end of exploitation date).

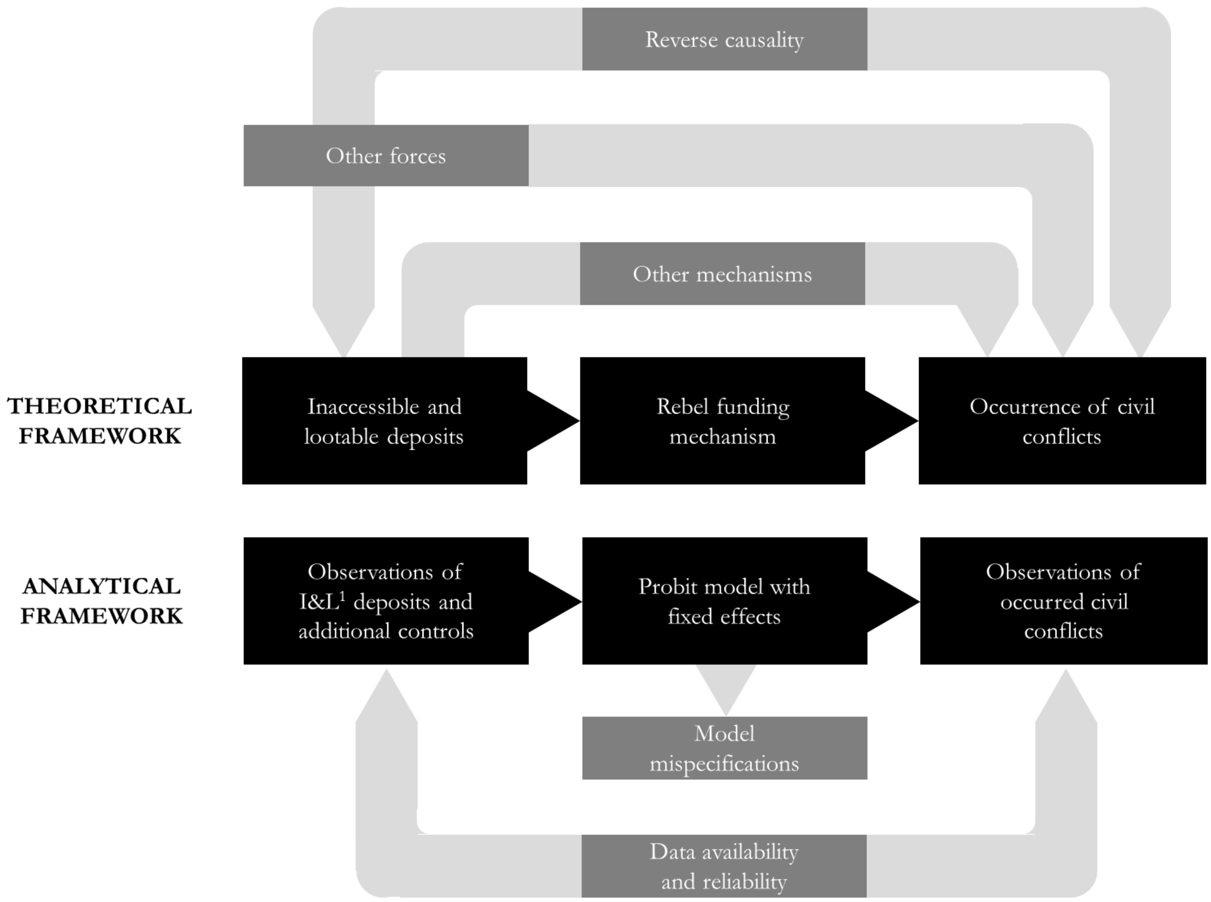
Another potential issue lies in the heterogeneity of data collection efforts across geographic regions. As we can observe using GIS software, observations on natural deposits tend to be clustered in very specific regions and countries. This feature, which characterizes all our resource datasets, originates from the fact that a restricted set of countries has been studied more in detail by researchers. As an immediate consequence, some states account for more reported deposits simply because they have supposedly attracted more interest in the past decades. To give a practical example, many diamond deposits are concentrated in Angola and South Africa, which are two countries that have been extensively studied for the role that diamond extraction has played in the development of their economies. Except from geological reasons, one additional motive that may explain why some resources are clustered in very specific spots is that some areas are more difficult and risky to explore for researchers. As a consequence, fewer natural resource deposits are documented in these districts. All these factors suggest that the number of deposits we are considering is lower than the real number of discovered ones, posing a serious risk for the validity of the model we implement. This fact has some important implications for the empirical results we have obtained from our analysis. After a deeper investigation, we have found for example that the suspiciously high coefficient associated with gold deposits is probably driven by the low number of inaccessible and lootable gold sources remaining in our dataset. More precisely, we discovered that this coefficient has probably been shaped by years that were characterized by an increase of gold deposits in Peru and Indonesia that were immediately followed by long periods of civil war. Due to the nature and to small number of observations that can be used, we may suspect that the large and significant coefficient we have obtained for gold deposits may be purely a result of chance.

To conclude our discussion, it is fundamental to note that data reliability and abundance is not the only problem we face in our analysis. The lack of information to build more appropriate variables and to better test the variety of simultaneous dynamics constitutes the major challenge that researchers have to confront with. Most of the criticalities we have just listed could potentially be solved by better shaping our variables and by including more relevant controls. Unfortunately, to do so we would need access to more extensive and precise datasets. For instance, in case it had been feasible, we would have considered the size of natural deposits, not only their number, to study the impact of natural resources on civil conflict. Moreover, if we could have employed historical data for transportation infrastructure quality, we would have certainly used travel time or road distance as a more solid proxy for geographic inaccessibility. As a final example, if geolocated information for civil conflict and rebel activity had been available for a longer time period, we could have performed a more targeted analysis focusing on a regional level and not on the broader national dimension. In particular, we could have matched areas with abundant natural resources with regions with a strong presence of rebel forces to study more precisely our research question. Before concluding our discussion, we want to point out that data for most natural resources is indeed available but its access is often restricted. This is certainly the case for diamond, gold and oil deposits data that has been widely collected by private companies and extensively used by the mining and the oil industries. From a general perspective, we have noted that it is in theory possible to rely on better data sources but it can be extremely costly given the commercial value of these pieces of information. Although data limitations are quite evident for studies focusing on a global dimension, we conclude that researchers may find it more relevant to stick to country specific case studies for now. In fact, available data tends to be better in terms of quality, quantity and timeliness when studying a more restricted context.

From a general perspective, studying the impact that natural resources may have on the occurrence of conflicts constitutes a hard challenge with many respects. On the one hand, there are many overlapping forces that simultaneously shape the risk that a country will experience a civil conflict. Although researchers may be aware of all these mechanisms, it is still difficult to empirically model their individual impact and their systemic interaction. On the other hand, the availability and the reliability of data sources constitutes a problem of no lesser importance. Despite the amount of effort spent on collecting and updating information about civil conflict and natural resources, data availability still constitutes a significant obstacle for the development of further pieces of research. The yet to be understood interplay of different forces, together with the scarcity of good data, makes the empirical analysis of the relationship between natural resources and conflict particularly challenging. From one side, it is true that econometric models must be effectively designed to capture multiple effects and complex emerging patterns. On the other side, the same models need to rely on a significant amount of good quality data which is often not accessible. The ultimate consequence of such limitation is that researchers are forced to adopt a reductive approach, aiming for a reasonable tradeoff between the complexity they aim to explain and the limits imposed by the lack of data.

To conclude, we still believe that our study has indeed been useful since it highlighted at least the major obstacles researchers face today. From the very beginning, the scope of our thesis was to explore the immediately consecutive step that the literature has indicated. Although we have experienced how the existent theoretical frameworks and the quality of data represent a major obstacle, we believe it is possible to discover a lot more in the field of the resource curse. However, before aiming for significant and useful conclusions, we should acknowledge that there is a pressing need for better hypotheses to be tested, which is conditional on the existence of better empirical frameworks and more reliable data.

Scheme 4 Factors explaining the unexpectedness of our results



Notes There are several factors that may explain the inconclusive nature of our results: 1) other forces and mechanisms may affect or exclusively explain the outbreak of civil conflicts, 2) there may be reverse causality patterns that cannot be completely isolated by our model, 3) the unavailability of relevant data does not allow to use more suitable econometric specifications and 4) the unreliability of available datasets constitutes a general constraint for testing our hypothesis.
(1) The abbreviation "I&L" stands for inaccessible and lootable.

7. Conclusion

The role that natural resources play in the development paths of many third-world countries has been a major concern for researchers in recent decades. As the literature has highlighted, natural resource abundance is often linked with poor economic, political and social outcomes. Given the promising progresses in the study on how natural resources particularly affect the incidence of civil conflicts, we decided to explore further how certain types of natural resources affect the probability that a resource-rich country may be hit by a civil conflict. The main interest of our study was to investigate the hypothetical link between the abundance of geographically inaccessible and easily exploitable natural deposits and the occurrence of civil conflict in a group of selected developing countries. Concerning the nature of this relationship, we have hypothesized that inaccessible and lootable resources may provide rebel groups with the necessary financial means to engage in a civil conflict with the central government. We have further supposed that revenues stemming from natural resources can be either used by rebels to initiate hostilities or to respond to government's offensives. Moreover, we have assumed rebels' military capability to constitute the key determinant of civil wars since governments are usually in control of a standing army. Finally, we had reasons to believe the funding opportunity to be the major driver of the outbreak of intrastate conflicts while motivations like greed and grievance do not play a significant role in this context.

To test this relationship, we have implemented a binary response model and tested a series of alternative specifications. We have selected the lagged number of diamond, gold, gemstone and drug deposits/plantations as our independent variables and the occurrence of civil conflict as our dependent variable. Contrarily to our expectations, our estimates suggest that the so-called rebel funding hypothesis is not supported by empirical results. Performing different robustness checks, we have further concluded that our estimates are highly sensitive to different model specifications and that they are all equally inconclusive. In order to make sense of this outcome, we have proposed different considerations that may explain our results. One possible reason is that the limited availability of data has not allowed us to take into account other relevant forces that had been indicated to play a significant role in such a context. Moreover, we have also suspected that the interplay of forces other than the rebel funding mechanism may make it particularly difficult to empirically isolate and test our hypothesis. Other potential issues lie in reverse causality patterns and in the simplistic econometric specification we have used to deal with the influence of unobserved factors. Most importantly, we believe that the greatest obstacle standing between our research effort and informative result has been the limited availability and uncertain quality of data sources. More specifically, the limited reliability of information on natural resources and civil conflict together with the lack of extensive geocoded datasets for our dependent variable has made the study of our hypothesis certainly challenging *a posteriori*.

The impact of natural resource abundance on the occurrence of civil conflicts is far from being eventually understood. Although many hurdles stand in the path leading to the explanation of such a relationship, we are certain that this research field will continuously attract the interest of social scientists. From a broad perspective, we sincerely believe in the need to fine-tune the existing frameworks used to study this manifestation of the resource curse. However, for better and newer questions to be effectively formulated and tested, economists and political scientists should first be able to rely on more extensive and reliable data sources.

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9. Appendix

In this section we report additional summary information we have referred to during our main discussion. The three tables below refer to **Section 4** where we discussed our data sources. **Table A1** lists the set of countries we have focused on during our analysis, reporting also the individual time periods we have restricted our attention to. **Table A2** lists the top three countries when considering the abundance of natural deposits of diamonds, gold, gemstones and drug plantations, distinguishing between all deposits and inaccessible and lootable ones. **Table A3** is an expansion of Table 6 and it additionally presents the number of discoveries as well as the level of non-exhausted deposits by decade.

Table A1 Selected countries

Africa		Central and South America		Asia		Middle East	
Country	Period	Country	Period	Country	Period	Country	Period
Algeria	1962 - 2007	Argentina	1945 - 2007	Bangladesh	1971 - 2007	Afghanistan	1945 - 2007
Angola	1975 - 2007	Bolivia	1945 - 2007	Bhutan	1971 - 2007	Bahrain	1971 - 2007
Belize	1981 - 2007	Brazil	1945 - 2007	Cambodia	1953 - 2007	Iran	1946 - 2007
Benin	1960 - 2007	Colombia	1945 - 2007	India	1947 - 2007	Iraq	1945 - 2007
Botswana	1966 - 2007	Costa Rica	1945 - 2007	Indonesia	1949 - 2007	Israel	1948 - 2007
Burkina Faso	1960 - 2007	Dominican Republic	1945 - 2007	Laos	1953 - 2007	Jordan	1946 - 2007
Burundi	1962 - 2007	Ecuador	1945 - 2007	Mali	1960 - 2007	Kuwait	1961 - 2007
Cameroon	1960 - 2007	Egypt	1945 - 2007	Mongolia	1945 - 2007	Lebanon	1946 - 2007
Central African Republic	1960 - 2007	El Salvador	1945 - 2007	Myanmar	1948 - 2007	Oman	1971 - 2007
Chad	1960 - 2007	Guatemala	1945 - 2007	Nepal	1945 - 2007	Pakistan	1947 - 2007
Congo	1960 - 2007	Guyana	1966 - 2007	Papua New Guinea	1975 - 2007	Qatar	1971 - 2007
Congo, Dem. Rep.	1960 - 2007	Haiti	1945 - 2007	Philippines	1946 - 2007	Saudi Arabia	1945 - 2007
Cote d'Ivoire	1960 - 2007	Honduras	1945 - 2007	Sri Lanka	1948 - 2007	Syrian Arab Republic	1946 - 2007
Djibouti	1977 - 2007	Mexico	1945 - 2007	Thailand	1945 - 2007	United Arab Emirates	1971 - 2007
Equatorial Guinea	1968 - 2007	Nicaragua	1945 - 2007	Vietnam	1954 - 2007	Yemen	1945 - 2007
Eritrea	1993 - 2007	Paraguay	1945 - 2007				
Ethiopia	1945 - 2007	Peru	1945 - 2007				
Gabon	1960 - 2007	Suriname	1975 - 2007				
Ghana	1957 - 2007	Uruguay	1945 - 2007				
Guinea	1958 - 2007	Venezuela	1945 - 2007				
Guinea-Bissau	1974 - 2007						
Kenya	1963 - 2007						
Lesotho	1966 - 2007						
Liberia	1945 - 2007						
Libya	1951 - 2007						
Madagascar	1960 - 2007						
Malawi	1964 - 2007						
Malaysia	1957 - 2007						
Mauritania	1960 - 2007						
Morocco	1947 - 2007						
Mozambique	1975 - 2007						
Namibia	1990 - 2007						
Niger	1960 - 2007						
Nigeria	1960 - 2007						
Rwanda	1962 - 2007						
Senegal	1960 - 2007						
Sierra Leone	1961 - 2007						
Somalia	1960 - 2007						
South Africa	1945 - 2007						
Sudan	1956 - 2007						
Tanzania	1961 - 2007						
Togo	1960 - 2007						
Tunisia	1956 - 2007						
Uganda	1962 - 2007						
Zambia	1964 - 2007						
Zimbabwe	1965 - 2007						

Note Summary of countries included in our empirical analysis. Data for country's year of independence is obtained by the Correlates of War Project (COW). We select developing countries (i.e. non-OECD) in Africa, Central America, South America, Asia and in the Middle East. We exclude small states (i.e. those whose area is below the 10'000 km^2 threshold), isolated countries (e.g. countries in the Pacific Region), nations for which there is a limited availability of observations due their recent independence history (e.g. the ex Soviet Block) and countries with no information about natural resource deposits (i.e. China).

Table A2 Countries with the most natural deposits

	Diamond deposits	Gold deposits	Gemstone deposits	Drug plantations
Panel 1 All deposits in selected countries				
1st richest country	*Brazil*	*Peru*	*Brazil*	*Brazil*
2nd richest country	*Venezuela, RB*	*Argentina*	*India*	*Myanmar*
3rd richest country	*South Africa*	*Mexico*	*Myanmar*	*India*
Panel 2 I&L 500+ Deposits[1]				
1st richest country	*Brazil*	*Guyana*	*Brazil*	*Iran, Islamic Rep.*
2nd richest country	*Venezuela, RB*	*Brazil*	*Tanzania*	*Colombia*
3rd richest country	*Guyana*	*Bolivia*	*Madagascar*	*Afghanistan*

Notes Summary information for the year 2007. Data for diamond and gemstone deposits as well as drug plantations is obtained from the Peace Research Institute of Oslo (PRIO). Data for gold deposits is obtained by independent work conducted by Balestri (2013). The table considers all discovered deposits (i.e. exhausted ones included) of diamonds, gold, gemstones and all drug plantations (i.e. abandoned cultivations included) up to the year 2007. Deposits are broadly defined as occurrences, i.e. sites with known activity related to extraction and production and/or with confirmed diamonds, gold and gemstones discovery. Plantations are broadly recorded as nodes on a 1.0×1.0 degree grid that overlaps with areas delimited by polygons where drug cultivation is known

(1) The abbreviation "I&L 500+" stands for inaccessible and lootable deposits located beyond 500 km from the state's capital

Table A3 Deposits' discovery by decade in developing countries - extended table

	Before 50s				50s				60s				70s				80s				90s				00s			
	All	I&L 250+[1]	I&L 500+[2]	I&L 750+[3]	All	I&L 250+	I&L 500+	I&L 750+	All	I&L 250+	I&L 500+	I&L 750+	All	I&L 250+	I&L 500+	I&L 750+	All	I&L 250+	I&L 500+	I&L 750+	All	I&L 250+	I&L 500+	I&L 750+	All	I&L 250+	I&L 500+	I&L 750+
Panel 1 Diamond deposits																												
Net Discoveries	185	100	76	48	40	13	9	7	99	33	19	15	136	57	41	21	40	18	12	8	325	176	150	112	97	19	7	5
% of net discoveries	*20%*	*24%*	*24%*	*22%*	*4%*	*3%*	*3%*	*3%*	*10%*	*8%*	*6%*	*7%*	*14%*	*14%*	*13%*	*10%*	*4%*	*4%*	*4%*	*4%*	*34%*	*42%*	*48%*	*52%*	*10%*	*5%*	*2%*	*2%*
Cumulative Discoveries	185	100	76	48	225	113	85	55	324	146	104	70	460	203	145	91	526	221	157	99	851	397	307	211	948	416	314	216
Cumulative % of total discoveries	*20%*	*24%*	*24%*	*22%*	*24%*	*27%*	*27%*	*25%*	*34%*	*35%*	*33%*	*32%*	*49%*	*49%*	*46%*	*42%*	*55%*	*53%*	*50%*	*46%*	*90%*	*95%*	*98%*	*98%*	*100%*	*100%*	*100%*	*100%*
Non-exhausted cumulative deposits	164	92	70	44	201	104	79	51	293	135	96	65	424	190	135	85	480	203	145	92	781	374	292	202	867	388	297	207
% of cumulative discovered deposits	*89%*	*92%*	*92%*	*92%*	*89%*	*92%*	*93%*	*93%*	*90%*	*92%*	*92%*	*93%*	*92%*	*94%*	*93%*	*93%*	*91%*	*92%*	*92%*	*93%*	*92%*	*94%*	*95%*	*96%*	*91%*	*93%*	*95%*	*96%*
Panel 2 Gold deposits																												
Net Discoveries	722	67	54	34	56	2	2	1	137	5	4	2	71	3	2	1	53	1	0	0	46	0	1	0	4	0	0	1
% of net discoveries	*66%*	*86%*	*86%*	*87%*	*5%*	*3%*	*3%*	*3%*	*13%*	*6%*	*6%*	*5%*	*7%*	*4%*	*3%*	*3%*	*5%*	*1%*	*0%*	*0%*	*4%*	*0%*	*2%*	*0%*	*0%*	*0%*	*0%*	*3%*
Cumulative Discoveries	722	67	54	34	778	69	56	35	915	74	60	37	986	77	62	38	1039	78	62	38	1085	78	63	38	1089	78	63	39
Cumulative % of total discoveries	*66%*	*86%*	*86%*	*87%*	*71%*	*88%*	*89%*	*90%*	*84%*	*95%*	*95%*	*95%*	*91%*	*99%*	*98%*	*97%*	*95%*	*100%*	*98%*	*97%*	*100%*	*100%*	*100%*	*97%*	*100%*	*100%*	*100%*	*100%*
Non-exhausted cumulative deposits	701	61	50	32	717	62	52	33	831	67	56	35	883	68	57	35	964	69	56	35	939	64	54	34	919	62	52	34
% of cumulative discovered deposits	*97%*	*91%*	*93%*	*94%*	*92%*	*90%*	*93%*	*94%*	*91%*	*91%*	*93%*	*95%*	*90%*	*88%*	*92%*	*92%*	*93%*	*88%*	*90%*	*92%*	*87%*	*82%*	*86%*	*89%*	*84%*	*79%*	*83%*	*87%*
Panel 3 Gemstone deposits																												
Net Discoveries	185	76	57	13	7	2	2	2	52	20	5	0	29	17	8	6	22	5	2	0	119	52	18	11	280	102	63	42
% of net discoveries	*27%*	*28%*	*37%*	*18%*	*1%*	*1%*	*1%*	*3%*	*7%*	*7%*	*3%*	*0%*	*4%*	*6%*	*5%*	*8%*	*3%*	*2%*	*1%*	*0%*	*17%*	*19%*	*12%*	*15%*	*40%*	*37%*	*41%*	*57%*
Cumulative Discoveries	185	76	57	13	192	78	59	15	244	98	64	15	273	115	72	21	295	120	74	21	414	172	92	32	694	274	155	74
Cumulative % of total discoveries	*27%*	*28%*	*37%*	*18%*	*28%*	*28%*	*38%*	*20%*	*35%*	*36%*	*41%*	*20%*	*39%*	*42%*	*46%*	*28%*	*43%*	*44%*	*48%*	*28%*	*60%*	*63%*	*59%*	*43%*	*100%*	*100%*	*100%*	*100%*
Non-exhausted cumulative deposits	158	69	51	13	154	66	51	14	197	83	54	14	216	91	58	18	240	98	60	19	341	143	74	28	615	242	135	70
% of cumulative discovered deposits	*85%*	*91%*	*89%*	*100%*	*80%*	*85%*	*86%*	*93%*	*81%*	*85%*	*84%*	*93%*	*79%*	*79%*	*81%*	*86%*	*81%*	*82%*	*81%*	*90%*	*82%*	*83%*	*80%*	*88%*	*89%*	*88%*	*87%*	*95%*
Panel 4 Drug plantations																												
Net new plantations	123	101	73	42	53	7	2	0	7	5	1	0	33	23	9	0	105	57	34	18	203	90	51	28	12	5	0	0
% of net new plantations	*23%*	*35%*	*43%*	*48%*	*10%*	*2%*	*1%*	*0%*	*1%*	*2%*	*1%*	*0%*	*6%*	*8%*	*5%*	*0%*	*20%*	*20%*	*20%*	*20%*	*38%*	*31%*	*30%*	*32%*	*2%*	*2%*	*0%*	*0%*
Cumulative cultivation	123	101	73	42	176	108	75	42	183	113	76	42	216	136	85	42	321	193	119	60	524	283	170	88	536	288	170	88
Cumulative % of total discoveries	*23%*	*35%*	*43%*	*48%*	*33%*	*38%*	*44%*	*48%*	*34%*	*39%*	*45%*	*48%*	*40%*	*47%*	*50%*	*48%*	*60%*	*67%*	*70%*	*68%*	*98%*	*98%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
Non-exhausted cumulative deposits	108	99	73	42	157	104	73	41	159	106	74	41	174	117	73	38	266	167	101	53	459	252	148	79	464	252	145	79
% of cumulative discovered deposits	*88%*	*98%*	*100%*	*100%*	*89%*	*96%*	*97%*	*98%*	*87%*	*94%*	*97%*	*98%*	*81%*	*86%*	*86%*	*90%*	*83%*	*87%*	*85%*	*88%*	*88%*	*89%*	*87%*	*90%*	*87%*	*88%*	*85%*	*90%*

Notes Summary information for the year 2007. Data for diamond and gemstone deposits as well as drug plantations is obtained from the Peace Research Institute of Oslo (PRIO). Data for gold deposits is obtained by independent work conducted by Balestri (2013). The table separately considers total and exploitable discovered deposits of diamonds, gold, gemstones and total and active drug plantations in selected decades. Deposits are broadly defined as occurrences, i.e. sites with known activity related to extraction and production and/or with confirmed diamonds, gold and gemstones discovery. Plantations are broadly recorded as nodes on a 1.0×1.0 degree grid that overlaps with areas delimited by polygons where drug cultivation is known to have occurred at some point in time.

(1) The abbreviation "I&L 250+" stands for geographically inaccessible (shortly, inaccessible) and easily exploitable (shortly, lootable) that are specifically located beyond 250 km from the state's capital. We report summary statistics also for inaccessible and lootable deposits located beyond 250 and 750 km from the state's capital in appendix A.
(2) The abbreviation "I&L 500+" stands for geographically inaccessible and easily exploitable that are specifically located beyond 500 km from the state's capital.
(3) The abbreviation "I&L 750+" stands for geographically inaccessible and easily exploitable that are specifically located beyond 750 km from the state's capital.