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TESTING THE TEHORY, BLESSING OR RESOURCE CURSE? THE EFFECT OF NATURAL RESOURCES ON POLITICAL VIOLENCE IN AFRICA©Σ

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ABSTRACT

Political conflicts in Africa have intensified due to the competition for natural resources by various conflicting parties and their conflict intensification. Previous studies have shown that cell phone coverage plays a significant role in the occurrence of these conflicts. This paper explores the impact of oil reserves and diamond abundance on cell phone coverage in Africa. The authors also investigate how rebels are motivated by these resources to engage in conflicts. The Scobit model (Nagler 1994) is used to analyse the cases of unbalanced conflict, which is found to be more accurate than the Logistic model. The results indicate that diamond abundance is a resource blessing, while oil reserves lead to a resource curse. However, the latter finding needs to be more consistent across robustness checks, suggesting that the effects of different natural resources on African political conflicts remain debatable.

Keywords: resource curse and blessing theory, political violence and natural resources in Africa, Scobit model

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MENGUJI TEORI, KEBERKATAN ATAU KUTUKAN SUMBER? KESAN SUMBER ASLI TERHADAP KEGANASAN POLITIK DI AFRIKA

JIAXIN HAN DAN FUSHENG FENG

ABSTRAK

Konflik politik di Afrika telah meningkat disebabkan oleh persaingan untuk sumber semula jadi oleh pelbagai pihak yang berkonflik dan konflik mereka yang semakin sengit. Kajian terdahulu menunjukkan bahawa liputan telefon bimbit memainkan peranan penting dalam berlakunya konflik ini. Makalah ini meneroka kesan rizab minyak dan limpahan berlian terhadap liputan penggunaan telefon bimbit di Afrika. Para penulis juga mengkaji bagaimana aktor pemberontak didorong oleh sumber ini untuk terlibat dalam konflik. Model Scobit (Nagler 1994) digunakan untuk menganalisis kes konflik tidak seimbang, yang didapati lebih tepat daripada model Logistik. Hasilnya menunjukkan bahawa limpahan berlian adalah berkat sumber, manakala rizab minyak menjadi kutukan sumber yang mempengaruhi dinamika konflik tempatan. Walau bagaimanapun, penemuan terakhir perlu lebih konsisten merentasi aspek lain penyelidikan yang meliputi kekukuhan dapatan kajian, menunjukkan bahawa kesan sumber asli yang berbeza terhadap konflik politik Afrika masih boleh diperdebatkan.

Kata Kunci: *teori keberkatan dan kutukan sumber, keganasan politik serta sumber asli di Afrika, model Scobit.*

Introduction

Africa is home to a large percentage of conflicts around the world (Jeffrey 2000). The development of Africa is often tied to the frequency and intensity of conflicts and crisis (Adhvaryu *et al*. 2015). Pierskalla and Hollenbach (2013)[1] argue in their paper that rapid increase of communication technologies significantly affects the probability of organized collective violent actions in Africa. That is to say, the technology factor – cell phone coverage substantially increases the probability of the occurrence of violent conflicts in Africa. Firstly, we notice that whether there are natural resources (diamond abundance and oil reserves) is one of the important factors in the previous literature. Furthermore, several studies have pointed out that natural resources of high value have been examined to have association with an increasing risk of violent conflicts, poor development, and collapse of peace, which refers to the theory of "natural resource curse" (Ross, 2004; Collier and Hoeffler 2004; Lujala 2009; 2010). We are questioning how natural resources can contribute to the likelihood of violent African conflicts without considering the influence of cell phone coverage. This paper aims to demonstrate that diamonds and oil significantly impact the escalation of civil wars in Africa.

Based on Global Conflict Barometer launched by Heidelberg Institute for International Conflict Research, the occurrence of conflicts in the year of 2008 exceeded any previous years, and Africa was the most conflicted area all over the world. "Conflict and fragility exact a costly toll on the economies of Africa. As we scale up the operational work in fragile states, a better understanding of the causes and impacts of conflict and fragility can help to prevent some of the deadly conflicts at the community level," said Makhtar Diop, the World Bank Vice President of the Africa Region, who delivered the conference's opening remarks in July 2015.[2] In 2019, 25 state-based conflicts were recorded, four conflicts more than 2018, and a recorded number of 13 conflicts were fought over territory. Internationalized civil wars are also at an all-time high level. Non-state conflicts decreased but remained one of the most serious threats. Moreover, conflict is still Africa's biggest challenge in 2020 according to Patricia Danzi, Regional Director for Africa for the International Committee of the Red Cross (ICRC), "conflicts last and they don't stop. And more are added." she said. It is also argued that the pattern of new conflicts bubbling up alongside existing ones is likely to repeat itself. A UNDP representative paints the picture in these terms:

> A snapshot of explosive conflict in today's Africa presents a worrying picture: of Eritrea and Ethiopia; of the DRC, Rwanda, Uganda, Namibia, Zimbabwe, Sudan, the last with the longest-running civil war on the continent; of Sierra Leone with gruesome atrocities against civilians; of Somalia, Burundi, Guinea Bissau and Lesotho, the latter reeling from South Africa's recent intervention. (Gordon-Summers 1999, 328).

Meanwhile, Africa owns a large quantity of natural resources; Africa is a continent that is abundant with natural resources, such as diamonds, gold, oil, natural gas, uranium, platinum, copper, cobalt, iron, bauxite, and cocoa beans, among which diamonds and oil are strategically important players in Africa. Africa owns 30% of the remaining mineral resources in the world. 57% of Africa's export earnings comes from hydrocarbons. From 1980 to 2012, proven oil reserves in Africa grew by 150% (*AlJazeera* 2018). Currently, diamond mining in Africa produces around half of the world's diamonds, however to date, they have produced over 75% of all diamonds. Over 1,9 billion carats with a value

of around $158 billion.

Abundant natural resources have become a mixed blessing to African citizens: on the one hand providing great wealth and promote economic growth to some extent in a certain region. In Sierra Leone, following a brutal civil war that ended in 2002, when diamonds accounted for ninety-six percent of all exports.[3] Meanwhile in Chad, Iraq, Libya, and Nigeria-all of which were affected by armed conflict during the early years of the twenty-first century-oil and gas account for as much as seventy percent of gross domestic product and more than eighty percent of government revenues.[4] Moreover, in Niger, uranium and gold are important revenue sources[5], as are oil, cocoa, and coffee in Ivory Coast, and diamonds and timber in the Central African Republic. In Burma, gas exports made up one-quarter of all exports, while forest products and gemstones were other important exports between 2008 and 2010.[6]

However, on the other hand, abundant natural resources bring citizens the resource course. Numerous researchers have supported the point that resource-poor countries often outperform resource-rich countries in economic growth. The natural resource accumulation that fuels economic growth also spurs conflicts through a rapacity effect (Caselli *et al.* 2013; Dube and Vargas 2013; Fearon, 2005). Over the past two decades, several African countries have endured brutal civil conflicts fueled by diamonds, which is known as "blood" or "conflict" diamonds. It has been noted that oil reserve also plays a crucial role in financing conflicts (Ross, 2004). What is more, Torvik (2001) shows that natural resource abundance increases rent-seeking behaviour and lowers income, while Manzano and Rigobon (2001) believe that the real problem for growth is the debt overhang in resource-rich countries. Moreover, countries rich in resources are vulnerable to corruption, resulting in becoming less responsive and reliable to citizens, which also strengthens grievances of rebels and further leads to potential conflicts (Collier 2004; Herbst 2000).

In contrast, there is also a possibility that the resource curse could be challenged due to the fact that countries with high resource wealth could avoid occurrence of conflicts such as Saudi Arabia, because some valuable resources like diamonds are too hard to explore, develop and transport by individuals or rebels that are not largely or well organized with low-level tools, making these valuable natural resources owned and highly secured by government powers, who are also potentially the most powerful sector within states. Therefore, rebels are less likely to reach and control these valuable resources in this situation. Governments, in turn, could possibly take advantage of abundant high-value resources to bribe rivals, in which way lead more stability of the states and prevent possible internal conflicts (Basedau *et al.* 2009). It is also found that there is a direct empirical relationship between natural resource abundance and economic growth, whose positive resource effects are particularly strong for subsoil wealth (Brunnschweiler 2006), and it is also regarded as resource blessing for African countries and African citizens to some extent.

Drawing a definitive conclusion about the relationship between natural resources and African political conflicts remains challenging. Various factors and mechanisms have been discussed, leading to differing opinions on whether this relationship is predominantly positive or negative. According to the aforementioned literature, whether resources tend to behave as resource curse or blessing in a certain African conflict area is still a debatable research question both in academia and in policy practice. Hence, in this paper, we would like to study the linkage between the existing of natural resources and the probability of occurrence of political conflicts in Africa, based on the theory of natural resource curse and also the dataset of rebel conflicts in Africa in the year 2008

from Uppsala Conflict Data Program Georeferenced Event Dataset. This analysis is done by using the dataset from Pierskalla and Hollenbach (2013).

It has been discovered that Pierskalla and Hollenbach's (2013) research needed to account for the possible connection between cell phone coverage and natural resources. However, areas abundant in natural resources such as diamonds and oil may have better economic conditions, resulting in more extensive cell phone coverage (Adhvaryu et al., 2015). We aim to test this potential correlation between natural resources and cell phone coverage, which has been found to increase the likelihood of violent political conflicts. Pierskalla and Hollenbach (2013) also discovered that regions with cell phone coverage significantly increased the probability of political conflicts in Africa. Therefore, when analysing data, cell phone coverage as an independent variable can test the additional effects of natural resources on the likelihood of violent African conflicts, excluding the impact of cell phones. In this context, cell phone coverage acts as a mediator variable, excluded from analysing natural resources and their impact on political conflicts. This mechanism holds theoretical and practical significance regarding the probability of political conflicts in Africa concerning natural resources.

In order to determine the impact of diamond abundance and oil reserves on conflict occurrence without factoring in cell phone coverage, we first examined the distribution of the dependent variable. Instead of using a logit model, we opted for a Scobit model (Nagler 1994), as it is more effective for imbalanced variables in previous studies. We noticed that the sample was skewed and unbalanced across all observations (as seen in Figure 2), so we confirmed that the Scobit model was more accurate due to an additional parameter than the Logit model. We then assessed the accuracy of our model choice through analytical testing such as AIC score, separation plots, and ROC curve. Next, we estimated the first differences under two opposite scenarios: regions with and without natural resources (diamond abundance and oil reserves) to determine if there was a significant variation between the two.

The study's results were unexpected as they showed that the influence of diamond abundance and oil reserves on the likelihood of political conflicts did not align. Specifically, areas rich in diamonds harmed insurgent violence, which contradicts the belief that it would contribute to civil conflicts. This phenomenon is referred to as "resource blessing" in contrast to the "resource curse" typically associated with diamond abundance. On the other hand, the study found that oil reserves positively affected the probability of political conflicts occurring in Africa, supporting the theory of the "natural resource curse". Therefore, it was discovered that different natural resources might have distinct effects on African civil wars, and it is more complex than simply categorising them as a resource curse or blessing like previous research has done.

Resource Curse or Blessing? Explaining Relations between Natural Resources and Violence in Africa

The "natural resource curse" theory, also known as the "paradox of plenty," illustrates how African countries rely heavily on revenue from natural resources. This dependence can lead to lower economic growth, weaker state capacity, and an increased likelihood of rebellion (Koning 2008). In order to comprehend how natural resources might be linked to political violence, it is essential first to examine the potential motivations and methods that rebels use to initiate wars.

There are specific natural resources that are considered to be valuable assets for both rebel groups and state governments. In Africa, diamonds and oil reserves have been particularly significant. Diamonds are precious and sought-after in markets, making them an attractive asset for rebels to exploit. "conflict diamonds" refers to diamonds believed to have fuelled or prolonged African conflicts. Similarly, the abundance of oil in conflict zones has been shown to impact the extension of armed conflicts significantly. According to a cross-section analysis by Collier and Hoeffler, the exploitation of natural resources is a common source of rebel military finance. In particular, high-value commodities such as diamonds and oil provide rebels with the means to gain support and make rebellion feasible. The availability of natural resources can also fund warfare and attract new supporters to conflicts. Unfortunately, abundant natural resources can intensify and prolong civil wars, especially in areas with long-standing disputes over ethnicity, religion, or land. Ultimately, these conflicts increase the likelihood of political conflicts and instability in Africa.

Another potential explanation is that governments' revenue dependence on natural resources deteriorates governance and further strengthens the grievances of the rebels, increasing rebels to organize political conflicts (Collier and Hoeffler 2004). This is the phenomenon of "resource curse". Olsson's (2007) "predator–prey model" suggests that natural resources may cause conflicts conditional on the quality of institutions. The weaker the state institution is, the higher the probability of political conflict onset since the weak institutions have less capability to fight against rebels. Based on the "rentier effect theory", resource-rich countries are more vulnerable to corruption than resource-poor countries and institution under-performance (Herbst 2000). As a government relies heavily on a few valuable resource revenues rather than taxation from the public, it becomes less accountable and responsive (Koning, 2008).

Moreover, when resource revenues are only possessed by a small group, the money often becomes a means of interest for networks, leading to misrule by elites who enjoy the most revenue from resources and state power. The weakness of the governance can also be caused by the characteristic of price fluctuations in raw material markets, which results in the unstable economy of a country. The weaker the state of power is, the more likely the rebels will seek opportunities to plunder the natural assets and take over the control of the resources by themselves, which then increases the probability of rebel conflicts against the government powers. As a result, we should expect more rebel movements in resource-abundant places.

The idea of a natural resource curse may be challenged due to the complexities involved in extracting and transporting valuable resources often owned and secured by the government. This limits the opportunities for rebels to control and use these resources for financial gain in organizing political conflicts. The difficulty of exploiting resources like diamonds can also reduce profits. Additionally, state governments may use abundant natural resources to bribe opposition and armed groups, contributing to state stability and avoiding political conflict. However, the motivations and operations of rebels are complex and natural resources may not be the primary reason for civil wars. External factors like foreign strategic interests and the role of oil companies should also be considered. Therefore, the link between natural resource dependence and political conflict remains to be seen.

Moreover, cell phone coverage has become increasingly important in influencing African political conflicts. The mobile industry has significantly impacted Africa's development, and there is a real need for telecommunications in the region. Studies have shown that mass media, such as television and radio, can also affect civil conflicts. Cell

phone technology has made payments and transfers more accessible and efficient, reducing transaction costs for individuals and markets. Pierskalla and Hollenbach (2013) argue that the rapid increase in communication technologies has significantly affected the probability of organized collective violent actions in Africa. Cell phone coverage allows for coordinating insurgent activity across geographically distant locations, increasing in-group cooperation for political conflicts. Governments in Africa need more ability to monitor cell phone activity, especially with the role of private companies in spreading technology. Thus, the high-speed development of cell phone technology can increase the ability of rebel groups to communicate and monitor in-group behaviour, boosting their capacity for political conflicts. However, there are possible reasons that explain why the perspective from the natural resource curse may be challenged. Some natural resources of high value are located only in specific areas, and those often require complex and expensive techniques for extraction and transportation. Since these valuable resources are likely to be owned and highly secured by the government, rebels have less opportunity to explore and control the resources for their financial support for organizing political conflicts. The difficulty of diamond abundance exploitation may cut down on the profits. For another, the state governments likely harness abundant natural resources to bribe the opposition and armed groups, contributing to state stability and avoiding political conflict (Basedau and Lay 2009). They further suggest that oil reserves-rich countries with high resource wealth could also prevent internal conflicts; one of the cases is Saudi Arabia, where insurgent political conflict is almost absent, corresponding to resource blessing.

Additionally, the motivations and operations of rebels are more complex, such as ideology and ethnic differences (Herbst 2000). Natural resources may not be the primary explanation to account for civil wars. For example, external forces such as foreign strategic interests and the role of oil companies should not be excluded when examining the problem of rebel movements (Obi 2010). Thus, it is plausible that the linkage between natural resource dependence and political conflict outbreaks is still unclear.

Cell phone coverage is becoming increasingly influential in political conflicts in Africa. Livingston (2011) states that the mobile industry has transformed the continent, making telecommunication a crucial need. Various studies have also examined the impact of mass media, such as television and radio broadcasting, on civil conflicts (Warren 2013; Yanagizawa-Drott 2012). In Africa, cell phone technology has enabled payments and transfers without the need for cash or credit cards, lowering transaction costs for individuals and markets, including conflict organizers. Pierskalla and Hollenbach (2013) suggest that the rapid growth of communication technologies has significantly increased the likelihood of organized collective violent actions in Africa. Cell phone technology provides citizens an efficient and convenient way to organize and call for political action. Governments in Africa cannot monitor the cell phone activity of insurgents, especially with the increasing role of private companies in spreading technology. As a result, rebel groups can overcome collective action problems and increase in-group cooperation in political conflicts. Cell phone coverage also enables the coordination of insurgent activity across distant locations.

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Empirical Implications

Our research has found that cell phone coverage significantly impacts violent conflicts. Building on this, we suggest that African regions with abundant natural resources have more advanced communication technology, specifically cell phone coverage. We also propose that rebel groups are more likely to organize violent conflicts in areas with high natural resource availability, such as diamond abundance and oil reserves in Africa. This is particularly true when considering the exclusion of the effect of cell phone coverage on these areas. In order to explore this further, we will examine this potential relationship in the next section of our analysis. As a result, we have formulated the following three hypotheses:

> **H1:** Regions that are rich in natural resources (diamond abundance and oil reserves in this context) have wider and more developed communication technology (cell phone coverage) in Africa.
>
> **H2:** Excluding the impact of cell phone coverage on conflicts, diamond abundance has a significant positive effect on the probability of occurrence of political conflicts in Africa.
>
> **H3:** Excluding the impact of cell phone coverage on conflicts, oil reserves are significantly positively associated with the probability of occurrence of political conflicts in Africa.

Data

In order to properly examine the arguments, we need to gather samples of cases where conflicts have arisen, information on where diamonds and oil reserves are located, and data on cell phone coverage availability. The data analysed in this paper comes from the dataset provided by Pierskalla and Hollenbach in 2013. The original information on rebel conflicts from 2008 was obtained from the Uppsala Conflict Data Program Georeferenced Event Dataset (UCDP GED), which provides yearly details on organized violent actions.[7] The data used in this study is specifically focused on conflicts and communication technology and is presented in a spatially disaggregated format.

The study includes two main independent variables: the diamond abundance indicator (Gilmore et al. 2005) and oil reserves (Lujala, Rød and Thieme 2007). The diamond abundance indicator is assigned a value of 1 if diamonds are present in a particular area and 0 if not. Similarly, the oil reserves variable is assigned a value of 1 in areas with oil reserves and 0 otherwise. The study also considers the impact of cell phone coverage on African political violent conflicts (Pierskalla and Hollenbach 2013) and acknowledges the potential correlation between cell phone coverage and natural resource abundance. It is believed that areas with abundant natural resources may positively affect the

availability of cell phone coverage.

Cellphone coverage information is provided by Collins Coverage, a service offered by Harper Collins Publishers. This information is based on data from cell phone companies through GSMA or Collins Bartholome.[8] The analysis uses spatially disaggregated grid cells, each measuring approximately 55km × 55km. Tollefsen, Strand, and Buhaug generated the data used in this analysis at the Peace Research Institute Oslo (PRIO) and includes a dummy variable that indicates conflict cases registered by UCDP GED within a specific grid cell in 2008. Additionally, a binary variable was created to indicate whether cellphone coverage was available in a specific area in 2007. In this analysis, focusing on individual-level data is unnecessary since information can spread quickly through collective action groups with cellphone coverage, regardless of the number of individuals who own cell phones in a given area. Therefore, spatially disaggregated data is more appropriate for this context.

Cofounders

It has been suggested that areas with rich natural resources are more prone to violent political conflict because rebel groups have a financial interest in controlling those resources. However, other regional factors can lead to clashes between rebels and the government, such as previous conflicts, ethnic exclusion, and competition over water resources. For example, Collier and Hoeffler (2004) argue that rebels prefer mountainous terrain because it provides natural protection, making conflicts more likely. To avoid omitting essential variables in our analysis, including these factors as control variables is important. In Pierskalla and Hollenbach's model (2013), conflict is more likely to occur in regions with larger populations, closer proximity to the capital, and areas near the country's border, particularly in rural and less government-controlled areas. In this study, we have included these critical variables in our models, which are presented in the appendix. Most data were sourced from the PRIO Grid, while data on prior conflicts came from UCDP conflict events. Data on ethnic group settlement and political exclusion were matched from Weidmann, Rød, and Cederman's (2010) and Cederman, Wimmer, and Min's (2010) datasets. Fortunately, we could use the dataset Pierskalla and Hollenbach (2013) constructed in this paper.

Regression Analysis

Cell phone companies may establish broader coverage in areas abundant in natural resources. Natural resources drive economic growth and attract more people to live and work in the area, leading to higher profits for communication technology companies. Regions with rich natural resources like diamond abundance and oil reserves may have more cell phone coverage bases, such as cell phone towers and higher-speed communication technology. This may be due to the higher levels of infrastructure investment that come with economic growth. A logistic regression analysis will investigate this relationship between natural resources and communication technology, which has been linked to political violence (Pierskalla and Hollenbach 2013). This analysis will also test the hypothesis that natural resources drive the distribution of communication technology.

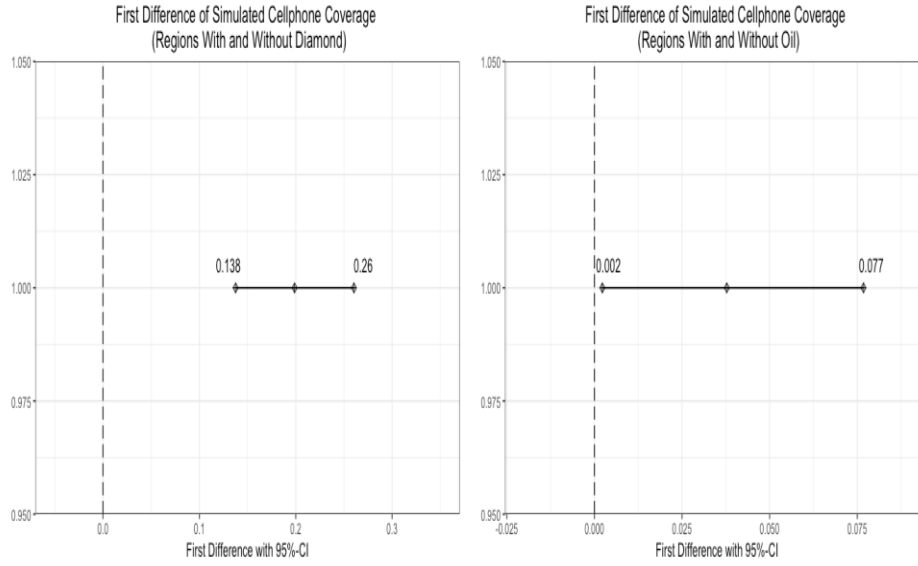
This study used a generalized linear model to analyse the impact of diamond abundance and oil reserves on cell phone coverage. The results, which are presented in

the Appendix, show that both factors have a significant effect on cell phone coverage. This confirms our first hypothesis that areas with these natural resources have better cell phone coverage.

To further investigate the impact of natural resources on African civil conflicts, we analysed the first differences of expected probabilities with 95% confidence intervals. However, it is difficult to directly test the relationship between natural resources and political conflicts due to the influence of cell phone coverage. Therefore, we focused on examining the potential additional effect of natural resources on African civil conflicts after excluding the impact of cell phone coverage.

Overall, the results suggest that areas with abundant natural resources are more likely to have better cell phone coverage and potentially more civil conflicts. However, further research is needed to fully understand the relationship between natural resources and African political conflicts.

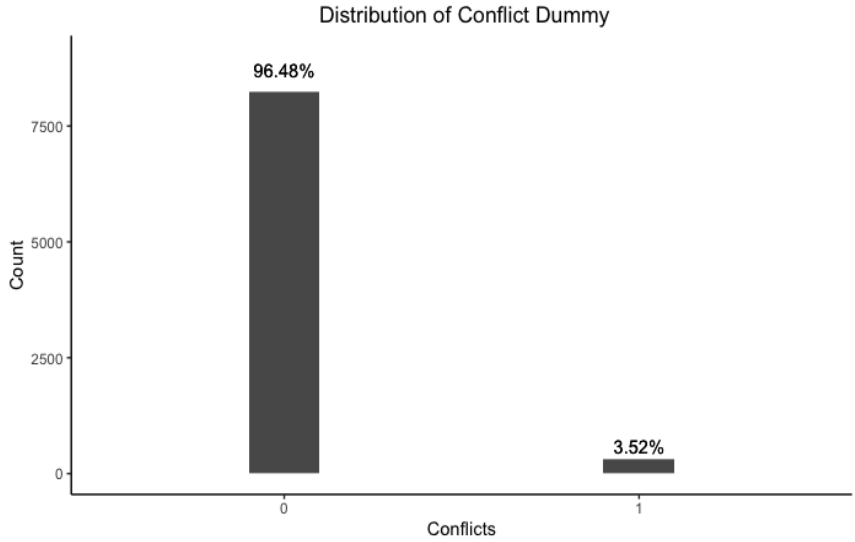
Figure 1: Significant Effect of Diamond Abundance and Oil Reserves on Cellphone Coverage



Source: (developed and produced by the Authors.)

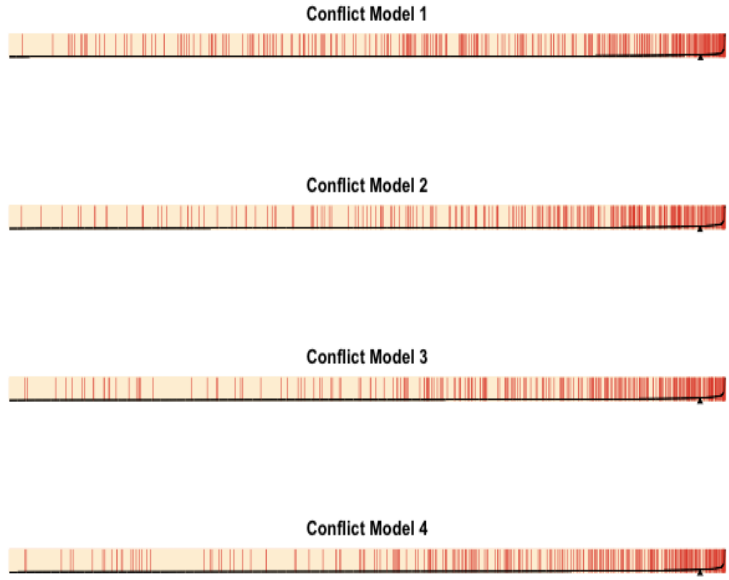
We will use the data and variables from the previous section for our estimations. Since our primary dependent variable is a binary political conflict indicator (0-1), where 1 represents insurgent violence in a particular area in 2008 and 0 represents the absence of conflict, we will use a standard logit regression model. However, we have noticed that the binary political conflict variables could be more balanced across all valid observations, as shown in Figure 2 (see Appendix). Of 8531 observations, only 300 (3.52%) represent political conflict events, and 8231 (96.48%) represent non-conflict cases. This skewed sample is unsuitable for a standard logit model, and symmetry violation may cause estimation issues (Tay 2016). Therefore, we will use a "Scobit model" with an additional scale parameter to account for the skewness. However, we must test whether the "Scobit model" is more precise than the "Logistic model" in this context. To do this, we will present estimations from both models and compare them using model fit tests. We will include the results of this analysis in the following section.

Figure 2: Distribution Plot for Conflict Dummy Variable



Source: (developed and produced by the Authors.)

Figure 3: Separation Plots of Four Logit Models



Source: (developed and produced by the Authors.)

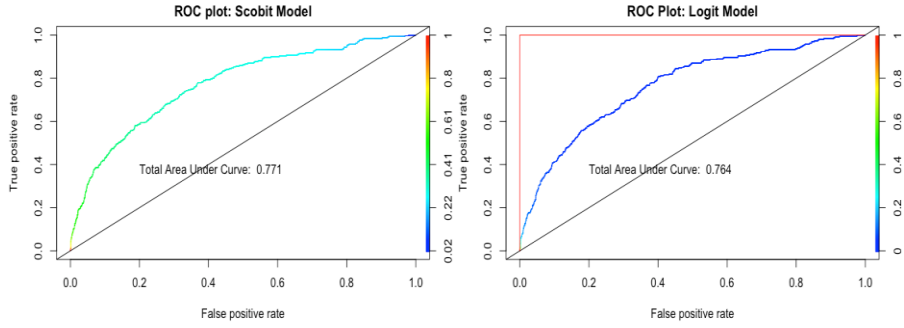
We created four standard logit regressions, each with a different set of explanatory variables. These variables are listed in the Appendix. Model 1 includes essential independent variables like the number of prior conflicts, distance to borders, distance to the capital, mountainous terrain, irrigation, population count, diamond abundance, and oil reserves. Model 2 adds a variable for ethnic exclusion based on Model 1. For Model 3, we included a measure of cell phone coverage to prevent omitted variable bias. Finally, Model 4 includes everything except the distance to the capital. The Akaike Information Criterion (AIC) test showed that Model 4 had the best model fit compared to the other three. To evaluate the model's performance, we used separation plots (displayed in Figure 3) to compare the four models. Overall, Model 4 performed the best at describing the data, as most of the events were on the right-hand side of the plot, consistent with the smallest value obtained above.

Based on the model fit test and comparison results of the four models above, we created a Scobit model using the point estimates from Model 4 as starting values. We then fitted the Scobit model as follows:

$$P_r(Y_i = 1) = \frac{1}{(1 + \mathrm{e}^{-x_i\beta})^{\alpha}}$$

where the probability of political conflict occurrence Y_i is dependent on the level of parameter β, a constant and numbers of control variables x_i, and the parameter of α. Then we used the Likelihood-Ratio test to compare two nested models. Model 4 is nested within the Scobit model because the Scobit model has an extra parameter compared to the Logistic model. The results show that the Scobit model performs better than Model 4. Figure 4 shows the ROC curve of both models, and it is clear that the Scobit model fits the data better. The AUC score, which summarizes the model's predictive power, is between 0 and 1. Model 4 has an AUC score of 0.76, while the Scobit model has an AUC score of 0.77. This means that the Scobit model is the better choice, consistent with the earlier arguments.

Figure 4: ROC-curve of Model 4 and Scobit Model



Source: (developed and produced by the Authors.)

The reader can find the approximations for five models in the Appendix of this paper. It is interesting to note that the effect of oil reserves is significant in the second, third, and fourth models, at a significance level of at least 10%. On the other hand, the effect of diamond abundance is statistically significant at a 5% level but surprisingly negative across all five specifications. This study confirms that variables such as prior political conflicts, mountainous terrains, water resources, exclusion of ethnic groups, accessibility of cell phone coverage, and larger population are all significantly associated with civil

political conflicts. This may suggest that oil reserves increase the risk of political conflict by providing financial support for rebel groups in the absence of cell phone coverage. At the same time, diamond abundance conversely decreases the occurrence of political conflicts. In the following discussion, we will further examine these potential causal mechanisms to understand their substantive effects better.

Substantive Effects

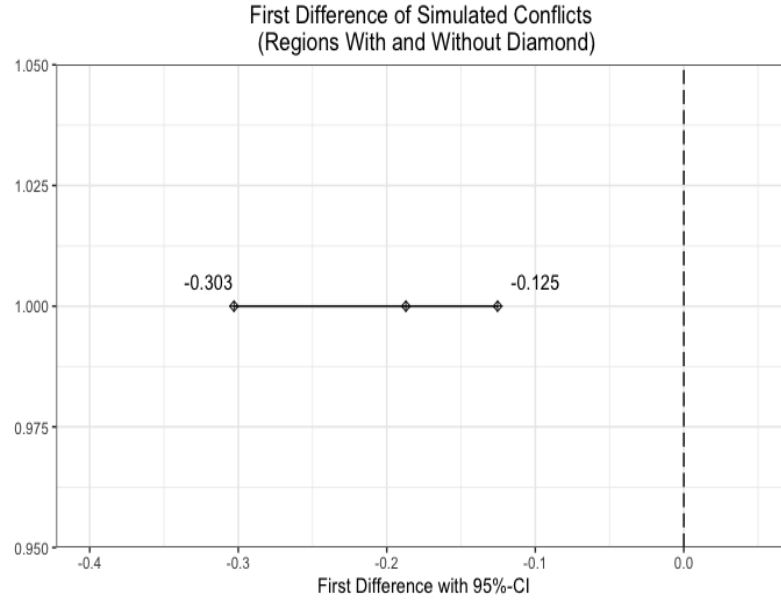
Before implementing further robustness check in the following section, I first evaluate substantive effects of natural resources. To understand the impacts of natural resource endowment in a substantive way, I would like to take first-difference value based on the Scobit model as quantity of interest (with 95% confidence intervals). I simulate the first differences with an observed value approach to examine whether areas with and without natural resources have significant difference on the occurrence of political violent conflicts, excluding cell phone coverage effect as well. After building up two scenarios respectively, one for cases with either diamond abundance or oil reserves and one without, I calculated the expected values for each natural resource by implementing the simulation. By taking first difference of the expected values, it is possible to detect whether natural resources have additional significant association with violent conflicts, excluding the effect brought by cell phone coverage effect.

Results

Based on the Scobit model, we simulated the first differences of predicted probabilities of political violent conflict for the diamond abundance and oil reserves indicators in Figures 5 and 6, respectively. We used a 95% confidence interval to estimate the first differences and test the last two hypotheses. Our analytical results show that the probability of political conflict incidents occurring in areas with diamond abundance is significantly lower on average. This suggests that when we remove the effect of cell phone coverage on political conflicts, diamond abundance indicates a negative relationship with insurgent political violence. This outcome goes against the "natural resource curse" theory, which suggests that high-value natural resources, such as diamond abundance (see Figure 5), intensify rivalry and brutal civil wars. Instead, it supports the "resource blessing" theory, indicating that diamond abundance may contribute to the peace and stability of regions.

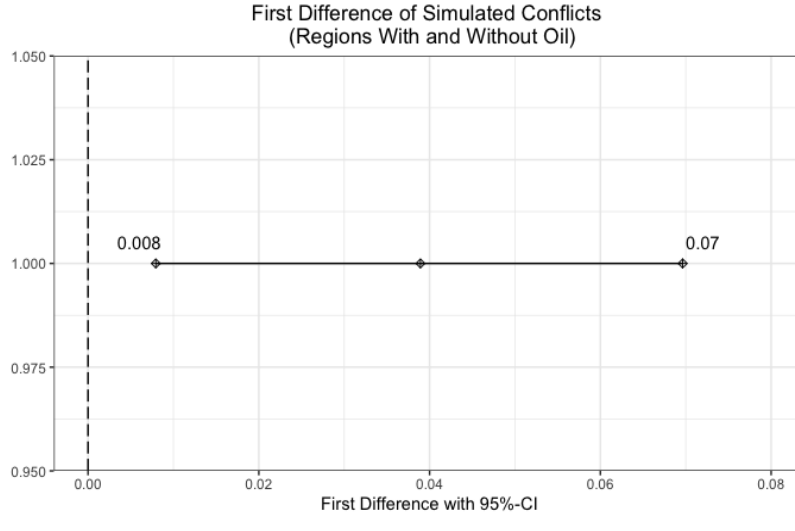
On the other hand, the first difference value for oil reserves shows that, on average, oil reserves are significantly associated with a substantive increase in fierce political conflicts (see Figure 6). This means that possessing oil reserves may increase violent political conflicts compared to areas without oil reserves to some extent, which corresponds to the "natural resource curse" theory. Thus, the results suggest we accept our last hypothesis but reject the second one at a 5% significance level. Finally, to confirm the conclusion of this study, we conducted robustness checks in the next section using negative binomial models containing the count of political conflict.

Figure 5: First Difference of Predicted Probabilities of Violent Conflict for the Diamond Indicator



Source: (developed and produced by the Authors.)

Figure 6: First Difference of Predicted Probabilities of Violent Conflict for the Oil Indicator



Source: (developed and produced by the Authors.)

Robustness Check

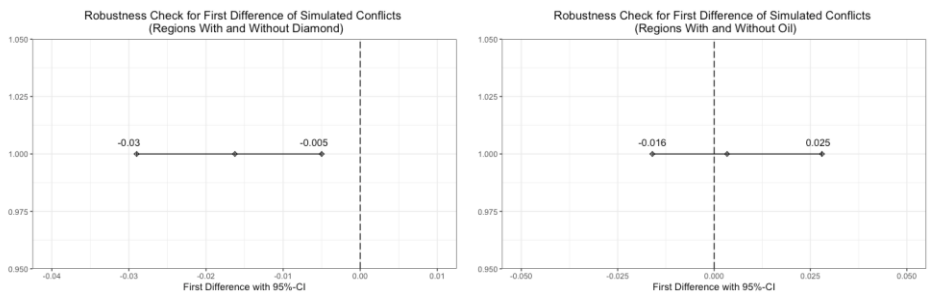
In order to test the strength of the Scobit model, we utilised a negative binomial model with a 95% confidence interval. This model used the number of political conflicts in Africa in 2008 as the dependent variable instead of the binary conflict's variable used in the previous Scobit analysis. The independent variables chosen for this model remained the same as in the previous analysis. We then created scenarios to differentiate regions with and without abundant diamond or oil reserves. We used an average mean approach to compare the occurrences of political conflicts between the two groups.

Figure 7 indicates that the impact of diamond abundance on political conflicts differs significantly from the Scobit model. This means that all other factors being equal, regions with a high diamond abundance are more likely to experience a decrease in the frequency of political conflicts in Africa, with a 95% confidence interval, as previously discussed. This finding is consistent with the Scobit model. Diamond abundance can positively impact Africa by promoting peace and stability rather than a negative impact as a resource curse.

The figure on the right indicates that oil reserves do not significantly contribute to the likelihood of political conflicts occurring, with a 95% confidence interval, when the negative binomial model is applied during the robustness check. This finding suggests that the significance of oil reserves on conflict occurrence, excluding the impact of cell phone coverage, is relatively small in the Scobit model. However, it is essential to note that the impact of oil reserves on the probability of political violent action should be carefully examined and debated before concluding. One possible explanation is that other complicated factors may influence the quantity of political conflict occurrence in regions rich in oil reserves when excluding the impact of cell phone coverage.

To summarize, the robustness check remains valid for the resource blessing brought by diamond abundance, but it does not apply to the resource curse caused by oil reserves. Therefore, different types of natural resources may affect the likelihood of political conflicts. The impact of these resources may be subject to debate due to numerous complex factors in different situations.

Figure 7: Robustness Check of First Difference of Predicted Probabilities of Violent Conflict for the Diamond and Oil Indicator Using Negative Binomial Model



Source: (developed and produced by the Authors.)

Conclusion

We have found that the impact of natural resources on civil wars is uncertain. However, we have used the dataset from Pierskalla and Hollenbach's paper to fill in the gaps. Their paper suggests that cell phone coverage can improve coordination amongst rebel groups

by providing better communication and overcoming difficulties in organising conflicts in distant locations.

Firstly, we proved that natural resources significantly affect communication technologies. Secondly, we examined how diamond abundance and oil reserves can increase the motivation and privilege for rebels to initiate political conflicts across Africa, excluding the impact of cell phone coverage. We used a Scobit model to test the empirical relationship, which proved more precise than the Logistic model. Our analysis showed that areas with diamond abundance have a lower probability of experiencing political conflicts in Africa. At the same time, oil reserves are positively and significantly related to the probability of conflict occurrence. A robustness check with a count model supported the former result but not the latter. Therefore, further analysis is necessary to test the latter result.

The outcome may correspond to the statistical result that the first difference value of oil reserves effect is relatively small. A non-significant sign of robustness check indicates that the additional effect of oil reserves on the probability of violent political conflicts remains debatable. Hence, further study is required in order to draw a promising conclusion. Nevertheless, the significant positive association between diamond abundance and African political rebel conflicts implies that diamond abundance may decrease the probability of political conflict in Africa. This surprising finding rebuts the second hypothesis based on the theory of the natural resource curse and, in contrast, accepts the last hypothesis as expected. It is reasonable to assume that the impact of natural resources on African conflicts can vary. Wilson (2013) argued that the effect of natural resources needs to be more consistent. Through historical analysis research on Sierra Leone from 1930 to 2010, he discovered that the nature of the resource curse or blessing changes over time. For example, exploiting "conflict diamonds" worsened the civil war during the political conflict period. However, it was a resource blessing during the post-colonial era at the national level, with local communities benefiting from social advantages. We acknowledge that there are limitations to our research. Firstly, our analysis focuses solely on African conflicts in 2008, so we cannot make conclusions about political conflicts over a more extended period. Additionally, we cannot determine whether the results I found apply to conflicts throughout Africa or examine any long-term effects of these conflicts. For example, Alexeev and Conrad (2009) argue that natural resources, such as oil reserves, can lead to economic development and long-term growth rather than short-term growth rates.

Secondly, the independent variables in our research, such as oil reserves, diamond abundance, and cell phone coverage, are all binary variables. This means that we cannot determine the exact number of natural resources or density of cell phone coverage in a particular region, as binary variables only indicate whether these resources exist in a region or not. Therefore, our research would be more precise if we obtained more detailed information about the natural resources and cell phone coverage in specific areas of Africa.

Finally, our robustness check does not account for the impact of oil reserves on political conflicts and leaves out the effect of cell phone coverage when applying the negative binomial model. This raises questions about the precise impact of these factors on political conflicts and could be the subject of further research. It would also be interesting to explore other factors that may affect oil reserves and political violence and to what extent cell phone coverage is correlated with these factors in the context of African conflicts.

After analysing the dataset from Pierskalla and Hollenbach's paper, we discovered a significant correlation between natural resources and cell phone coverage. Areas with diamond abundance or oil reserves tend to have more cell phone coverage than those without. These findings offer evidence for resource blessing due to the abundance of diamonds and resource curse caused by oil reserves when excluding the impact of cell phone coverage. It also suggests that whether there is a resource curse or blessing is debatable for different types of natural resources. Therefore, several factors should be carefully considered when concluding the relationship between natural resources and violent political conflicts in further research.

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Notes

[1] The information comes from a paper titled "Technology and Collective Action: The Effect of Cell Phone Coverage on Political Violence in Africa." by Pierskalla and Hollenbach (2013): 207-224. The replicated data also comes from this same paper.
[2] See also *WB*. July 5, 2015. Confronting Conflict and Fragility in Africa." *The World Bank (WB)*. Accessed on July 3, 2022. https://www.worldbank.org/en/news/feature/2015/07/05/confronting-conflict-and-fragility-in-africa
[3] *IMF*. January 25, 2009. "Sierra Leone: Selected Issues and Statistics. Appendix." *International Monetary Fund (IMF) Country Report*, no. 09/12. Accessed on July 3, 2023. http://www.imf.org/external/pubs/ft/scr/2009/cr0912.pdf.
[4] See also *IMF*. January 25, 2010. "External Publications." *International Monetary Fund (IMF).* Accessed on July 3, 2023. http://www.imf.org/external/pubs/ft/ser/2010/cr10196.pdf
[5] IMF. February 25, 2009. "Niger: Selected Issues and Statistics. Appendix." *International Monetary Fund (IMF) Country Report*, no 09/70 Accessed on July 3, 2023. http://www.imf.org/external/pubs/ft/scr/2009/cr0970.pdf.
[6] See Turnell, Sean. 2010. "Finding Dollars and Sense: Burma's Economy in 2010." In *Finding Dollars, Sense, and Legitimacy in Burma*, edited by Susan L. Levenstein, 20-39. Washington D.C: Woodrow Wilson International Center for Scholars.
[7] According to UCDP, violent events are characterized as the use of armed force by an organized actor against another organized actor or civilians, resulting in at least one direct death. This occurs at a specific location and for a specific period.
[8] G For more information on this topic, please visit the GSMA website at http://www.gsma.com/home/ or the Collins Bartholomew website at http://www.bartholomewmaps.com/.

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Appendix

Table 1: Regression Table for Model 1-4

	Dependent variable:			
	Conflict Dummy, 2008			
	Model 1	Model 2	Model 3	Model 4
Pre-2000 UCDP Conflict Count	0.019***	0.016***	0.015***	0.015***
	(0.003)	(0.003)	(0.003)	(0.003)
Border Distance	−0.001**	−0.001**	−0.001*	−0.001*
	(0.0004)	(0.0005)	(0.0005)	(0.0005)
Capital Distance	−0.0004***	−0.0003**	−0.0002	
	(0.0001)	(0.0002)	(0.0002)	
Mountainous Terrain	1.404***	1.727***	1.632***	1.654***
	(0.165)	(0.176)	(0.178)	(0.177)
Percentage of Irrigatated	−0.028**	−0.030**	−0.039**	−0.037**
	(0.014)	(0.015)	(0.016)	(0.016)
Share of Local Groups That Are Nationally Excluded		0.861***	1.061***	1.011***
		(0.146)	(0.153)	(0.148)
Diamond Deposit	−2.425**	−2.066**	−2.133**	−2.117**
	(1.005)	(1.006)	(1.007)	(1.007)
Oil and Gas Deposit	0.141	0.488**	0.478*	0.485*
	(0.224)	(0.249)	(0.248)	(0.248)
Cellphone Coverage			0.672***	0.703***
			(0.141)	(0.139)
Population Count (k)	0.001***	0.001***	0.001***	0.001***
	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Constant	−3.280***	−3.791***	−4.287***	−4.421***
	(0.134)	(0.160)	(0.195)	(0.166)
Observations	10,385	8,531	8,531	8,531
Log Likelihood	−1,451.198	−1,181.365	−1,169.989	−1,170.829
Akaike Inf. Crit.	2,920.396	2,382.730	2,361.978	2,361.659
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 2: Comparison for Scobit and Logit Model (Model 4)

	Scobit Model		Logit Model	
	Estimates	SE	Estimates	SE
Intercept	-0.819	0.457	-4.421 ***	0.166
Pre-2000 UCDP Conflict Count	0.013***	0.002	0.015 ***	0.003
Border Distance	-0.0006 **	0.0002	-0.0008 *	0.0005
Mountainous Terrain	0.760***	0.115	1.654 ***	0.177
Percentage of Irrigatated	-0.014**	0.006	-0.037**	0.016
Local Groups Excluded	0.490***	0.081	1.011 ***	0.148
Diamond Deposit	-0.866**	0.375	-2.117 **	1.007
Oil and Gas Deposit	0.208	0.120	0.485*	0.248
Cellphone Coverage	0.267**	0.074	0.703 ***	0.139
Population Count (k)	0.0005**	0.0001	0.0007 ***	0.0001
α	1.335 ***	0.266		
Note:			*p<0.1; **p<0.05; ***p<0.01	