

When Disasters Hit Civil Wars: Natural Resource Exploitation and Rebel Group Resilience

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Existing literature on the relationship between natural disasters and conflicts provides mixed findings. In this article, we argue that whether natural disasters hurt rebel group resilience depends on their funding source and the mode of resource extraction. Rebel groups that obtain their funding from natural resources are more susceptible to natural disasters because this funding source could be easily disrupted by rapid-onset disasters. How rebel groups exploit natural resource wealth also conditions the effect of natural disasters on rebel group resilience. Rebel groups that depend on extorting resource production, despite having a seemingly stable revenue stream, are more likely to face funding cuts after a severe natural disaster. In contrast, rebel groups that rely on smuggling natural resources, due to a higher level of flexibility and mobility, are more likely to survive natural disasters. We test our arguments using data on armed groups, natural disasters, and rebel contraband, and the results of the logit models with interaction terms support our hypotheses. Our findings bridge the environmental conflict literature and the resource curse literature, and offer important policy implications.

La literatura existente sobre la relación entre los desastres naturales y los conflictos proporciona conclusiones contradictorias. En este artículo, sostenemos que el hecho de que los desastres naturales afecten o no la resiliencia de los grupos rebeldes depende de su fuente de financiamiento y de la manera de extraer recursos. Los grupos rebeldes que se financian con recursos naturales son más susceptibles a los desastres naturales porque esta fuente de financiamiento podría verse interrumpida fácilmente por desastres repentinos. El modo en el que los grupos rebeldes explotan la riqueza de los recursos naturales también condiciona el efecto de los desastres naturales en la resiliencia de dichos grupos. Los grupos rebeldes que dependen de la extorsión de la producción de recursos, a pesar de tener un flujo de ingresos aparentemente estable, tienen más probabilidades de afrontar recortes de fondos después de un desastre natural grave. Por el contrario, los grupos rebeldes que dependen del contrabando de recursos naturales, debido a un nivel más alto de flexibilidad y de movilidad, tienen más probabilidades de sobrevivir a los desastres naturales. Analizamos nuestros argumentos usando datos sobre grupos armados, desastres naturales y contrabando por parte de rebeldes, y los resultados de los modelos logísticos con términos de interacción respaldan nuestras hipótesis. Nuestras conclusiones tienden un puente con la literatura sobre conflictos ambientales y el aprovechamiento de los recursos naturales disponibles, y ofrecen importantes consecuencias políticas.

La littérature existante portant sur la relation entre catastrophes naturelles et conflits offre des constats variés. Dans cet article, nous soutenons que la possibilité que les catastrophes naturelles nuisent à la résilience des groupes rebelles dépend de la source de financement et du mode d'extraction des ressources de ces groupes. Les groupes rebelles obtenant leur financement à partir de ressources naturelles sont plus sensibles aux catastrophes naturelles car cette source de financement peut facilement être perturbée par la rapidité de déclenchement des catastrophes. La manière dont les groupes rebelles exploitent les richesses en ressources naturelles conditionne également l'effet des catastrophes naturelles sur la résilience de ces groupes. Malgré l'apparente stabilité de leur flux de revenus, les groupes rebelles dépendant de l'extorsion de production de ressources sont davantage susceptibles d'être confrontés à des réductions de financement suite à une grave catastrophe naturelle. À l'inverse, les groupes rebelles dépendant du trafic de ressources naturelles sont davantage susceptibles de survivre aux catastrophes naturelles en raison de leurs plus hauts niveaux de flexibilité et de mobilité. Nous avons mis nos arguments à l'épreuve en utilisant des données portant sur les groupes armés, les catastrophes naturelles et la contrebande rebelle, et les résultats des modèles de régression logistique à termes d'interaction soutiennent nos hypothèses. Nos conclusions établissent un lien entre la littérature portant sur les conflits environnementaux et la littérature portant sur la malédiction des ressources tout en suggérant d'importantes implications politiques.

Introduction

How do natural disasters affect ongoing civil conflicts? One existing argument is that natural disasters provide an opportunity for rebel groups to expand or launch attacks.

In December 2017, Typhoon Kai-tak struck the Philippines and killed at least thirty-two people. A few days later, the New People's Army (NPA), a rebel group that has engaged in guerrilla warfare for nearly fifty years, attacked Philippine soldiers who carried disaster relief aid.¹ A 2016 report published by a German think tank also warns that climate-induced disasters will intensify conflicts, as shown in

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¹ See <https://www.reuters.com/article/us-philippines-rebels-storm/philippines-says-maoist-rebels-attacked-soldiers-on-typhoon-relief-duty-idUSKBN1EC0JA> (accessed April 25, 2018).

the cases of the Islamic State in Syria and Boko Haram in Nigeria, both of which use water as a weapon and take advantage of livelihood insecurity to recruit followers (Lukas and Rüttinger 2016). The “disaster diplomacy” literature, contrarily, argues that natural disasters could be a catalyst for peace between states or within a state (Kelman 2006), as resource scarcity after natural disasters may facilitate cooperation or reconciliation between rebel groups and the government.

These divergent arguments suggest that rebel groups may react to natural disasters differently. Why do some rebel groups fail to sustain themselves in the aftermath of natural disasters and face a defeat by the government, while others successfully manage the impact of natural disasters and remain resilient against the government? This article answers this question by focusing on how rebel groups obtain their source of funding. While there is potential endogeneity between the choice of funding mode and rebel performance, natural disasters serve as a perfect instrument to test how different funding streams affect rebel resilience as they occur exogenously.

The civil war literature suggests that natural resources provide an important funding source for rebel groups and that rebels relying on resource wealth tend to survive longer. We argue, however, that depending on natural resources increases a rebel group’s vulnerability to natural disasters, as severe disasters can easily disrupt natural resource production and therefore the group’s funding stream. The mode of extracting natural resources also conditions the effect of natural disasters on rebel resilience. Extorting and directly controlling natural resource production restricts rebel groups’ activities to fixed locations, and thus makes them more likely to be hurt by disasters. Relying on smuggling natural resources, contrarily, gives rebels mobility and flexibility and makes them accustomed to looking for alternative resources in other regions. This makes smuggling rebel groups more likely to withstand the impact of severe natural disasters, and thus increases their chance of surviving or even winning the war with the government, as the government may be spending both human and financial resources for disaster relief.

We test our arguments using a variety of data on armed groups, natural disasters, and rebel contraband. Our sample covers ninety-three rebel–country dyads from 1991 to 2011. Our dependent variable is a binary indicator of rebel resilience, which we define as a rebel victory, conflict continuation, or a peace agreement in a given year. The results show that natural disasters and natural resource wealth have a negative interactive effect on rebel resilience, meaning that relying on natural resource money hurts rebel groups worse after disasters. Moreover, after we disaggregate the mode of resource extraction, we find that the effect of natural disasters on rebel resilience is conditional on whether rebel groups engage in extortion or smuggling. Rebel groups relying on extorting natural resource production and rebel groups relying on both modes of resource exploitation are less likely to survive severe natural disasters, whereas rebel groups earning money from smuggling natural resources are more likely to survive or win after severe disasters.

This article bridges the environmental conflict literature and the resource curse literature.² While the latter sug-

²The resource curse literature has three variants: natural resources impeding economic growth (e.g., Sachs and Warner 1995; Khanna 2017), natural resources hurting democracy (e.g., Aslaksen 2010; Wright, Frantz, and Geddes 2015), and natural resources inducing civil conflicts or political violence (e.g., Collier and Hoeffler 2004; Lujala, Gleditsch, and Gilmore 2005; Lee 2018). In this article, we only refer to the literature that focuses on civil wars, although all these three phenomena are interrelated and can be causes or consequences of one another.

gests that natural resources provide crucial income to rebel groups and thus lengthen civil conflicts, little is known as to whether and how this funding source may be influenced by external shocks such as natural disasters. We show that natural disasters could cause disruption of resource income and thus hurt rebel group resilience. This provides an explanation as to why some rebel groups survived severe natural disasters but others collapsed or were reconciled with the government after natural disasters.

Natural Disasters, Rebel Capability, and Conflict Duration

How do natural disasters affect civil conflicts? Existing literature on the relationship between natural disasters and political violence provides two contrasting views, which both focus on the resources available to rebel groups and/or governments. One group of scholars, based largely on the relative deprivation theory, argues that the depletion of resources brought by natural disasters increases the competition among people and thus also increases the likelihood of armed conflicts. Natural disasters, particularly rapid-onset disasters such as earthquakes, tsunamis, and floods, deprive people of their houses, food, or even loved ones in a short time. The frustration and desperation of those in the affected region who face a shortage of resources therefore rise after disasters (Brancati 2007; Nel and Righarts 2008; Homer-Dixon 2010), and their grievances are often directed against the authorities that are responsible for disaster relief. Thus, natural disasters lead to more violent behavior.

This thread of research fits into a broader literature on the environment and conflict nexus, which argues that environmental scarcity increases the risk of conflicts. In a seminal paper, Gleditsch (1998) criticizes this literature by indicating a number of methodological issues, such as omitting important variables, untestable models, and reverse causality.³ He also points out that existing studies have “the problem of gathering valid and reliable data on the environmental behavior of nations or smaller geographical units” (Gleditsch 1998, 396), which Schwartz, Deligiannis, and Homer-Dixon (2000) agree on. Two decades since then, more useful and reliable datasets on how states or rebel groups interact with the environment have been developed, including the Rebel Contraband Dataset (RCD) used in this article (Walsh et al. 2018).

The other group of scholars focuses on the abundance of resources as a necessary factor for rebellions, and they argue that the scarcity of resources after natural disasters curtails violence. Salehyan and Hendrix (2014, 240), for example, explain that “even if people have the motive to fight, they also need the capability to do so, and environment scarcity may limit such capability, thus undermining the resource base necessary for mobilizing armed violence.” Similar arguments are made in Slettebak (2012) and Kreutz (2012) in the context of climate-related natural disasters.⁴

The real-world cases indicate that the above two competing arguments are both likely. After the 2004 Indian Ocean Tsunami, for instance, the Free Aceh Movement (GAM), a militant group in Indonesia, signed a peace agreement with the Indonesian government to end the long-standing civil

³Please see Gleditsch (1998), Gleditsch and Urdal (2002), and Schwartz, Deligiannis, and Homer-Dixon (2000) for more details of this debate.

⁴The former work shows that countries hit by climate-related natural disasters have a lower risk of armed conflicts, and the latter finds that natural disasters increase the likelihood that conflicting parties initiate peace talks and agree to a ceasefire.

war, whereas the Liberation Tigers of Tamil Eelam (LTTE), a separatist group based in northern Sri Lanka, prolonged their fighting with the Sinhalese government (Beardsley and McQuinn 2009). In the wake of earthquakes, the Egyptian government escalated repression on the Islamic groups after the 1992 Cairo earthquake, preventing them from establishing legitimacy (Wood and Wright 2016), but the Colombian government failed to bargain with rebel groups and was attacked more fiercely after the 1999 earthquake (Brancati 2007). These variations suggest that no single theory can perfectly explain the disaster–conflict relationship and that other factors may play a role in determining whether the outcome is peace or violence.

In this regard, many believe that state capacity or regime type moderates the positive impact of climate-related shocks on violent behavior (Omelicheva 2011; Jones, Mattiacci, and Braumoeller 2017), as countries with strong institutions and good governance are more capable of managing shocks and thus are less subject to violence after natural disasters. Others argue that ethnically fragmented or populous countries are more likely to suffer from armed conflicts in the wake of disasters (e.g., Slettebak 2012). These country-level factors, however, cannot explain the cases in which rebel groups in the same country behave differently after a natural disaster. Walch (2014), for example, shows that after the 2012 typhoon in the Philippines, the Moro Islamic Liberation Front cooperated with the government during relief operations but the NPA remained hostile to the government. In other words, scholars could also pay attention to group-level variations to explain the disaster–conflict relationship, which few studies have done except for a number of comparative case studies (Beardsley and McQuinn 2009; Klitzsch 2014; Walch 2014).

Another critical issue with the existing literature is that more research focuses on the onset than the duration of civil conflicts. This gap is surprising given that many countries suffering from ongoing armed conflicts are also prone to natural disasters (Eastin 2016, 323), especially countries in South and Southeast Asia, Central America, and Sub-Saharan Africa. Many of these countries are lagging behind other countries on development and struggling with poverty or inequality. The general public especially children in these conflict- or disaster-prone countries are therefore suffering from hunger, displacement, and lack of education. Because civil conflicts may also increase a state's reliance on natural resources and damage the environment (Gleditsch 1998; Brunnschweiler and Bulte 2009), countries that are plagued with natural disasters and violence are likely to find themselves trapped in this vicious circle. Given that both armed conflicts and natural disasters often occur in less developed countries, which further impedes their development, it is imperative to know how natural disasters affect *ongoing* civil conflicts.

The civil war literature has identified a variety of factors that affect the duration of ongoing conflicts. Geographic locations, particularly a conflict zone remote from the state stronghold, rough terrains that inhibit a state's power projection against rebels, ethnic values attached to the "sons of the soil," and access to natural resources are all expected to prolong conflicts (Fearon 2004; Buhaug, Gates, and Lujala 2009). Among these, access to natural resources is critical to rebel operations, as resource money can be used by rebel groups to recruit and sustain members and to buy armory, food, and necessities. Lujala (2010), for example, finds that conflicts in which rebels are near natural resources are double in duration. The type of natural resources or the mode of exploiting natural resources may also matter. Conrad

et al. (2019) and Walsh et al. (2018) find that rebels are more likely to resist government repression when they profit from smuggling natural resources due to the flexibility and mobility provided by this mode of resource exploitation.

As the above literature review suggests, both natural disasters and natural resources have significant impacts on the dynamics of civil conflicts. While the literature on the disaster–conflict relationship often refers to rebel groups' available resources, whether they be abundant or scarce, as the contributing factor of violence, little research has explored how these factors interact. This article examines the interaction between natural disasters and rebel groups' funding resources and its consequence on rebel resilience, which we turn to in the next section.

Natural Disasters, Natural Resources, and Rebel Resilience

A civil conflict can end in a variety of ways. Shorter conflicts do not necessarily mean rebels are weaker or less capable of resisting state repression, as a conflict may be terminated by rebel victory or a negotiated settlement. In this article, we focus on "rebel resilience," which we define as the ability of rebels to win over the state, to enter a peace settlement, or to maintain their survival, as compared to conflict termination by state victory (which indicates rebels' inability to keep fighting). In other words, in our operationalization, we consider rebel victory, peace settlements, and conflict continuation all as rebel resilience, despite the first two indicating conflict termination. While Weinstein (2006) defines rebel resilience as a rebel group's ability to maintain its membership over time and respond to shocks, we believe that a victory over the government is the ultimate goal for most rebel groups. Also, as argued by Fortna (2015), rebel groups fight to change the status quo, and given that the government needs to at least partially concede when agreeing to a peace settlement, peace agreements can also be considered as a certain form of rebel success.

As reviewed in the previous section, the existing literature provides two distinct insights on how natural disasters affect violence/peace and what determines conflict duration. While we side with the scholars who suggest that resource availability is critical for rebel groups, we believe that these two arguments are not incompatible with each other. Indeed, natural disasters may cause desperation and thus trigger unrest or the onset of civil wars, but we argue that they simultaneously hurt the existing groups' capacity by reducing the resources available to them. This is especially likely when they rely on natural resources as their main source of funding. We also move beyond simply exploring the relationship between natural disasters and conflicts and further argue that how rebel groups obtain and exploit natural resources matters.

To begin, natural resources play an important role in state–rebel relations during civil conflicts. When rebels have access to natural resources, they have a stronger capability to fight as well as a lower incentive to enter peace negotiations with the government (Ross 2004; Lujala 2010). As a result, conflicts financed by resource wealth are more likely to have a longer duration (Fearon 2004). Different types of natural resources, moreover, may lead to divergent outcomes in conflicts. Natural resources that are concentrated in an area (i.e., point resources), such as oil and primary diamonds, often require capital-intensive extraction and thus may enhance the cohesiveness of a rebel group, which in turn influences the duration of a conflict (Humphreys 2005,

515).⁵ Natural resources that are more diffuse, such as opium and secondary diamonds, can be more easily accessed and looted by rebels, and thus are more likely to lengthen conflicts (Lujala 2010).

Indeed, natural resources provide an important funding source for rebel groups. Once this revenue stream is unavailable, however, the power balance between the state and the rebel group may change. We argue that natural disasters are harmful to rebel groups, particularly those that obtain their funding from natural resources. Natural disasters, especially when very severe, may cause drastic environmental changes, leading to the loss of resources. Resource scarcity impedes a rebel group's ability to fight, and it also makes it more difficult to enlist new members. As Walch (2018) shows using case studies in the Philippines, natural disasters hinder rebel recruitment because rebel groups' supply lines are weakened and government and international presence is increased after a disaster. While desperate people may choose to join rebel groups to reflect their grievances after disasters, if the organization cannot provide sufficient resources such as food, shelter, and basic supplies, they will hesitate since survival is of more importance to them (Salehyan and Hendrix 2014). In other words, rebel groups need resources to sustain themselves or to expand, and therefore natural disasters that often cause resource scarcity harm rebel groups' organization and operations.

Some rebel groups rely on external support to sustain themselves, and they may be relatively unsusceptible to natural disasters as long as their funding continues. The strikingly different fates between the GAM and LTTE after the 2004 tsunami are partly because the LTTE had funding from external sources but the GAM relied on local resources (Beardsley and McQuinn 2009). When rebel groups primarily rely on natural resources as the main source of funding, how a natural disaster affects the sustainability of these resources will impact how the disaster affects the group. After a severe natural disaster, the values of these material resources can be largely degraded or damaged. Portions of lands that had been provided as remuneration for participation in violence may be washed away by a tsunami or storm. Landslides or other changes in the natural environment caused by heavy rain or earthquakes may make exploitation of natural resources such as gems and timber difficult, so resource availability may be suspended. Moreover, local residents who make a living by mining may lose their ability to pay taxes to the rebel group that predates from the local population. Therefore, the funding of a rebel group based on lootable resources is very likely to discontinue after a disaster, hurting its ability to fight or to keep its operations.⁶

Indeed, when natural disasters hit a country, the state military is also likely to be affected, as the government needs to reallocate resources to disaster relief (Walch 2014). We believe, however, that the effect is not uniform even if a

⁵The existing literature, however, shows mixed results regarding the effect of oil on conflict duration. While Humphreys (2005) shows that oil production is positively associated with military victory, which means shorter conflicts, Lujala (2010) finds that onshore oil near conflict zones leads to longer conflicts.

⁶Indeed, the value of natural resources may go up after a natural disaster because of the decrease in supply. Hurricane Katrina, for example, severely damaged the US oil production in the Gulf of Mexico, causing oil prices to rise to above \$70 per barrel (Pan 2005). If the natural resource production controlled by the rebel group or in the affected area only accounts for a small share of the total supply, however, a natural disaster that destroys the production may not be followed by an increase in prices. Even if the price surges, compared to the state government, a rebel group is less likely to take this advantage to profit if it is also badly hurt by the disaster. Therefore, we expect that in general natural disasters have a negative impact on rebel groups that derive funding from natural resources, regardless of the price. We thank an anonymous reviewer for this point.

disaster equally hits both rebels and the government. As Walch (2018, 4) argues, rebels are more vulnerable to disasters than the state "because rebel groups do not have the same access to infrastructures and military equipment to start with, and because they cannot as easily tap into national and international resource networks." The 2004 tsunami hitting Aceh illustrates this argument. While the tsunami more severely affected the Indonesian government by causing 2,698 security personnel deaths compared to 70 GAM member deaths, only the GAM was militarily weakened after the disaster. This is because the Indonesian military troops gathered resources widely across the nation, whereas the GAM's resource networks were heavily disrupted by the disaster (Billon and Waizenegger 2007, 418). In other words, there is a huge asymmetry in the ability to mobilize resources between rebels and the state, and the impact of disasters thus is generally more harmful to rebels than to the state.⁷

In sum, the destructive impact of severe natural disasters is more pronounced on the rebels. Particularly, rebel groups that rely on local material resources are more susceptible to natural disasters, as their funding is likely to be disrupted by severe disasters. This leads to our first empirically testable hypothesis:

Hypothesis 1: *Natural disasters reduce rebel groups' resilience, especially when rebel groups earn money from natural resources.*

Hypothesis 1 suggests that natural disasters and reliance on natural resources *jointly* hurt a rebel group. The ways in which rebels earn income from natural resources, however, vary across groups, which may condition their susceptibility to natural disasters. In a recent article, Conrad et al. (2019) argue that rebel groups that depend on *smuggling* natural resources are more capable of resisting government repression than groups *extorting* natural resource production because the former tend to be more mobile and have more flexibility in choosing different resources. Following this logic, we further develop our argument to explain how the mode of extracting natural resources affects a rebel group's resilience to natural disasters.

As discussed above, point resources are geographically more concentrated and usually produced by extractive industries (Le Billon 2001, 570), whereas diffuse resources are more widespread and characterized by lower capital intensity, which provides many access points to outsiders (Le Billon 2012, 28–29). We argue that these two types of resources correspond to the two modes of extraction identified by Conrad et al. (2019). Extorting natural resource production is to "demand a share of the income generated from natural resources in exchange for refraining from violence against the producers," which requires a constant connection with or involvement in the production of natural resources, including direct control of mining fields (Conrad et al. 2019, 596). On the contrary, smuggling (i.e., illegal transportation of goods) is a more episodic type of extraction and often creates resource networks that "provide sources of income that are not concentrated in any one geographical area, or even based on any one resource" (Conrad et al. 2019, 596).

⁷A key issue that follows would be whether a natural disaster occurs in the area where the rebel group is based. If a natural disaster does not hit the rebel base, then the argument of asymmetry between the rebels and the state may not hold. We acknowledge that this is likely, but due to the unavailability of location-based data, we simply assume that *on average* rebel groups are affected to a higher degree by natural disasters than the government is. Our future research will gather subnational level data on disasters and rebel groups to better address this issue.

We argue that the mode of resource exploitation may influence rebel groups' vulnerability to natural disasters. Specifically, rebel groups that rely on resource extortion are more susceptible to severe natural disasters than rebel groups that smuggle natural resources for two reasons. First, when a natural disaster hits a region, the production of point resources is more likely to be disrupted than that of diffuse resources. This is because the production base of point resources is often centralized, whereas the production bases of diffuse resources often spread widely. Rebel groups that rely on extortion are more likely to exploit point resources, such as oil and minerals, than rebel groups that smuggle.⁸ While extorting resource production represents a stable funding source in normal times, these profits are vulnerable to unintentional shocks (Hazen 2013, 65), including natural disasters. Once the production of natural resources is destroyed by severe natural disasters, rebel groups' funding may suddenly stop, making it difficult for them to maintain survival. Walch (2018, 5), for example, points out that external shocks like natural disasters make rebels unable to control desertion or provide financial incentives to individual members. Lujala (2009) also argues that governments have stronger incentives to control the extraction of point resources using military force, which implies that rebel groups that extort point resource production are more likely to become the state military's target after disasters.

Rebel groups that smuggle, on the contrary, usually exploit diffuse resources, such as opium, coca, and timber. The production of diffuse resources is more scattered and thus is less likely to completely discontinue after one disaster. Groups relying on smuggling also have a higher level of mobility and flexibility (Conrad et al. 2019), and the natural resources they derive funding from may not come from the region where they operate. Some rebel groups, such as Al-Qaeda in the Islamic Maghreb, Mozambique National Resistance, and People's United Liberation Front, engage in smuggling timber, drugs, or gemstones across national borders and build a large trafficking network (Laub and Masters 2015; Walsh et al. 2018). We thus believe that they are more resistant to unexpected shocks like natural disasters due to their mobility and a more widespread base of operations. If market prices of natural resources rise after disasters, smuggling may even be more profitable to rebel groups than normal times.

Second, the mode of resource extraction may influence a rebel group's vulnerability to natural disasters through affecting its organizational structure. Capital-intensive resource extraction needs a rebel group to have a corporate structure, as the production of resources or profiting from resource production requires a centralized organizational process controlled by the leader. Extracting diffuse resources, however, "creates opportunities for soldiers of all ranks to earn money by extracting or transporting the resources themselves" (Ross 2003, 58). As Marsh (2007) argues, when the leadership controls the access to resources, a group can maintain its cohesiveness, but a group is more fragmented when the access points of resources are available to regional commanders and individual membership. Similarly, Lidow (2016, 7) argues that the control of financial and military resources by the leadership results in more cohesive and disciplined rebels.

The level of a rebel group's cohesiveness may determine both the length of a conflict and how it ends. Cohesive

groups can mobilize both material and non-material resources and thus deploy significant offensiveness against the state military, enhancing their strength. If a cohesive group is hit by a natural disaster and loses its key leadership or assets, however, it is more likely to collapse than a fragmented group that does not centralize the power. Because rebel groups that extort resource production tend to have a cohesive or hierarchical structure, they may become more fragile after being badly hit by disasters. Not only their funding source may be disrupted by disasters, but also their centralized decision-making may be obstructed by this type of sudden external shocks. Furthermore, while all rebel groups aim to control territory, which is one of rebels' major goals, groups that rely on extortion are more likely to control territory than groups that smuggle, as they need a fixed base to operate their businesses and to monitor and manage the production.⁹ The territory they control is often near or contains the production site of the natural resources that they derive funding from. Therefore, if a severe natural disaster destroys the resource production, the rebel group that earns money from extorting the production will also be weakened.

Unlike groups relying on extortion that may suddenly lose their funding source, rebel groups that smuggle natural resources do not often control territory and may have a decentralized structure. After natural disasters hit their base, these groups can move to another area or switch to another resource more easily. Their weak organizational structure and engagement in smuggling make individual members accustomed to moving and looking for alternative resources, thus decreasing the chance of sudden collapse. The Kachin Independence Organisation (KIO), for instance, is a rebel group that is based in the Kachin state in northeastern Myanmar, a country plagued with frequent natural disasters especially floods and landslides caused by cyclones. The KIO obtains its funding by engaging in cross-border trade of jade and timber with China, and they not only remain intact but are even able to offer aid to victims after several major floods.¹⁰ After all, as Conrad et al. (2019, 600) point out, "[g]roups with multiple funding sources should be more resilient to attempts by other actors to cut off their funding." Therefore, although their primary source of funding seems less stable than rebel groups relying on extortion, rebel groups that smuggle natural resources may be less sensitive to natural disasters due to their fragmented organizational structure and high mobility.

To sum up the above arguments, natural disasters are more likely to cause damage to rebel groups that depend on natural resource wealth because this source of funding could be easily disrupted in the aftermath of severe disasters. This negative effect of natural disasters on rebels is further conditional on the mode of resource extraction. Extorting natural resource production provides continuing funding to rebels, thus strengthening their group cohesiveness, but it also makes them more vulnerable to sudden shocks such as natural disasters. Rebel groups smuggling natural resources, on the contrary, may be less sensitive to natural disasters because they are more mobile and have more flexibility in earning money from different sources. Therefore, we have the following two hypotheses:

⁹Our data show that only 26 percent of the rebel groups that smuggle natural resources control territory, whereas 60.8 percent of the rebel groups that rely on extortion control territory.

¹⁰See <https://www.bnionline.net/en/news/chin-state/item/714-kio-aid-distributed-to-flood-victims-in-west-burma.html> (accessed January 23, 2020).

⁸Please see the online appendix for the top ten resources exploited by groups that rely on extortion and groups that smuggle, respectively.

Hypothesis 2: *Among rebel groups that earn money from natural resources, those extorting natural resource production are more vulnerable to severe natural disasters.*

Hypothesis 3: *Among rebel groups that earn money from natural resources, those smuggling natural resources are more resilient to severe natural disasters.*

Research Design

We argue that the key to explaining the variation of rebel performance lies in the mode of resource extraction, particularly whether a rebel group in a conflict relies on extorting or smuggling natural resources. Therefore, we restrict our sample to rebel groups involved in existing conflicts. The data on civil conflicts are from the Non-State Actors in Armed Conflict Dataset (NSA) compiled by [Cunningham, Gleditsch, and Salehyan \(2013\)](#), which is an expansion of the UCDP/PRIO Armed Conflict Data. We define a rebel group based on the UCDP coding, which is “any non-governmental group of people having announced a name for their group and using armed force to influence the outcome of the stated incompatibility” ([Pettersson 2019](#), 1). In this definition, rebel groups have to be formally organized opposition groups that engage in consciously planned violence instead of spontaneous violence. From this perspective, both terrorist and insurgent groups can be included in our data.¹¹ The civil conflicts included in our analysis experienced at least twenty-five battle-related deaths within a state in a given year between 1945 and 2011 over political issues such as secession and control over the government ([Cunningham, Gleditsch, and Salehyan 2013](#)). Further, the data are restricted to conflicts involving active (and not dormant) actors that have clear leadership ([Cunningham, Gleditsch, and Salehyan 2009](#), 579).

Based on the NSA, we create two datasets used in this article. The first dataset includes all rebel groups regardless of whether they rely on natural resources for their operations or not, as our first hypothesis compares rebel resilience against natural disasters across all rebel groups. Our second and third hypotheses attempt to explore rebel resilience based on the mode of resource exploitation within rebels relying on natural resources. Thus, we restrict our sample to rebels only relying on natural resources. In this respect, the second dataset is a subsample of the first dataset. In the first dataset, we have 85 rebel groups and 93 state–rebel conflicts from 1991 to 2011 with a total of 471 dyad-year observations. For a conflict that ended but resumed later, we consider it as two different state–rebel conflicts even though the combatant parties are the same. This explains why we have a larger number of state–rebel conflicts than that of rebel groups. The average duration of a conflict is ten years with minimum of two years and maximum of forty-two years. The second dataset has 45 state–rebel conflicts from 1991 to 2011 and a total of 270 dyad-year observations, and has the same average, minimum, and maximum duration as the parent sample.¹²

Dependent Variable

Rebel resilience, the dependent variable in our analysis, is a binary indicator that has a value of 1 when a conflict ends with a rebel victory or a peace settlement, or when a conflict does

not end, and 0 when a conflict temporarily suspends due to ceasefire or a state victory, or when a conflict vanishes (i.e., the battle-related deaths in a given calendar year fall below 25).¹³ In the full sample, the first category includes forty-one state–rebel group dyads, which indicates that forty-one conflicts ended with rebel victory or peace settlements, or did not end within the period under investigation. On the other hand, fifty-two state–rebel dyads ended with the forms listed under the second category. In the restricted sample, the first category includes twenty-two state–rebel group dyads, while the second category has twenty-three state–rebel dyads. We employ a logit model with clustered standard errors at the regional level for the estimation. Although rapid-onset disasters occur in a short time, it may take time for the impact of disaster-related damage to be translated into impact on the rebel groups. We thus lag our disaster variable by one year, which could also avoid a reverse time order between the dependent and independent variables.

Independent Variables

The first key independent variable in our analysis is natural disasters. We use data from the EM-DAT, which is maintained by the Centre for Research on the Epidemiology of Disasters ([Guha-Sapir, Below, and Hoyois 2015](#)). The EM-DAT codes a disaster when it meets at least one of the following criteria: (1) ten or more people reported killed; (2) hundred or more people reported affected; (3) declaration of a state of emergency; and (4) call for international assistance ([Guha-Sapir, Below, and Hoyois 2015](#)). The EM-DAT categorizes natural disasters into six types: geophysical, meteorological, hydrological, climatological, and biological, extraterrestrial disasters. In this article, we only consider rapid-onset disasters, including geophysical and hydrological disasters (which include earthquakes, volcanic activities, mass movements, floods, landslides, and wave action). These disasters occur quickly without warning, and they often change geophysical landscapes and the distribution of resources and population. Therefore, it is more appropriate to use rapid-onset disasters to test our theoretical claims than to include slow-onset disasters. Previous research has used different coding schemes to measure a country’s proneness to natural disasters, such as simply counting the number of disasters in a year, counting the number of disasters that caused more than a certain number of victims, and using a binary indicator for disasters that reached a certain threshold of casualties ([Nel and Righarts 2008](#); [Omelicheva 2011](#); [Eastin 2016](#)). Our measure for disasters combines the number of deaths with the number of missing, injured, and homeless persons caused by disasters in a given year ([Kreutz 2012](#)), which is coded as the *severity of disasters* for two reasons. First, our theory indicates that rebel resilience to natural disasters is conditional on the mode of resource exploitation, and it predicts that severe disasters are more likely to distort the funding source for rebels who rely on extorting natural resources. So, it is more appropriate to use a continuous measure for the severity of disasters

¹¹ A complete list of the rebel groups included in our sample can be seen in the online appendix.

¹² The sample reduction from the NSA is due to missing information of the variables used in the regression analysis.

¹³ We follow [Fortna \(2015\)](#) and consider a peace settlement as rebel resilience because it indicates a certain level of government concessions and rebel success. We do not include ceasefire agreements into rebel resilience because this mode of conflict termination simply means both sides agree to at least temporarily stop fighting and it does not give rebels any political achievements. When we exclude peace settlements from rebel resilience, the results remain similar. Moreover, since a binary variable reduces the variation of information, we also use an ordered categorical variable to operationalize rebel resilience (from state victory, no or low activity, peace agreements, to conflict continuation or rebel victory) and employ the ordered logistic model as a robustness check. Both results remain supportive of our hypotheses and can be seen in the online appendix.

than to simply count the number of disasters, as the latter gives equal weight to each disaster regardless of severity. Second, we also include the number of injured, missing, and affected people because such people can hardly maintain their daily lives and cannot engage in resource extraction for rebel groups. Because disasters often damage physical properties and infrastructure for economic activities, including resource production, it is more logical to consider not only deaths but also other types of impact.¹⁴

While this country-level measure takes into account the severity of disasters in a country in a given year, it ignores a country's past propensity to disasters and therefore the level of their disaster preparedness. A disaster-prone country may be relatively resilient to natural disasters compared to countries that rarely face disasters, as their past experiences better prepare them for future shocks. For instance, the Philippines periodically suffer from typhoons, volcano eruptions, and earthquakes that devastate some regions,¹⁵ with regions controlled by rebel groups being no exception, so the government has implemented a series of policies to enhance their disaster management and be proactive in building funding mechanisms.¹⁶ In other words, if two countries suffer from disasters with the same level of severity, the lesser experienced country may be less prepared and thus face greater damage. To take this issue into account, we include the lagged three-year moving average of disaster frequency (the total count of disasters in each year) for each country. It measures a country's recent proneness to disasters on average to control for how experienced a country is in managing disasters.¹⁷

The other two key independent variables are access to natural resources and the mode of natural resource extraction. As explained in the theory section, we explore not only the relationship between natural resources and rebel resilience but also how this relationship is conditioned by the mode of resource exploitation. To do so, we rely on data from the RCD, version 1.0, which is a newly compiled dataset by Walsh et al. (2018). The RCD is based on the UCDP dyadic data and thus includes armed conflicts with at least twenty-five battle-related deaths in a given year from 1990 to 2012. The RCD is novel in that it not just specifies whether a group has access to natural resources and the type of resources it has access to, but also codes how a rebel group extracts resources. Using the RCD, we generate two variables: *natural resources* and *mode of exploitation*. *Natural resources* is a binary indicator that identifies whether or not a rebel group relies on any type of natural resources for their operations. *Mode of exploitation* is a categorical variable taking the value of 1 when rebels engage directly or indirectly in illegally importing and exporting the available resources (smuggling), 2 when rebel groups engage in coercing workers, selling extracted resources to outsiders, or protecting illegal miners (extortion), and 3 when rebel groups rely on both modes of exploitation.

We hypothesize that relying on a stable mode of resource extraction (extortion) puts rebel groups at risk when natu-

ral disasters destruct those sources, but rebel groups relying on an unstable mode of resource exploitation (smuggling) are less sensitive to destructive disasters. However, relying on one mode of extraction does not prevent a group from relying on the other. In fact, fourteen out of the ninety-three rebel groups included in the dataset engage in both extortion and smuggling. We believe that these groups' resilience can be further strengthened because they hedge the risk through different modes of earning income, so we include three categories in *mode of exploitation* rather than two to differentiate between groups only relying on smuggling, groups only relying on extortion, and groups relying on both smuggling and extortion.¹⁸ To test our argument that rebel groups depending on resource wealth (especially those extorting natural resources) are more vulnerable to natural disasters, we include interaction terms for the disaster variable and each of the resource exploitation variables. Moreover, when testing Hypotheses 2 and 3, we restrict our sample to groups that rely on natural resources. In other words, we test the effect of natural disasters conditional on the mode of resource exploitation among rebel groups that earn income from natural resources.

Control Variables

We include a number of country-level variables in the model as control variables. Gross domestic product (GDP) (in constant 2010 US dollars, logged) is included to control for a country's economic capability. Wealthier countries may respond to disasters more quickly and can more efficiently provide disaster relief. Second, although disasters usually cause more casualties in poor countries, the impact may be alleviated by foreign aid or disaster relief (Strömberg 2007). To measure the impact of foreign aid, we include the annual amount of total aid to all sectors received by a country (in constant 2015 US dollars, logged). The total population size of a country (in thousands, logged) is also included, as a country with a large population size is prone to both civil conflicts and natural disasters (Slettebak 2012). Data on GDP are obtained from the World Bank's World Development Indicators, data on foreign aid are from the OECD's International Development Statistics, and data on population size are from the National Material Capabilities (NMC) dataset, version 5.0 (provided by the Correlates of War project).

We also control for political regime using the Polity scores from the Center for Systemic Peace. Autocratic regimes may be less sensitive to people's suffering, and this variable is thus included to control for the degree to which peoples' voices are translated into a state's decision-making. Using the original Polity score, however, may bias the results because civil conflict-related indexes are also used in constructing the Polity index. We thus create an alternative index removing the civil conflict dimension based on Vreeland (2008), *X Polity*. We further include data on military personnel (in thousands, logged) from the NMC to measure a country's military size and its ability to cope with rebel groups in terms of human resources.

In addition to the above country-level factors, we include two group-level variables—*territorial control* and *group age*. As our theory suggests, the extent of territorial control is closely related to the form of resource exploitation, with smuggling groups less likely to control territory than groups extorting natural resource production. Territorial control may

¹⁴ Indeed, there is potential endogeneity between conflicts and the severity of disasters, as countries undergoing conflicts may be less prepared for disasters and the impact may be larger. Since our sample only includes ongoing conflicts, however, this does not pose a serious problem to our research design.

¹⁵ See <http://www.dw.com/en/philippines-a-country-prone-to-natural-disasters/a-17217404> (accessed April 15, 2018).

¹⁶ See <https://www.preparecenter.org/countries/philippines> (accessed February 28, 2019).

¹⁷ We include the frequency of disasters as a control variable to avoid multicollinearity issues that can occur when we include the same intensity variable in the regression model.

¹⁸ The regression output returns two coefficients for the latter two categories, which are taken as the differences from the first category.

Table 1. Descriptive statistics of the variables

	Number of observations	Mean	Standard deviation	Minimum	Maximum
Rebel resilience	471	0.539	0.498	0	1
	270	0.537	0.499	0	1
Severity of disasters	471	11.966	3.708	0	18.668
	270	12.547	3.833	0	18.668
Natural resources	270	0.575	0.494	0	1
Modes of resource exploitation†	270	2.174	0.824	1	3
ln(GDP)	471	25.526	1.683	21.210	28.198
	270	25.867	1.725	21.210	28.198
ln(Population)	471	18.203	1.604	14.867	20.923
	270	18.509	1.744	14.867	20.923
ln(Military personnel)	471	12.297	1.409	7.601	14.096
	270	12.632	1.416	8.006	14.096
X Polity	471	3.259	4.035	-6	7
	270	4.529	3.496	-4	7
ln(Foreign aid)	471	20.262	1.089	14.478	22.007
	270	20.325	1.085	14.478	21.975
Group age	471	10.388	8.266	1	42
	270	11.818	8.733	43	6.186
Territorial control	471	0.384	0.486	0	1
	270	0.451	0.498	0	1

†The observations are restricted to only rebel groups that rely on natural resources.

also affect a rebel group's resilience through other mechanisms, such as affinity to land or indivisible value. Previous evidence shows that rebels holding territory leads to a prolonged conflict (Fearon 2004). To estimate the impact of resource exploitation on rebel resilience while controlling for the impact of territory, we thus include *territorial control* in our model as a control variable. The data are from the NSA, which is a binary indicator equal to 1 for rebels controlling territory and 0 otherwise.¹⁹ The *group age* variable is the cumulative number of years from the group's onset to its termination. As widely accepted in the literature, older rebels are more resilient than younger groups because older groups have established institutions to make them more robust and resistant to external shocks like disasters and countermeasures by the government. Group age is calculated based on the information from the NSA. Lastly, a natural disaster may not merely hit a single country, as its impact may spread beyond the national border. We thus include regional dummies in the model that represent the Middle East, Asia, Africa, and the Americas, with Europe being the base region (which is based on the UCDP dyadic dataset). The descriptive statistics for all the variables are presented in table 1 for both the full and restricted samples.

Empirical Findings

The results are presented in table 2. Models 1 and 2 show the results when only the key independent variables are included, and Models 3 and 4 include all control variables. Also, Models 1 and 3 test the general correlation between relying on natural resources along with natural disasters and rebel resilience to test Hypothesis 1, whereas Models 2 and 4 further disaggregate resource exploitation to test Hypotheses 2 and 3. With or without the control variables, our main findings are highly consistent across models, as shown by the

¹⁹We also estimate an additional model that includes a three-way interaction variable multiplying natural resources, natural disasters, and territorial control to differentiate the effect with and without territory. The results remain supportive of our arguments and can be seen in the online appendix.

consistent direction of the coefficients and the level of statistical significance for the interaction terms between natural resources and disasters.

Three conclusions can be drawn from table 2. First, when there are no natural disasters, rebels that derive funding from natural resources, particularly through extorting resource production or through both extortion and smuggling, are highly resilient. This is shown by the positive and statistically significant coefficients for natural resources, extortion, and both modes. This echoes the findings in the existing literature on conflict duration that access to resource wealth helps rebels (Fearon 2004; Ross 2004; Le Billon 2012). Specifically, stable revenues from resource extraction allow rebels to fund their operations, including purchasing arms and paying militants to continue fighting, without the need to rely on external actors. This also suggests that smuggling groups are less resilient than groups that extort resource production in normal times without disasters.

Second, while having access to natural resources increases rebel resilience in general, rebels relying on natural resources are vulnerable to severe natural disasters compared to rebels having no access to natural resources. This is indicated by the negative and statistically significant coefficients for the interaction terms between natural resources and the severity of disasters in Models 1 and 3. Figure 1a presents the marginal effects of relying on natural resources on rebel resilience conditional on the level of natural disaster severity based on Model 3.²⁰ As it shows, when the level

²⁰The calculation of the marginal effects in a logit model is not as straightforward as that in the linear model because in a nonlinear model the marginal effect (even without an interaction term) is conditional on other independent variables. Both the marginal effects and the standard errors are computed using the *margins* command in Stata (version 16). For details of interaction terms in nonlinear models, see Kam and Franzese (2007) and Ai and Norton (2003). Following Berry, Golder, and Milton (2012), we add information on the product terms (coefficients, standard errors, and *t*-ratio) and a histogram of the conditioning variable to show the distribution in the marginal effect figure. We also identify the range between the 25th percentile and the 75th percentile of the conditioning variable (indicated by the dashed line rectangle).

Table 2. Logistic regression analysis of natural resources, natural disasters, and rebel resilience

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
Severity of disasters	0.058 (0.052)	0.102 (0.109)	0.180 (0.020)	0.158** (0.070)
Natural resources	3.311** (1.409)		2.398* (1.231)	
Modes of exploitation				
Extortion		13.165*** (5.085)		13.527*** (3.357)
Both		7.150*** (2.246)		6.613*** (2.360)
Natural resources × severity of disasters	-0.271*** (0.087)		-0.225*** (0.062)	
Modes of exploitation				
Extortion × severity of disasters		-0.965*** (0.342)		-1.083*** (0.275)
Both × severity of disasters		-0.493*** (0.163)		-0.478*** (0.144)
Group age			0.113*** (0.027)	0.089*** (0.031)
Territorial control			0.905 (0.698)	1.014 (1.768)
ln(GDP)			-0.416*** (0.119)	-0.341* (0.202)
ln(Population)			0.531 (0.479)	0.590 (1.215)
ln(Military personnel)			-0.120 (0.534)	-0.412 (1.023)
X Polity			0.076 (0.183)	0.091 (0.206)
ln(Foreign aid)			-0.232 (0.187)	-0.650 (0.436)
Regional dummies	Yes	Yes	Yes	Yes
AIC	595.573	263.153	512.531	221.529
Number of observations	471	270	471	270

Notes: * $p < .1$; ** $p < .05$; *** $p < .01$ (two-tailed).

Robust standard errors, clustered by region, are in parentheses.

Regional dummies and a three-year moving average of frequency of disasters are included in all models.

of disaster severity is 0 or low, earning income from natural resources has a positive effect on rebel resilience, but this helpful effect decreases as the level of disaster severity increases. When the severity level is very high, having access to natural resources has a negative impact on rebel resilience. In other words, rebels deriving revenues from natural resources are in general highly resilient, but their reliance on the natural environment makes them vulnerable to severe disasters, and thus the probability of remaining resilient after severe disasters is lower. This finding supports our first hypothesis.

Third, when we disaggregate the resource variable into extortion, smuggling, and both modes, the results show a clear distinction between rebel groups smuggling natural resources and rebel groups extorting natural resources. In Models 2 and 4, the coefficient for the interaction term between extortion and the severity of disasters is negative and statistically significant, and so is that for the interaction term between both modes and the severity of disasters. This suggests that groups relying on extortion or groups relying on both modes of resource exploitation are more vulnerable to natural disasters than groups that smuggle natural resources. As shown in figure 1b, which presents the marginal effects of resource exploitation based on Model 4, rebels deriving revenues from only extortion (indicated by the solid line) are the most resilient among the three groups

when there are no or only minor disasters. When the level of disaster severity is high, however, extorting groups have a much lower probability to remain resilient than groups that smuggle. This mirrors the findings of Conrad et al. (2019) that smuggling renders rebels mobility and flexibility and thus makes them more capable of resisting government repression. Rebel groups that only rely on extorting natural resources, due to their low mobility and cohesive organizational structure, are the most likely to fail (i.e., being defeated by or seeking a ceasefire with the state) in the aftermath of severe natural disasters. These findings offer support to Hypotheses 2 and 3, and also corroborate the argument of Cunningham, Gleditsch, and Salehyan (2009) that fragmented rebel groups are “*too weak* to extract concessions or obtain negotiated settlements, yet *too secure* to easily be eradicated by governments” (Cunningham, Gleditsch, and Salehyan 2009, 575).

Our results show that severe natural disasters hurt rebel groups that derive funding from natural resources, especially through extortion, but how severe should natural disasters be to affect those groups? To understand the substantive effect, we calculate the severity of natural disasters that will have a harmful effect based on the estimated results. Specifically, natural disasters that cause around 980,000 casualties or more (including those killed, injured, homeless, and missing) will hurt rebel groups having access to

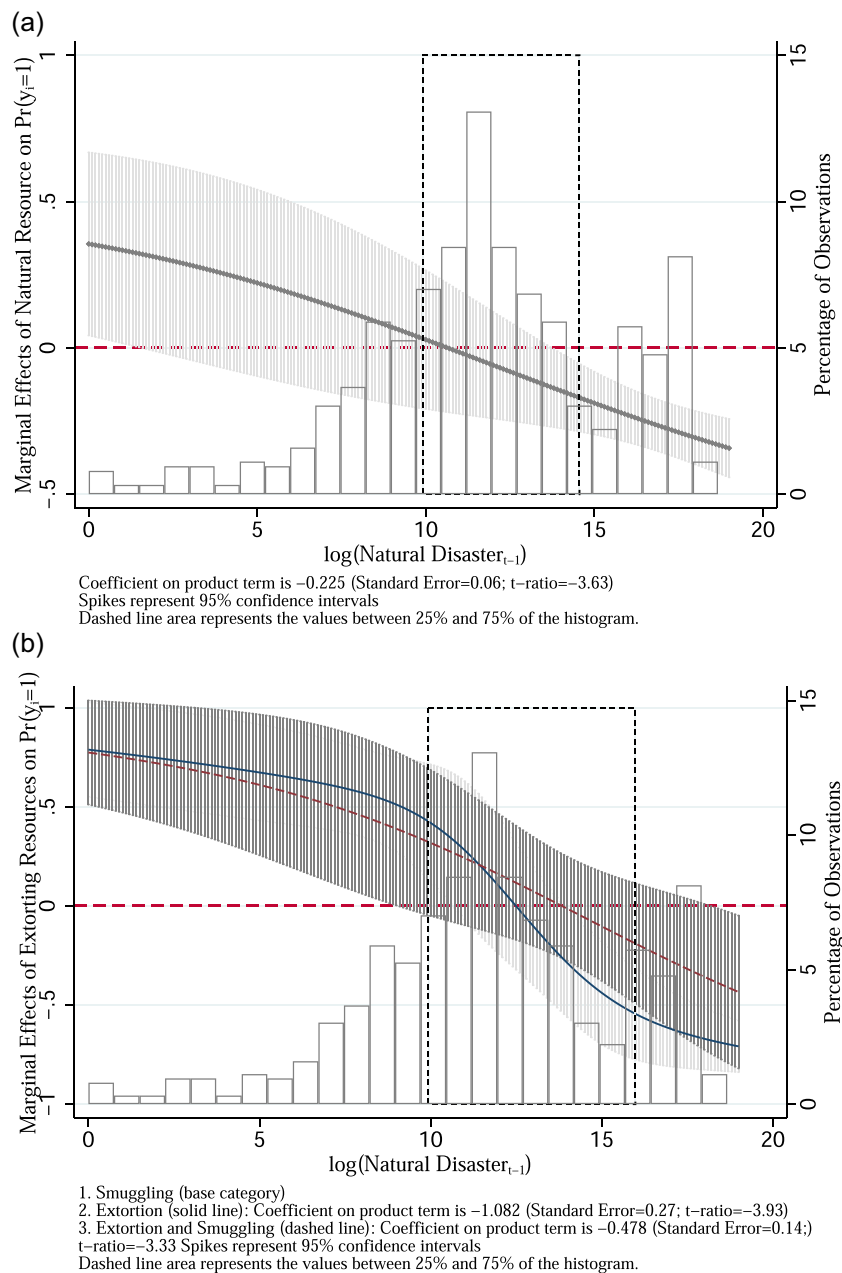


Figure 1. Marginal effects of natural resources and mode of resource extraction on rebel resilience. (a) ME(Natural Resource | Natural Disasters). (b) ME(Modes of Exploitation† | Natural Disasters).

Note. †Exploitation is a categorical variable equal to 1 for smuggling (base), 2 for extortion, and 3 for both smuggling and extortion.

natural resources.²¹ Moreover, natural disasters that cause around 1,200,000 casualties or more are likely to have a negative impact on rebel resilience for groups that extort resource production.²² Natural disasters that affected more than 1,200,000 people account for almost 38 percent of the sample, which indicates that disasters of this magnitude are not rare in the real world.

²¹Please note that the information for the disaster variable is summed up by dyad-year (and not by a single disaster) and thus the number indicates the total number of affected people in a country-year. The number is calculated at the 95 percent confidence level, and it will be 730,000 if we use the 90 percent confidence level.

²²At the 90 percent confidence level, the number is 890,000.

In addition to the main results, the findings for the control variables in [table 2](#) are worth discussing. First, GDP has a negative impact on rebel resilience. This is consistent with our expectation that wealthier countries are better at handling civil conflicts. Second, the rebel group's age is positively and statistically significantly related to the probability of rebel resilience. This means that the longer a group has existed, the more likely that the group can win or continue to fight. The average predicted probability while setting the other variables at the observed values that a rebel group wins or enters a peace settlement, or a conflict continues changes from 43 percentage point to 58 percentage point when the group's age increases from four years (the 25th percentile) to fifteen years (the 75th percentile) using

the result of Model 4. This finding mirrors the argument of Jordan (2009) that older groups have established robust organizational structures and thus are resilient to external shocks such as governmental repression.

In sum, the empirical findings largely support our three hypotheses. We find that rebel groups that obtain their funding from natural resources are more vulnerable to the impact of natural disasters. The mode of resource exploitation also matters. Rebels depending on extorting natural resource production are generally robust, but they are extremely susceptible to external shocks that would affect resource extraction such as severe disasters. On the contrary, rebel groups relying on smuggling resources are rather resilient to disasters due to their mobility and flexibility offered by this mode of resource exploitation.

Discussion and Conclusion

The existing literature provides mixed findings with respect to the relationship between natural disasters and conflicts. While one camp argues that resource scarcity generated by disasters leads to conflicts, the other contends that the same scarcity rather diminishes political turmoil. Our results show that the effect of natural disasters on rebel group behavior is conditional on both the availability of natural resources and the mode of resource exploitation. The depletion of resources by natural disasters may hasten the demise of rebel groups, although this effect is not homogeneous across all groups in the same country. We provide a more nuanced argument and theorize that the impact of natural disasters depends on how rebels acquire their funding as well as the ways in which they derive funding from natural resources. Stable access to natural resource wealth through extorting resource production helps rebels sustain themselves as long as the source of funding is available, but rebels using this strategy are particularly vulnerable to a sudden destruction of natural resources (e.g., such destruction as caused by severe rapid-onset natural disasters). On the contrary, rebels relying on ad-hoc exploitation strategies of natural resources such as smuggling are more resilient to external shocks because their higher levels of mobility and flexibility make them more capable of managing these opportunistic earnings and diversifying the risks.

Our analysis is not without limitations. One issue is the inclusion of multilevel variables in the model. Due to missing information and the fact that we focus on ongoing conflicts, our sample includes only thirty-six countries, and many state–rebel conflicts occur in the same countries, particularly India, the Philippines, and Colombia. Rebel groups in these countries may be influenced by common contextual factors or share similar features, which suggests that they are not necessarily independent (Steenbergen and Jones 2002). We deal with this issue by interacting group-level factors with country-level factors to account for the differences across groups in the same country and clustering the standard errors. As mentioned above, however, our analysis may not be able to differentiate between groups that are located in the disaster-affected area and those that are not. Future research thus needs to gather and analyze subnational level information to better address this issue.

Despite the limitation, our study has some merits. This article is one of the first studies to quantitatively identify the conditional effects of natural disasters on conflicts, and it provides at least two insights for academics and policymakers. First, our article offers a new finding to the resource curse literature. A number of previous works have indicated that access to natural resource wealth strengthens rebels and

helps prolong conflicts (Ross 2004; Lujala 2010). Based on the unique RCD database compiled by Walsh et al. (2018), we find that this robustness is conditional. Relying on stable resource exploitation strategies such as extorting puts rebels at risk when unexpected shocks occur, as their single and steady source of funding can be easily disrupted. Rebel groups that earn money from ad-hoc strategies of resource exploitation such as smuggling are more robust in the face of natural disasters. Therefore, governments that wish to combat rebel or terrorist groups should increase their efforts to track and smash these groups' smuggling networks.

Second, our findings contribute to the growing debate on the relationship between natural disasters and ongoing civil wars. We show that the relationship is conditional on the rebel groups' source of funding. Rebel groups that depend on local resources, especially on the exploitation of natural resource wealth, are more vulnerable to severe natural disasters. Due to climate change, we may witness more severe natural disasters in the future, which will pose a serious challenge to governments in terms of disaster preparedness and management. Countries that are more vulnerable to climate change are often those plagued with civil conflicts, poverty, and inequality. Thus, it is important to understand how natural disasters affect ongoing conflicts, which can help development agencies offer better solutions to countries trapped in low development and political violence. While some believe that these climate-induced disasters may catalyze violent behavior or be utilized by extremist groups to recruit followers (e.g., Lukas and Rüttinger 2016), our findings suggest that some existing armed groups may be knocked out by severe disasters. So, in the wake of disasters, governments not only need to focus on disaster relief, but can also take this as an opportunity to target the rebel groups that are weakened by disasters to seek a peaceful solution.

Supplementary Information

Supplementary information is available at the *International Studies Quarterly* data archive.

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