EXPORT CROPS AND CIVIL CONFLICT

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Abstract
Many experts see a move toward high-value export crops, such as fruits and vegetables, as an important opportunity for economic growth and poverty reduction, but little is known about the effects of export crops in fragile and conflict-affected countries. We exploit movements in world market prices combined with geographic variation in crop production to show that increases in the value of bananas, the country's biggest export crop, caused an increase in conflict violence and insurgent-controlled territory in the Philippines. This effect was concentrated in provinces where bananas are produced in large plantations with areas greater than 25 hectares. Our results are consistent with a mechanism in which insurgents fund their operations by extorting large agricultural export firms. (JEL: O13, Q17, H56, D74)

1. Introduction

Many governments and international experts see a move toward high-value export crops as an important opportunity for poverty reduction and economic growth, in part because these crops require higher labor input and generate higher profits per acre than staple crops (Humphrey 2005; Weinberger and Lumpkin 2005; World Bank 2008; Webber and Labaste 2010; World Bank 2011; Dudwick and Srinivasan 2013). To take advantage of this opportunity, many developing countries invest heavily in the production of nontraditional export crops like fruits and vegetables. The Least

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Developed Countries, for instance, have increased their horticultural exports by 250% in the ten years between 2001 and 2011. Donors and international agencies increasingly carry out value chain interventions to help poor countries acquire the infrastructure and local know-how needed to grow and export horticultural crops. Recently, some organizations have begun to extend value chain interventions to fragile and conflict-affected countries (Parker 2008; Grossmann et al. 2009; Dudwick and Srinivasan 2013).[1]

There is, however, only limited evidence on how a move toward export crops affects fragile and conflict-affected countries. Theoretically, it is possible that these countries are poised to particularly benefit from such a move. Export crops tend to be highly labor-intensive and generate substantial employment in rural areas, which is believed to reduce conflict by increasing the returns to peaceful economic activity (Dal Bo and Dal Bo 2011; Dube and Vargas 2013; Calí 2015). In addition, the tax revenue generated by export crops may reduce conflict by increasing the state's capacity to deal with security threats and provide law and order (Fearon and Laitin 2003). Based on this optimistic view, a recent World Bank study concludes that "promoting labor-intensive export sectors in fragile countries may help reduce conflict intensity and risk" (Calí 2015). In a similar vein, a recent discussion paper by the World Economic Forum states that "export-oriented agriculture ... is one of the most promising areas of activity in many fragile states" (World Economic Forum 2014).

Yet, it is also possible that a move toward export crops will increase conflict by creating opportunities for armed groups to fund themselves by extorting farmers and export firms. Of course, the surplus generated by any kind of economic activity might be a target for extortion and predation. However, some scholars have argued that predation incentives are particularly strong for export crops because they are usually marketed through highly concentrated value chains with a small number of "choke points" that can easily be held up by armed groups (Collier 2000). This hypothesis is supported by numerous cases of extortion of agricultural export firms by nonstate armed groups. For instance, rebel groups in Thailand, India, Indonesia, Sri Lanka, and Cote d'Ivoire have been accused of extorting plantations and exporters of rubber, tea, coffee, and cacao (Campbell 1982; Daly 2003; Soares 2007; Bhaumik 2009; Rediff 2009; Wijenayake 2013). The banana exporter Chiquita admitted to paying 1.7 million U.S. dollars for protection to terrorist paramilitary groups in Colombia between 1997 and 2004 (Appuzzo 2007). The same company is currently involved in a suit that alleges it also made payments to the leftist FARC rebels in an earlier period (Frankel 2018). The company Dole recently announced that it would shut down its banana plantations in the southern Philippines due to rising extortion demands and related rebel attacks (Jones 2016). The government of the Philippines sees extortion as a major threat to national security, arguing that extortion revenue allows rebels to fund their operations (Crismundo 2017; Ranada 2017). An extortion-fueled increase in conflict could have

1. For example, value chain interventions by USAID, GTZ, and the World Bank have operated in Afghanistan, Nepal, Somalia, South Sudan, and Uganda.

devastating effects on human welfare, which could more than offset the additional employment and profits created by export crop production.[2]

This paper estimates the effect of changes in the value of export crops on the intensity of civil conflict in the Philippines during the period 2001–2009. The focus of our analysis is on bananas of the Cavendish variety, which are the country's most important export crop in value terms. In addition, we report results for sugar, the country's most important traditional export crop. Our empirical strategy is based on a difference-in-differences approach that combines movements in world market prices with geographic variation in crop production, similar to the one used by Dube and Vargas (2013). Our measure of conflict intensity is based on data from incident reports produced by Philippine military units, which were used to inform military strategy and are an unusually reliable source of information on conflict in the country (Berman et al. 2011; Crost et al. 2014). Our results show that provinces with high per capita banana production at baseline experienced an increase in violent conflict in years with high world market banana prices, relative to provinces that produced few or no bananas. Robustness tests find no evidence that this result is due to nonparallel time trends between provinces with different levels of baseline banana production. We address the possible endogeneity of banana prices by instrumenting the world market banana price with rainfall in Ecuador, the world's leading banana exporter.

To learn about the mechanism through which export crops affect conflict, we explore heterogeneity with respect to farm size and market concentration. Using data on farm sizes from the Agricultural Census of the Philippines, we show that an increase in banana prices leads to a large increase in conflict in provinces where bananas are produced in large plantations with an area above 25 hectares. Conversely, the price of bananas does not significantly affect conflict in provinces where bananas are grown in smaller farms. We also estimate the effect of changes in the value of two other banana varieties, Lacatan and Saba, which are grown for domestic consumption in highly decentralized markets with many small farmers and traders. We find no statistical evidence that conflict is affected by changes in the value of these banana varieties, though our confidence intervals do not allow us to rule out sizable effects. We further find no evidence for a conflict-increasing effect of changes in the value rice, the country's most important staple food crop, which is also produced predominantly by small farmers and traded in decentralized domestic markets. These results are consistent with a mechanism in which rebel groups fund themselves by extorting large plantations and export companies, most likely because this is more cost-effective than extorting a large number of small farmers. This mechanism is supported by a large body of anecdotal evidence that Philippine rebels extort banana exporters (Vanzi 2003; Apuzzo 2007; GMA News 2009, 2011; MindaNews 2010; Lim 2012, 2014; Unson 2011, 2015). We also explore whether our results are driven by the effect of crop prices

2. The negative effects of conflict are well documented and considered to be one of the major impediments to poverty reduction (World Bank 2011). They include substantial reductions in economic growth (Abadie and Gardeazabal 2003; Lopez and Wodon 2005), education (Leon 2012), and health (Ghobarah et al. 2004; Camacho 2005; Akresh et al. 2012; Mansour and Rees 2012).

on wages and find little evidence for this explanation, though the statistical power of this analysis is limited. We find no statistical evidence that changes in the price of different crops affect wages differently, though the confidence intervals associated with our estimates are large.

Next, we explore whether baseline insurgent capacity plays a role in determining the effect of export crops on conflict. Theoretical models suggest that insurgent capacity has a nonmonotonic relationship with conflict intensity (Hirshleifer 1989; Skaperdas 1996; Kalyvas 2006). Models of contest–success functions, for instance, predict that conflict between two groups is most intense when the groups are evenly matched—a further increase in the capacity of an already dominant group will lead to a decrease in conflict intensity because the outmatched group has little chance of winning and withdraws from the contest (Hirshleifer 1989; Skaperdas 1996). If an increase in the value of export crops leads to an increase in insurgent capacity—perhaps because insurgents fund themselves by extorting export firms—we should expect it to exacerbate violence in areas where insurgent capacity was initially low, and to reduce violence in areas where insurgent capacity was initially high.

We explore this hypothesis using unique administrative data from intelligence assessments conducted by the Armed Forces of the Philippines in 2001, 2004, and 2008. This data contains a measure of local insurgent capacity—the fraction of villages in a province that are so firmly controlled by insurgents that they can openly carry arms and conduct recruitment operations in central parts of the village. As a first step, we provide direct evidence on the effect of crop values on insurgent capacity. Based on panel data from all three available rounds of the intelligence assessment, we find that an increase in the value of Cavendish bananas led to an increase in the number of villages controlled by insurgents. This finding has important implications. Previous studies argue that insurgent control can be detrimental to human welfare even in the absence of violence, by eroding the rule of law and depressing investment (Kalyvas 2006; Fearon 2008; Berman et al. 2012). Our results show that an increase in export crop value can lead to an increase in the capacity of an already entrenched insurgent group, thereby weakening the ability of the state to control its own territory.

We further analyze how the effect of crop values on conflict depends on baseline insurgent control in 2001, at the beginning of our period of observation. We find that the violence-increasing effects of crop values are concentrated in provinces with low baseline insurgent control. By contrast, in areas with initially high insurgent control, an increase in crop values leads to a decrease in conflict violence. This result is consistent with the hypothesis that insurgents gain capacity by extorting agricultural exporters, and that insurgent capacity has a nonmonotonic relationship with conflict intensity, perhaps because strong insurgent groups can establish local monopolies of violence that the government can no longer contest. Although such a nonmonotonic relationship is predicted by several influential models of conflict (e.g., Hirshleifer 1989; Skaperdas 1996; Kalyvas 2006), our study is among the first to test this prediction with quantitative empirical evidence.

Our study contributes to the literature on commodity markets and civil conflict. Previous studies have found mixed evidence on the relationship between commodity values and conflict. Brückner and Ciccone (2010) found that increases in the value of export commodities increase the incidence of civil conflict across countries, but Besley and Persson (2008) found the opposite effect and Deaton and Miller (1995) found no effect. The mixed evidence from these cross-country studies has led to calls for studies that disentangle the effects of different types of commodities, as well as for microlevel studies based on within-country analyses (Blattman and Miguel 2010; Bazzi and Blattman 2014). In a comprehensive cross-country analysis, Bazzi and Blattman (2014) specifically estimate the effect of increases in the value of agricultural exports. They find no evidence that higher crop values affect the incidence and onset of civil conflict, but some evidence that they make existing conflicts more likely to end. Dube and Vargas (2013) find that increases in the price of an agricultural commodity (coffee) led to decreases in conflict in the coffee-producing regions of Colombia, whereas an increase in the price of a mineral commodity (oil) led to an increase in conflict in oil-producing regions. Consistent with this evidence, Berman and Couttenier (2015) found that increased world market demand for an agricultural commodity led to a decrease in conflict in regions that produce the commodity. Similarly, Dube et al. (2016) found that a decrease in the price of maize led to an increase in drug cultivation and drug related violence in Mexico.

In contrast to this recent literature, our study finds that an increase in the value of bananas exacerbates conflict. This constitutes novel evidence that the conflict-reducing effect of agricultural commodities is not universal—an increase in the price of a legal agricultural export can exacerbate conflict.[3] As a further contribution, our work points to a specific mechanism through which agricultural exports can increase conflict and identifies conditions under which they are likely to do so. This mechanism, extortion of plantations operated by large agricultural export firms, suggests a possible explanation for why our results differ from those of previous studies of agricultural commodity prices and conflict. For instance, the difference between our results and those of Dube and Vargas (2013) could be due to the fact that banana production is highly centralized in a small number of large plantations, whereas coffee production is relatively decentralized with many small farmers. The transaction costs of extortion are therefore likely to be higher for coffee, since it is more costly to extort thousands of small farmers than a few large plantation owners, making coffee a less lucrative source of revenue for rebel groups.

Our study is also relevant to the literature on climate shocks and conflict. Previous work has found that rainfall and temperature shocks can exacerbate civil conflict (e.g., Miguel et al. 2004; Miguel and Satyanath 2011; Hsiang et al. 2013; Couttenier and Soubeyran 2014). Several recent studies have found evidence that this effect is

3. Previous work by Arezki and Brueckner (2014) found a link between increases in the price of a country's food exports and decreases in the quality of political institutions, but did not explore civil conflict specifically. Also relevant to our work, Angrist and Kugler (2008) found that increases in the value of an illegal agricultural export, coca, led to increased conflict.

particularly pronounced for agriculturally relevant climate shocks, such as rainfall during the growing season (Harari and La Ferrara 2018; Crost et al. 2018). Our results raise the possibility that the effect of agricultural production shocks on conflict could depend on the type of agricultural commodity and the production system in which it is produced.

Finally, our study is related to the large body of evidence suggesting that extraction of mineral commodities can increase civil conflict (see Berman et al. 2017; Crost and Felter 2018, for recent examples). Particularly relevant to our study, Sánchez de la Sierra (2015) finds that an increase in the value of conflict minerals in the Democratic Republic of Congo allowed rebel groups to establish local monopolies of violence. Our results suggest that such a "resource curse" effect may not be unique to minerals but could also exist for other commodities that are produced in concentrated and easily extortable production systems.

Our results have important implications for agricultural development policies in fragile and conflict-affected countries. They suggest that a move toward export crops can have the unintended consequence of strengthening insurgent groups and exacerbating civil conflict. They further shed light on the conditions under which this is likely to occur—when export crops are produced in large, easily extorted plantations, in regions with an existing rebel presence. This knowledge may be useful for policy-makers trying to capture the potentially large economic benefits of export crop production while avoiding unintended side effects on civil conflict.

2. Background

2.1. Banana Production in the Philippines

Global agricultural trade has rapidly expanded over the past few decades. According to the UN Food and Agricultural Organization, the total value of agricultural exports has more than tripled from 400 billion to 1.3 trillion US dollars between 2001 and 2011. A substantial component of this growth is due to increased exports of horticultural goods (i.e., fruits and vegetables), which have grown from 69 billion to 204 billion US dollars in the same time period. This rapid growth in agricultural exports includes some of the poorest countries in the world. For instance, between 2001 and 2011, the value of agricultural exports from the Least Developed Countries approximately tripled from 4 to 12 billion US dollars, whereas the value of horticultural exports more than quadrupled from 690 million to 3.5 billion US dollars.

Bananas are one of the most important horticultural exports from developing countries. Between 2001 and 2011, total banana exports increased from 14 to 19 million metric tons; their value increased from 4 to 9 billion US dollars. The biggest exporter is Ecuador, which produced approximately 33% of the world's total banana exports in 2011. The Philippines are the world's fourth largest banana exporter, responsible for approximately 11% of banana exports (based on data from 2011). Virtually all exported bananas are of the Cavendish variety, which has been selected for its capacity to be shipped over long distances without bruising. The entire export process, from harvest to arrival at the final destination, should take no longer than about three weeks so that the fruits do not become overripe.

The basic characteristics of the banana supply chain are similar across the major exporting countries. The fruits are cut from the plant in large bunches while still green and transported to processing plants located on the plantation, usually by truck or cable-way. The bunches are cut into smaller "hands", that are washed and treated with fungicide. They are then sorted, packed into cardboard boxes and taken by truck to a port, where they are shipped in refrigerated containers to their destination. To ensure compliance with phytosanitary regulations in importing countries and to avoid hold-up problems, supply chains are highly vertically integrated and often controlled entirely by a multinational export firm. Traditionally, production itself was controlled by export firms who owned large banana plantations. Recently, however, many exporters have moved towards contract-farming arrangements, in which production is in the hand of independent farmers who are provided credit, inputs and technical training and deliver the fruits to a processing plant owned by the exporter.

Bananas are the most important export crop in the Philippines. In 2011, the value of the country's banana exports was 470 million US dollars, making up approximately 10% of the total value of the country's agricultural exports. Production in the Philippines more than doubled between 2000 and 2013, expanding from 1.6 to 3.3 million metric tons. The export market is highly concentrated and dominated by a small number of multinational export firms, including Dole, Chiquita, and the Japanese multinational Sumitomo. As in other countries, virtually all of the bananas grown for export are of the Cavendish variety (and virtually all Cavendish bananas are grown for export). Cavendish bananas are usually grown in plantation style arrangements, where bananas grown on large tracts of land are processed in a small number of processing plants. Some of the plantations are owned by multinational corporations and large landowners, though in many of them, the land has been redistributed to farmers through a process of land reform that began in 1987. Still, even in cases where the land is owned by farmers, the processing is usually controlled by the export company. Figure 4 shows the geographic distribution of Cavendish bananas across the country. The figure shows that production mostly takes place in Mindanao and the Visayas.[4]

In addition to the export market, the Philippines also produce bananas for a vibrant domestic market. The most important varieties for the domestic market are Lacatan, which is consumed raw as a "dessert" banana, and Saba, which is consumed as a cooking banana and plays an important role in many traditional dishes. The domestic market is made up of a large number of small growers and traders. In some cases,

4. Informal interviews with people familiar with the banana industry in the Philippines suggest that this geographic pattern is to a large extent explained by variation in the exposure to Typhoons. Cavendish plantations and processing plants are large long-term investments that can sustain substantial damage if hit by a typhoon. The historical incidence of typhoons is lowest in Mindanao and highest in Luzon, and banana firms take this into account for their investment decisions.

small growers sell directly to consumers in local markets. In other cases, they sell to small and medium sized traders who supply wholesale markets and supermarkets in the cities. Figure 4 shows that production of these other banana varieties is more widely spread across the country, with major centers of production in all the major island groups.

Cane sugar is another important export crop from developing countries. Estimated at over 20 billion US dollars in 2011, the total value of worldwide sugar exports is substantially larger than that of bananas, though this figure includes beet sugar, which is mostly produced in wealthier countries. Importantly, the export chain of cane sugar has some similarities with that of bananas. For example, it is also subject to time constraints, since the raw sugar cane has to be processed quickly after cutting in order to minimize deterioration and loss of sucrose content (Larrahondo et al. 2006). As a result, growing operations are often geographically concentrated in the vicinity of a sugar mill.

Sugar is the most important "traditional" export crop of the Philippines, with a long history that dates back to Spanish colonial rule. After a decline in the late 1990s and early 2000s, sugar exports have experienced a resurgence—in 2011 their value was just over 350 million US dollars, approximately 7.5% of the country's total agricultural exports. As in the case of Cavendish bananas, sugar production in the country has been concentrated in plantation-style arrangements, usually owned by large landowners. The sugar processing industry is also highly concentrated, with fewer than 30 sugar mills currently operating in the country (Sugar Regulatory Authority 2016).

Due to their highly concentrated nature, export chains for banana and sugar lend themselves to predation by armed groups (Collier 2000). Consequently, there is substantial anecdotal evidence that armed groups in the Philippines and other countries fund themselves by extorting banana and sugar export firms (Vanzi 2003; Apuzzo 2007; GMA News 2009, 2011; MindaNews 2010; Unson 2011, 2015; Lim 2012, 2014). The following section describes the country's major armed groups and their main funding sources.

2.2. Civil Conflict in the Philippines

The Philippines are the site of several long-running conflicts between the country's government and different armed groups. The most geographically widespread conflict is with the New People's Army (NPA), a Maoist guerrilla group that serves as the armed wing of the Communist Party of the Philippines. During the period of observation, 2001–2009, the NPA was active in 68 out of the 78 provinces of the Philippines. The group is organized in a relatively decentralized way. In 2001, it was structured in approximately 100 independent guerrilla fronts, each operating in a distinct territory. The NPA carries out small-scale attacks on army outposts and police stations in order to further its professed goal of overthrowing the government and replacing it with a communist system. The groups is known to fund their operations by collecting "revolutionary taxes" from a variety of businesses, including banana exporters, under the threat of destroying processing plants or burning banana trees.

Another long-running conflict involves the Moro-Islamic Liberation Front (MILF), an ethnic-separatist group seeking an independent state for the Muslim minority in the island of Mindanao. The MILF split from the Moro-National Liberation Front (MNLF) in 1976, after that group entered a peace agreement with the government that led to the establishment of the Autonomous Region in Muslim Mindanao (ARMM). During our period of observation, the MILF was involved in several high-profile clashes with the Armed Forces of the Philippines, including the beheading of 11 Philippine Marines in Basilan in 2007. The MILF reportedly receives funding from Muslim countries, such as Saudi Arabia and Iran, as well as remittances from Muslim Filipino expatriates. It has, however, also been linked to extortion activities, including extortion-related attacks on banana plantations (GMA News 2009; Unson 2011).

A third conflict is with the Abu-Sayyaf group, an Islamist terrorist group that has pledged allegiance to the Islamic State. This group operates in a relatively small geographic area that covers the Sulu archipelago in the far southwest of the Philippines and reaches into neighboring Malaysia. The group's most high-profile attack was the bombing of a large ferry in 2004 that led to the deaths of 116 people. To generate revenue, the group has carried out a number of kidnappings for ransom and is allegedly involved in smuggling operations across the South China Sea.

Finally, there is conflict between the government and so-called "Lawless Elements"—loosely organized armed groups that are sometimes led by renegade commanders of the NPA or MILF. These groups have more diffuse political goals and have been linked to criminal activities, such as kidnapping for ransom, drug trafficking, and extortion. They have also been linked to extortion-related attacks on banana plantations (Mindanao Examiner 2014).

3. Mechanisms: Bananas and Civil Conflict in the Philippines

Anecdotal evidence suggests that Philippine rebel groups fund their operations by extorting a variety of businesses, including telecommunications providers, mining firms, and agricultural exporters. For instance, the New People's Army is well-known for raising "revolutionary taxes" on businesses under the threat of destroying their equipment and disrupting their operations. The government of the Philippines estimates that the group collects over 28 million U.S. dollars per year in extortion payments from mining and agricultural companies in the Mindanao region alone (Colina 2018).

Firms that refuse to make extortion payments are at risk of being attacked by rebels. There are numerous media reports of NPA attacks on sugar mills, banana plantations, and processing plants (Vanzi 2003; MindaNews 2010; GMA News 2011; Lim 2012, 2014; Unson 2015). Many of these reports cite failure to comply with extortion demands as the main motivation for the attack.[5] Extortion of banana companies has

5. For example, after the NPA attacked a banana plantation in Southern Mindanao, the spokesperson of the Armed Forces of the Philippines stated that "economic sabotage was the sole intent of the attacks

recently received renewed media attention after Dole Philippines announced the closure of its banana plantations in Mindanao due to the rising risk of extortion-related attacks (Jones 2016).

The government sees extortion as a major threat to national security, since rebels use extortion revenue to fund their operations. To stem financial flows to rebel groups, the government recently launched a campaign that urged businesses not to submit to extortion attempts. As part of this campaign, the commanders of the Armed Forces of the Philippines and Philippine National Police released a joint statement declaring that "giving financial aid to the rebels will give them more strength and this must be stopped" (Crismundo 2017). In addition, President Duterte gave several speeches threatening to bring charges of money laundering against companies that make extortion payments (Ranada 2017).[6]

To synthesize this anecdotal evidence, we posit the following stylized mechanism for how an increase in banana prices exacerbates conflict through an extortion channel. Initially, a higher world market price increases the returns that banana exporters receive from functioning banana plantations and processing plants. This leads rebels to increase their extortion demands, since they know the firm now has a higher willingness to pay to avoid an attack that disrupts its operations. The firm can either agree to the rebels' demands or refuse to pay and try to defend itself, perhaps with the help of government forces. Either choice can lead to an increase in conflict. If the firm pays, rebels can use the revenue to purchase arms or pay fighters that carry out attacks on other targets, not necessarily related to banana plantations. If the firm does not pay, rebels may launch punitive attacks to back up the credibility of their extortion threat.

We thus posit two channels through which the extortion mechanism can increase conflict, a direct one and an indirect one. The direct extortion channel (increased attacks against firms that do not pay), has been referred to in the literature as the predation, rapacity, or greed mechanism (Collier and Hoeffler 2004; Berman et al. 2012; Dube and Vargas 2013). In this mechanism, rising commodity values lead to an increase in the value of contested resources. The conflicting parties therefore have an increased incentive to win the contest over control of the resources, which leads to increased investment in conflict-related activities (Dal Bo and Dal Bo 2011; Berman et al. 2012). In the case of extortion in the Philippines, this increased contest over resources manifests itself either as rebel attacks on firms that resist extortion demands, or as preemptive attacks by government forces that aim to weaken rebels' ability to make credible extortion threats.

as the company reportedly refused to pay the so-called revolutionary tax to the rebels" (Lim 2012). An experienced military field commander recounted an incident that occurred in his area of operations in the late 2000s: "There was a banana planter who refused to pay the revolutionary tax. The NPA sent extortion letters repeatedly. When he still did not pay up the rebels razed the banana plantation to the ground. "This same commander recalled a response by a surrendering NPA rebel: "It is easy to extort from the banana planters—just a simple threat from us to burn their plantations and they would all pay" (interview with Armed Forces of the Philippines field commander April 24, 2016.

6. As a result, firms are unwilling to admit to making extortion payments, so that direct data on them is unavailable.

In the indirect extortion channel, rising commodity values lead to an increase in extortion revenue, which strengthens the capacity of rebel forces. Several influential theoretical studies contend that financing constraints play an important role in the activity of nonstate armed groups De Mesquita (2005) and Shapiro and Siegel (2007). Recent work by Limodio (2018) has found empirical support for this hypothesis by showing that an increase in donations to Islamist organizations led to an increase in terrorist attacks in Pakistan.

It should, however, be noted that a funding-related increase in rebel capacity will not necessarily lead to an increase in violence. Theoretical models of conflict, particularly those based on contest–success functions, predict a hump-shaped relationship between the relative capacity of two conflicting groups and the amount of violence (Hirshleifer 1989; Skaperdas 1996; Kalyvas 2006). Consider, for example, a contest between the government of a state and a rebel group for control of a valuable prize.[7] If the prize is located in a region where the government has much higher capacity than the insurgents, there will be little violence because insurgents are unable to challenge government control of the prize. Similarly, if the prize is in a region where insurgent capacity is much higher, there will also be little violence because the government cannot challenge insurgents, who can effectively impose a local monopoly of violence. Violence will thus be highest in regions where government and insurgents are evenly matched, where both groups believe that they have a sufficiently high probability of winning the contest. The effect of an increase in insurgent capacity therefore depends on the initial level of capacity.

This argument is graphically presented in the diagram in Figure 1. In a region where insurgent capacity is initially low, such as at point A, an increase in their capacity will exacerbate conflict violence. However, at point B, where insurgent capacity is already high, a further increase will reduce violence because the state is less able to challenge insurgents' monopoly of violence. By the same logic, a decrease in insurgent capacity can lead to an increase in violence if it occurs in a region with high initial insurgent capacity, such as point B. The diagram clarifies the challenge inferring changes in insurgent capacity from data on conflict violence alone. A decrease in violence could result from a decrease in insurgent capacity in a region where it was initially low (point A to A$'$) or from increased insurgent capacity in a region where it was initially high (point B to B$'$). Data on insurgent capacity allows us to distinguish between these two cases. The indirect predation channel predicts that an increase in commodity values will lead to an increase in insurgent capacity, an increase in violence in regions with low baseline insurgent capacity, and a decrease in violence in regions with high baseline insurgent capacity—a prediction that is difficult to reconcile with either a direct predation or an opportunity cost effect. We test these predictions in Section 5.3 of the paper, using data on insurgents' control of villages as a proxy for their local capacity.

7. This prize could be a resource with direct material value to the groups such as a mine, or a political outcome such as the ability to determine labor policies or to adjudicate land disputes in a region.

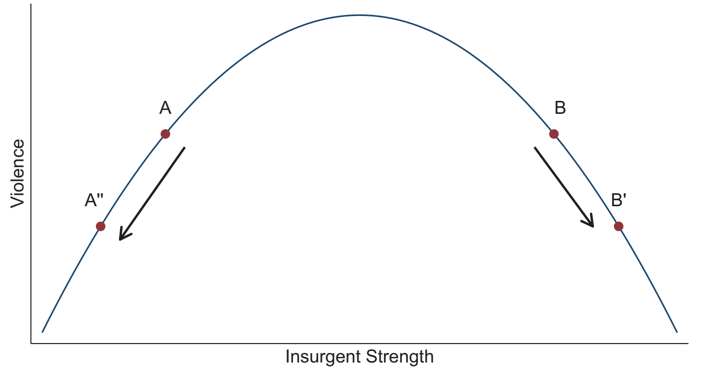

FIGURE 1. Insurgent strength and conflict violence: Predictions from contest–success models. The figure shows the stylized relationship between insurgent capacity (relative to government) and conflict violence predicted by models of contest–success functions. The hump-shaped relationship implies that an observed decrease in violence can either be due to an decrease insurgent capacity from a low-capacity starting point (point A), or an increase in insurgent capacity from a high-capacity starting point (point B).

4. Data and Summary Statistics

Data on conflict violence was compiled from unclassified portions of incident reports submitted by Philippine military units operating in the field during the period 2001–2009. This data source was previously used by Felter (2005), Berman et al. (2011), and Crost et al. (2014, 2016, 2018) to study the determinants of conflict in the Philippines. The data includes information on the groups involved in an incident, the initiating party, as well as the number of combatant and civilian casualties. Although it is possible that military units had incentives to misreport incidents, the fact that the reports were not intended for public release and were used by the armed forces to plan their own operations makes them an unusually reliable source of information on conflict events.[8] The outcome of interest for this study is the number of violent incidents, defined as incidents resulting in at least one casualty, in a given province and year. This outcome is a relatively low-noise measure of conflict intensity, and was previously used by Crost et al. (2018) to study the effect of seasonal rainfall on conflict in the Philippines.

We also analyze a measure of territorial control by the New People's Army, the country's most geographically widespread insurgent group, which we use as a proxy for the group's local capacity. Data on this measure was compiled from intelligence assessments conducted by the Armed Forces of the Philippines in support of their

8. Furthermore, misreporting is not unique to data from armed forces. Most studies of conflict rely on reports from newspapers or humanitarian agencies, which also have incentives for selective reporting and may have limited access to on-the-ground information.

campaign planning in 2001, 2004, and 2008.[9] For these reports, military field operatives identified villages with insurgent activities and assigned them to three categories based on the level of influence insurgents wielded.[10] Data derived from intelligence assessments of this type have been used by Crost et al. (2016) to study the effect of conditional cash transfers on insurgent influence in the Philippines.

For our measure of territorial control, we calculate the fraction of villages in a province that were assigned the highest category of insurgent influence. This category includes villages "characterized by a permanent rebel presence in the village, with rebels at times observed carrying arms openly and in some cases conducting military training among their members" (Crost et al. 2016). We believe that this measure is a good proxy for the NPA's local capacity, since only a locally dominant armed group would be able to carry arms and conduct training openly without interference by the armed forces. For our analysis, we divide provinces into three categories of insurgent capacity. Low NPA capacity provinces are defined as those that have no villages in the highest influence category. The remaining provinces are further divided into medium and high NPA capacity, depending on whether the fraction of villages in the highest influence category was above or below the median of this subsample.[11]

Data on agricultural production come from the Philippine Bureau of Agricultural Statistics and is available through the CountryStat database.[12] Data on banana production by farm size come from the Agricultural Census of the Philippines from the year 1991. The census reports the number of productive banana trees in farms of different sizes. We use this data in a heterogeneity analysis to calculate the fraction of banana trees in large plantations, which we define as farms larger than 25 hectares, the highest size category reported by the Census.

Our analysis also controls for province level rainfall and temperature during the wet and dry season, as well as for an indicator that takes the value 1 if the province was hit by a major typhoon. The rainfall and temperature variables were derived from the Tropical Rainfall Measuring Mission's gridded global dataset and previously used by Crost et al. (2018). We also use this dataset to calculate the annual average rainfall in the banana producing provinces of Ecuador, which we use to instrument for the world market price of Cavendish bananas. Data on typhoons come from the EM-DAT database on natural disasters maintained by the Catholic University Leuven. Data on world market prices come from the World Bank's Commodity Price Data (the "Pink Sheet"). Prices are adjusted for inflation and reported in 2010 US dollars. Data on province population comes from the 2000 Census of the Philippines.

9. This intelligence assessment only collected information on the New People's Army, so we do not have access to data on the influence of other armed groups.

10. See Felter (2005) for a detailed description of how the NPA exerts influence and indicators of this influence at the village level.

11. The median province with a nonzero number of villages in the highest influence category has 2.1% of villages in this category.

12. http://countrystat.bas.gov.ph/. This website was last accessed in February of 2015.

TABLE 1. Summary statistics.

	Cavendish producing province	
	Yes	No
Cavendish production (kg per capita)	9.36	0
	(27.22)	
Lacatan production	21.0	8.9
	(26.0)	(31.1)
Saba production	53.8	36.1
	(52.8)	(66.0)
Sugarcane production	219.4	166.6
	(522.4)	(696.8)
Rice production	236.1	242.1
	(152.2)	(196.6)
Violent incidents	8.7	6.1
	(10.1)	(7.9)
Incidents with at least one government casualty	4.7	3.3
	(5.9)	(5.0)
Incidents with at least one insurgent casualty	2.6	1.9
	(3.8)	(3.0)
Incidents with at least one civilian casualty	2.4	1.7
	(3.4)	(2.6)
Government-initiated violent incidents	3.1	2.6
	(4.3)	(4.0)
Insurgent-initiated violent incidents	5.6	3.5
	(7.0)	(4.7)
Violent incidents involving the NPA	4.2	3.8
	(5.5)	(5.7)
Violent incidents involving the MILF	1.6	0.3
	(5.7)	(1.6)
Violent incidents involving the ASG	0.15	0.62
	(0.67)	(3.7)
Violent incidents involving LE	2.4	1.2
	(5.1)	(2.5)
Casualties	20.9	13.7
	(31.3)	(28.8)
No. of provinces	29	48
No. of observations	259	432

Notes: The unit of observation is the province-year.

Table 1 presents summary statistics. There are 29 Cavendish producing provinces in the country, with an average per capita production of 8.7 kg in 2002. Cavendish-producing provinces experience slightly higher levels of conflict violence than provinces that do not produce the crop. The table also shows the relatively low intensity of conflict in the Philippines, with an average of 8.7 violent incidents per year in Cavendish-producing provinces and 6.1 in the other provinces. The majority of incidents are initiated by insurgents, though the government also initiates a sizable fraction. The majority of incidents involve the New People's Army, followed by

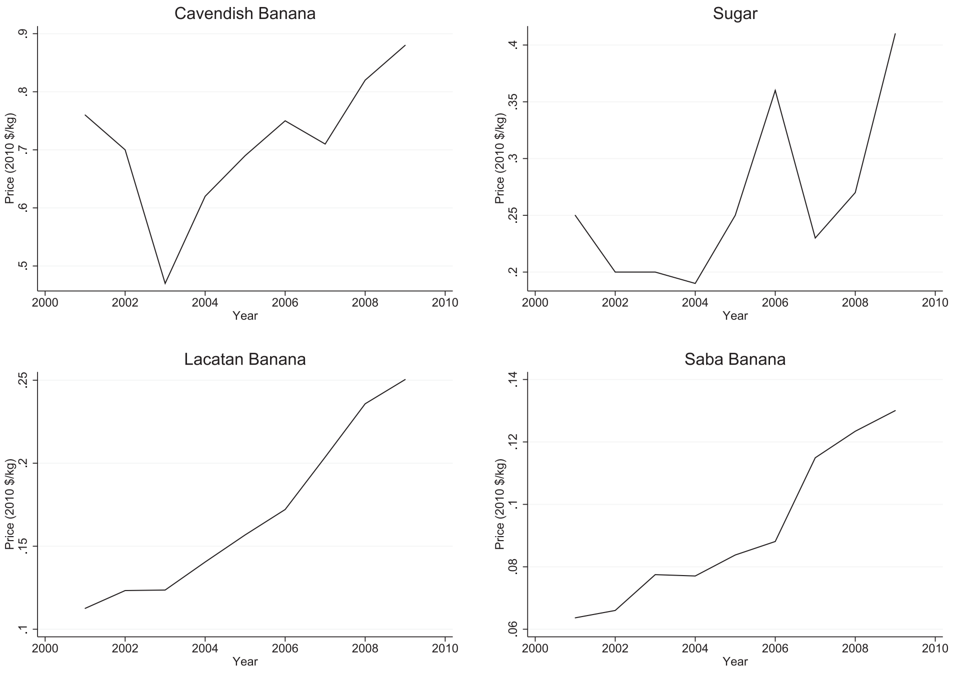

FIGURE 2. Commodity prices, 2001–2009. The figure shows average annual crop prices for the period 2001–2009. For Cavendish bananas and sugar, we report world market prices from the World Bank's Commodity Price Data (the "Pink Sheet"). For Lacatan and Saba, we report domestic prices from the Philippine Bureau of Agricultural Statistics. All prices are converted to 2010 US dollars.

Lawless Elements and the Moro-Islamic Liberation Front. The Abu-Sayyaf Group is only involved in a very small fraction of incidents.

Figure 2 shows the time trends of banana and sugar prices during the period of observation. The price of Cavendish bananas exhibits a markedly nonlinear pattern, initially decreasing between 2001 and 2003 and then mostly increasing from 2003 to 2009, with a small dip in 2007. These sharp nonlinear price movements are fortuitous for our research design, since they allow us to identify the effect of changes in Cavendish values while controlling for unobserved variables that follow different linear trends in Cavendish-producing and nonproducing provinces. The price of sugar also exhibits sharp swings, beginning with a small decrease between 2002 and 2004, followed by a spike in 2006, a sharp dip in 2007 and a second spike in 2009. These price movements lend themselves somewhat less well to identification since they consist mostly of an upward trend, with the exception of the spike-dip pattern in 2006 and 2007. The price movements of domestically consumed bananas are even less well suited for identification, since they are difficult to distinguish from an upward trend. Given these limitations, the main focus of this paper will be on Cavendish bananas, with additional results for sugar and other bananas reported only as additional suggestive evidence.

5. Results

5.1. Baseline Results

Our empirical strategy follows a difference-in-differences approach based on movements in world market prices combined with province-level variation in crop production. It is similar to that of Dube and Vargas (2013), who studied the effect of the value of oil and coffee production on conflict in Colombia. Specifically, we estimate the following regression as our main specification:

$$Y_{it} = \beta_0 + \beta_1 Cavendish_i \times Price_t + \alpha_i + \lambda_t + \varepsilon_{it}. \quad (1)$$

In this equation, $Cavendish_i$ denotes province i's per capita production of Cavendish bananas in 2002, the first year for which data on this variable is available.[13] $Price_t$ denotes the natural logarithm of the crop's world market price in year t. We also include province and year fixed effects (α_i and λ_t). Observations are weighted by province population in 2000 and standard errors are clustered at the province level.

The coefficient β_1 is identified by comparing the relationship between the world market price of a crop and the number of conflict incidents between provinces with high versus low production of the crop. A positive value of β_1 implies that an increase in the world market price is associated with a relative increase in conflict in provinces that produce higher quantities of the crop. This coefficient can be interpreted as the causal effect of an increase in crop values under the assumption that provinces with different levels of crop production were on parallel trends with respect to unobserved determinants of conflict. To test this assumption, we conduct a placebo test that introduces the "lead" of the interaction term, that is, $Cavendish_i \times Price_{t+1}$ into equation (1). If our results were driven by nonparallel time trends, we would expect the lead coefficient to be significantly different from zero. We show in what follows that the lead coefficient is small in magnitude and not statistically significant, which increases our confidence that provinces with different average levels of crop production were on parallel time-trends.

Table 2 reports the results of our baseline specification in equation (1). It shows that an increase in the world market price of Cavendish bananas leads to a relative increase in the number of conflict incidents in provinces with a higher average level of Cavendish banana production. The estimates are statistically significant at the 5% level and robust to inclusion of province-specific linear time trends. Our preferred specification in column (2) estimates that a province with 1 kg per capita production of Cavendish bananas at baseline experienced approximately 0.016 additional violent incidents as a result of a 10% increase in the world market price, relative to a province that does not produce Cavendish bananas. This estimate implies that the fluctuations

13. Before 2002, the Philippines Department of Agriculture did not disaggregate banana production data by variety. We are therefore unable to use Cavendish production before the start of the period of observation as a measure of baseline crop production. In Appendix Tables A1 through A9, we present evidence that our estimates are robust to excluding observations before 2003 from our analysis.

TABLE 2. The value of banana production and civil conflict.

	Dependent variable Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish prod. (kg per cap.) × Log Price	0.15**	0.16**	0.17***	0.19***
	(0.066)	(0.067)	(0.035)	(0.037)
Cavendish prod. × Lead of Log Price			–0.026	–0.053
			(0.058)	(0.061)
Mean of dependent variable	7.12	7.12	7.12	7.12
Control variables	No	Yes	No	Yes
No. of provinces	77	77	77	77
No. of observations	691	691	691	691

Notes: Control variables are rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

in Cavendish prices during the period of observation are responsible for a substantial increase in violent incidents. For example, between 2003 and 2009 Cavendish prices increased by approximately 87%. According to our estimates this price increase led to 1.21 additional violent incidents per year in the average Cavendish-producing province with a baseline production of 8.7 kg per capita. ($0.16 \times 8.7 \times 0.87 = 1.21$). There were 29 Cavendish producing provinces in the Philippines during our period of observation, so that this effect corresponds to approximately 35 additional violent incidents per year in the country as a whole.[14]

A first set of robustness tests in columns (3) and (4) of Table 2 shows that the future value of the world market price is not associated with an increase in conflict in Cavendish-producing provinces. This result increases our confidence that provinces with different average levels of Cavendish production were on parallel time trends with respect to unobserved variables, so that our estimates reflect the causal effect of an increase in crop values.

Next, we explore how the difference in conflict between provinces with high/low Cavendish production evolves over time by estimating the following regression:

$$Y_{it} = \beta_0 + \sum_{j=2001, j\neq 2004}^{2009} \theta_j Cavendish_i \times \mathbb{1}(Year_t = j) + \alpha_i + \lambda_t + \varepsilon_{it}. \quad (2)$$

The coefficient θ_j captures the slope of the relationship between a province's baseline Cavendish production and conflict in year j, relative to the omitted year 2004. If conflict in Cavendish producing regions is driven by changing prices, the time-profile

14. The magnitudes of our estimates are similar to those found by Dube and Vargas (2013) for the case of coffee in Colombia. That study find that the sharp drop in coffee prices during the coffee crisis of 1997–2003 (a price decrease of approximately 65%) led to an excess of approximately 48 guerrilla attacks and 10 paramilitary attacks per year in the coffee-producing regions of Colombia. The study further finds that the effect of oil prices on violence in oil-producing regions is substantially smaller.

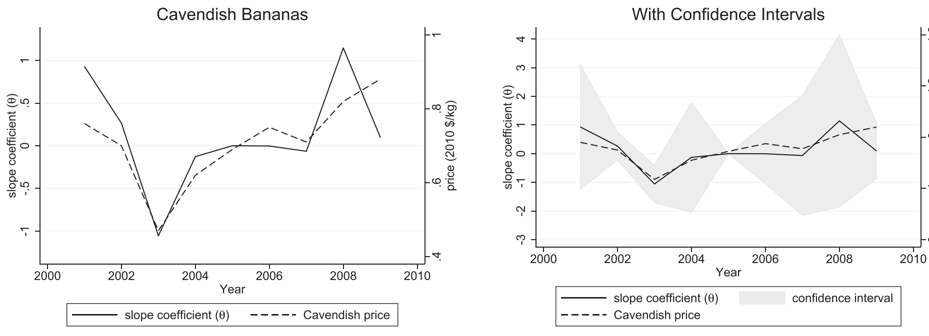

FIGURE 3. Cavendish prices and conflict intensity. The figure shows the evolution of Cavendish prices as well as slope coefficients (θ_j) from equation (2). These coefficients capture the slope of the relationship between province-level Cavendish intensity and conflict violence in a given year. 2005 is the omitted category, so the other θ_j coefficients capture the slope in year *j* relative to the slope in 2005. The top panel plots point estimates only, the bottom panel also shows confidence intervals.

of the θ_j coefficients should match the evolution of the world market price. We test this prediction in what follows by graphing the θ_j coefficients together with world market prices against time.

Figure 3 shows estimates of the θ_j coefficients from equation (2) plotted next to the time series of world market Cavendish prices. The graph shows that the θ_j coefficients and prices evolve similarly over time, initially decreasing between 2001 and 2003, then mostly increasing from 2003 to 2009, with a small dip in 2007. This pattern implies that the association between Cavendish intensity and conflict in the cross-section is substantially more positive in years with high world market prices. The remarkable similarity in the time-paths of prices and θ_j coefficients is unlikely to have occurred by chance, which increases our confidence that the estimates in Table 2 reflect a causal effect of crop values on conflict.

A potential threat to our empirical strategy comes from the possibility that the world market price of bananas was itself affected by conflict in the Philippines. An increase in conflict in banana-growing provinces might, for example, lead to disruptions in supply, which could lead to an increase in the world market price. This type of reverse causality would lead to an upward bias in our estimates. To test for this possibility, we estimate an instrumental variables regression in which we instrument the world market price of bananas with rainfall in Ecuador, the world's leading banana-exporting country. This test is motivated by the fact that high rainfall in Ecuador will lead to a substantial decrease in world banana supply, since Ecuador supplies about 30% of the world's export bananas and banana plants are susceptible to root diseases when exposed to overly wet soil. This decrease in supply leads to an increase in the world market price of bananas that is exogenous to conflict in the Philippines. Table 3 shows estimates of this IV approach. The first stage estimates in column (1) confirm that high rainfall in Ecuador is indeed associated with an increase in the world market price of bananas. The IV estimates in column (2) are similar to the OLS coefficients in Table 2,

TABLE 3. Robustness test: instrumenting price with rainfall in Ecuador.

	IV Violent incidents		First stage Cavendish prod. × Log US banana price	
	(1)	(2)	(3)	(4)
Cavendish prod. (kg per cap.) × Log Price	0.20**	0.18**		
	(0.082)	(0.081)		
Cavendish prod. × Rainfall in Ecuador			1.14***	1.14***
			(0.10)	(0.11)
F-stat. of first-stage			119.6	118.0
Mean of dependent variable	7.12	7.12	3.51	3.51
Control variables	No	Yes	No	Yes
No. of provinces	77	77	77	77
No. of observations	691	691	691	691

Notes: All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

suggesting that those estimates were not biased bias by the potential endogeneity of world market prices and province-level banana production.

Another concern for our analysis is the relatively strong spatial concentration of export crop production in the Philippines. For instance, the map in Figure 4 shows that production of Cavendish bananas is concentrated in Mindanao and the Visayas. Therefore, unobserved shocks that are correlated across space could bias our standard error estimates downward, in a way that is similar to within-cluster correlation. We address this problem in two ways. First, we estimate a set of regressions that control for island-group-by-time fixed effects and that restrict the geographic range of our sample, for example, only using data from Mindanao, to rule out that our results are driven by unobserved shocks to a particular island group.[15] Second, we estimate the spatial autocorrelation robust standard errors described by Conley (2008) and previously implemented by Hsiang (2010).

The first three columns of Table 4 show that our estimates are robust to controlling for spatially correlated unobserved shocks in the form of island-group-by-time fixed effects. Column (4) further shows that the estimates remain statistically significant when using the spatial autocorrelation robust standard errors described by Conley (2008). This increases our confidence that the regression coefficients and standard errors in Table 2 are not biased by spatially correlated unobserved shocks to regions with high levels of Cavendish production.

In an additional analysis, we explored potential time-lags between changes in crop prices and conflict in a regression that uses the province-month as the unit of analysis.

15. The country's three major island groups are Luzon, the Visayas, and Mindanao.

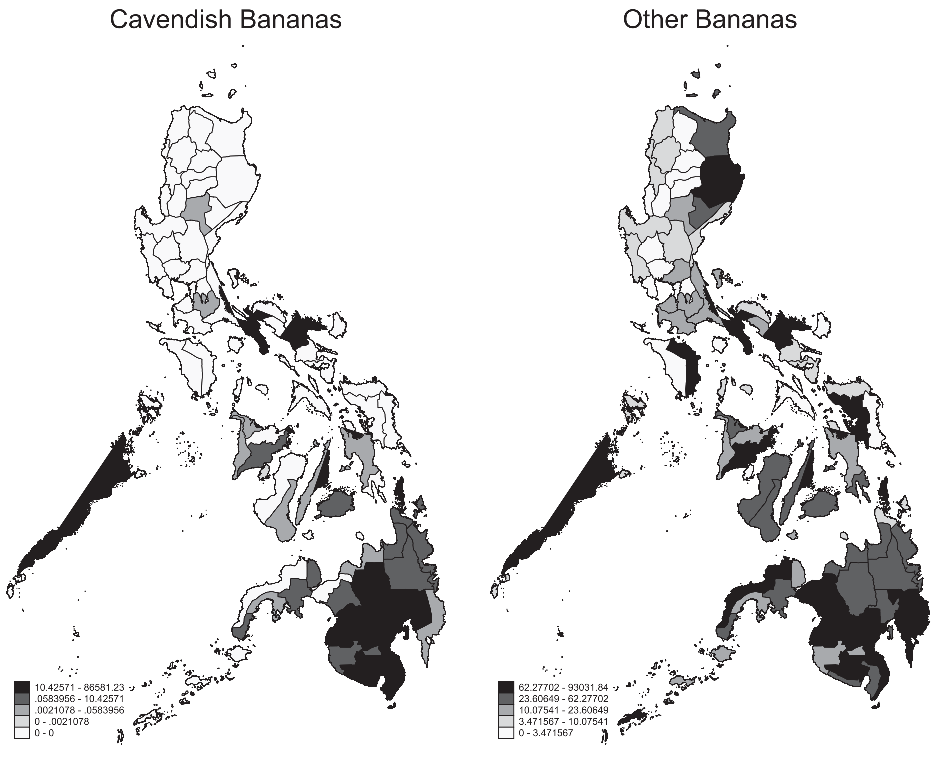

FIGURE 4. Mean banana production by province. The figure shows mean production of Cavendish and other bananas by province during the period 2001–2009, based on data from the Philippine Bureau of Agricultural Statistics. Provinces are divided into quantiles of production.

TABLE 4. Robustness tests for spatially correlated shocks.

	Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish prod. (kg per cap.) × Log Price	0.18**	0.19**	0.21**	0.16***
	(0.080)	(0.084)	(0.085)	(0.039)
Mean of dependent variable	7.12	9.18	12.3	7.12
Island-group-by-time FE	Yes	Yes	Yes	No
Mindanao and Visayas only	No	Yes	Yes	No
Mindanao only	No	No	Yes	No
Conley standard errors	No	No	No	Yes
No. of provinces	77	40	24	77
No. of observations	691	358	214	691

Notes: All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors are in parentheses. In columns (1)–(3), standard errors are clustered at the province level. In column (4), standard errors are robust to spatial and temporal autocorrelation, as described by Conley (2008), with a spatial bandwidth of 5000 km and a maximum lag of 9 years. **Significant at 5%; ***significant at 1%.

TABLE 5. Who initiates and who suffers the violence?

	Initiated by		Casualties suffered by		
	Government (1)	Insurgents (2)	Armed Forces (3)	Insurgent (4)	Civilian (5)
Cavendish prod. (kg per cap.) × Log Price	0.074	0.082***	0.13**	0.019**	0.023***
	(0.046)	(0.024)	(0.063)	(0.0089)	(0.0076)
Mean of dependent variable	2.76	4.31	3.82	2.19	1.97
No. of provinces	77	77	77	77	77
No. of observations	691	691	691	691	691

Notes: All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

We found that the effect of prices on violence occurs with a lag of at approximately one month, whereas the effect in the current month is small and statistically insignificant. However, the large standard errors associated with the monthly analysis do not allow us to reject the hypothesis that the lagged effect and the contemporaneous effect are equally large, leaving the results of this analysis somewhat inconclusive. The results are therefore not included in the paper, but are available from the authors on request.

5.2. Heterogeneous Effects

In Table 5, we separately present estimates of the effect of Cavendish value on violence initiated and suffered by different groups. Columns (1) and (2) of Table 5 show that the effect is approximately equal for incidents initiated by the government and by insurgent groups, though it is only statistically significant for the latter. However, columns (3) through (5) show that the effect is largest for incidents with at least one government casualty. The effect on incidents with insurgent and civilian casualties is substantially smaller, though in the case of civilians it is large relative to the low mean of this type of incidents. These results are consistent with the hypothesis that an increase in Cavendish values leads to an increase in the capacity of insurgent groups, which enables them to successfully engage with government forces and civilians who oppose their agenda.

Table 6 presents separate estimates for different insurgent groups. The effect of crop values is by far largest for incidents involving the New People's Army, consistent with the large amount of qualitative evidence that this group finances itself by extorting agricultural export firms (Vanzi 2003; MindaNews 2010; GMA News 2011; Lim 2012, 2014; Unson 2015). The effect is substantially smaller and not statistically significant for the Moro-Islamic Liberation Front. For the Abu Sayyaf Group, the effect is statistically significant and small in absolute magnitude, though large relative to the low mean of incidents involving the group.

Table 7 tests for heterogeneous effects across provinces with different baseline levels of three characteristics: poverty, road infrastructure, and percent Muslim

TABLE 6. Effect on conflict with different rebel groups.

	Violent incidents involving		
	NPA (1)	MILF (2)	ASG (3)
Cavendish prod. (kg per cap.) × Log Price	0.13* (0.078)	0.0058 (0.017)	0.0060** (0.0030)
Mean of dependent variable	3.94	0.78	0.45
No. of provinces	77	77	77
No. of observations	691	691	691

Notes: All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. *Significant at 10%; **significant at 5%.

TABLE 7. Heterogeneity analysis.

	Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish prod. (kg per cap.) × Log Price	0.094* (0.048)	0.15** (0.069)	–0.010 (0.018)	0.27 (0.44)
Cavendish prod. × Log Price × Poverty rate	0.0019 (0.0052)			0.084 (0.075)
Cavendish prod. × Log Price × Road density			–3.26*** (0.15)	–9.58 (9.02)
Cavendish prod. × Log Price × Percent Muslim population		–0.21 (0.28)		–3.12 (2.67)
Mean of dependent variable	7.12	7.12	7.12	7.12
Control variables	No	Yes	No	Yes
No. of provinces	75	77	77	75
No. of observations	675	691	691	675

Notes: All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Data on percentage Muslim population and road density (percentage of villages with highway access) come from the 2000 Census. Data on the poverty rate come from the 1997 Family Income and Expenditure Survey (FIES). All three variables are expressed as deviations from the sample mean, so that the coefficient in the first row represents the difference-in-differences estimate for the average province. Standard errors, clustered at the province level, are in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.

population. The results show that the effect of banana values is significantly smaller in provinces with a denser road network (though this estimate becomes insignificant when we simultaneously allow for heterogeneity across all three characteristics). A possible explanation is that a denser road network allows government forces to more quickly respond to extortion attempts and exert firmer control over the province's territory; a topic we explore in more detail in what follows. We find no evidence for

TABLE 8. The role of baseline insurgent control.

	Violent incidents	# of villages controlled by NPA	
	(1)	(2)	(3)
Cavendish prod. (kg per cap.) × Log Price		1.59*	
		(0.88)	
Cavendish prod. × Log Price × Low control	0.15**		1.58*
	(0.067)		(0.85)
Cavendish prod. × Log Price × Medium control	0.74**		6.25***
	(0.31)		(2.24)
Cavendish prod. × Log Price × High control	–0.91*		10.1**
	(0.47)		(4.25)
Mean of dependent variable	7.12	13.2	13.2
No. of provinces	77	77	77
No. of observations	691	229	229

Notes: All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. *Significant at 10%; **significant at 5%; ***significant at 1%.

heterogeneous effects for provinces with different baseline levels of poverty or Muslim population.

5.3. *Possible Mechanisms*

The results in the previous section are markedly different from those of the seminal paper by Dube and Vargas (2013), who found that an increase in the value of agricultural commodities led to an decrease in conflict violence in Colombia. In this section, we explore possible explanations for this difference in results, and in doing so attempt to shed light on possible mechanisms that link crop values and civil conflict.

We first explore the role of baseline insurgent control. In the period studied by Dube and Vargas (2013), the Colombian government had only limited control over substantial parts of the nation's territory, many of which were de facto controlled by the leftist FARC guerrilla or by right-wing paramilitary groups. This could partly explain the difference in results if an increase in commodity values leads to an increase in insurgent control and there is a nonmonotonic relationship between control and violence, as discussed in Section 3 and depicted in Figure 1. To test this explanation, we compare the effects of crop values in areas with different levels of insurgent control at baseline.

Column (1) of Table 8 shows that an increase in Cavendish values significantly increases the number of violent incidents in provinces with low and medium baseline NPA control, but decreases it in provinces with high baseline NPA control. These results are consistent with the hypothesis that an increase in Cavendish values allows the NPA to further expand its hold over provinces in which it already has high capacity, which leads to a decrease in violence because the government has less ability to contest the

TABLE 9. The role of banana plantations.

	Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish prod. × Log price × Plantation percentage below median	–0.50	–0.35		
	(0.42)	(0.51)		
Cavendish prod. × Log price × Plantation percentage above median	0.15**	0.16**		
	(0.067)	(0.068)		
Banana trees in plantations (per cap.) × Log price			2.25***	2.56***
			(0.82)	(0.82)
Banana trees (per cap.) × Log price			0.057	–0.093
			(0.24)	(0.26)
Mean of dependent variable	7.12	7.12	7.12	7.12
Control variables	No	Yes	No	Yes
No. of provinces	77	77	77	77
No. of observations	691	691	691	691

Notes: For this analysis, we define banana plantations as farms larger than 25 hectares, the largest size category recorded in the Agricultural Census of the Philippines. Control variables are rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

territory. Columns (2) and (3) show direct evidence for this hypothesis. An increase in Cavendish values leads to an increase in the number of villages controlled by the NPA. The estimates in column (2) show that a 10% increase in Cavendish prices increases the number of NPA controlled villages by 0.158 in a province that produced 1 kg of Cavendish bananas in 2002 (recall that the average Cavendish-producing province produced 8.7 kg per capita in that year). The results in column (3) suggest that the size of the effect depends on the baseline level of NPA control: it is substantially higher in provinces with higher baseline control.

Next, we explore the role of farm size and market concentration. Banana production is highly centralized in a small number of large plantations, whereas coffee production is relatively decentralized with many small farmers. The transaction costs of extortion may therefore be higher for coffee, which might explain why an opportunity cost effect dominates in that context whereas the predation effect dominates in the case of bananas. To test this explanation, Table 9 tests whether the conflict-increasing effect of banana production varies with the size of farms in which the crop is grown. The regressions presented in columns (1) and (2) separately estimate the effect of changes in banana values on provinces with larger/smaller percentages of banana trees in large plantations.[16] The conflict-increasing effect of an increase in banana prices is only significant in provinces where the fraction of banana trees in large plantations is above

16. For this analysis, we define a large plantation as a banana farm with an area larger than 25 hectares, the highest size category reported in the Census.

TABLE 10. Other crops and civil conflict.

	Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish Prod. (SD) × Log Cavendish Price	2.92**	2.91**	2.97**	2.97**
	(1.24)	(1.24)	(1.28)	(1.28)
Saba Prod. (SD) × Log Saba Price			–0.55	–0.55
			(4.27)	(4.38)
Lacatan Prod. (SD) × Log Lacatan Price			–0.42	–0.57
			(4.16)	(4.21)
Rice Prod. (SD) × Log Rice Price	0.16	0.11	0.21	0.17
	(0.78)	(0.75)	(0.79)	(0.77)
Sugar Prod. (SD) × Log Sugar Price	1.89***		1.88***	
	(0.65)		(0.66)	
Sugar prod. × Log Sugar Price × Low control		1.62***		1.61***
		(0.33)		(0.34)
Sugar prod. × Log Sugar price × Medium influence		5.29***		5.29***
		(0.67)		(0.65)
Sugar prod. × Log Sugar price × High influence		–1.18		–1.20
		(1.12)		(1.10)
Mean of dependent variable	7.12	7.12	7.12	7.12
No. of provinces	77	77	77	77
No. of observations	691	691	691	691

Notes: All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Note that production levels are expressed in standard deviations to make estimates comparable across crops. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

the median. In provinces below the median, the estimate is negative and not statistically significant.

To further explore this result, columns (3) and (4) include interactions between the world market price of bananas and the total number of productive banana trees, as well as the number of banana trees in plantations larger than 25 hectares. Our preferred specification in column (4) suggests that a 10% increase in the price of bananas led to 0.26 additional violent incidents in a province with one more banana tree per capita located in a large plantation. By contrast, movements in the price of bananas did not significantly affect conflict in provinces where banana trees are located in smaller farms. These results suggest that the size of farms plays an important role in determining how changes in crop values affect civil conflict. They are consistent with anecdotal evidence that insurgents fund their operations by extorting large banana plantations.

As additional evidence for the role of market concentration, Table 10 estimates the effect of increases in the value of several crops that differ in market structure. To make comparisons across crops easier, we express baseline per capita production of each crop (all measured in 2002) in terms of standard deviations from the sample mean. We find no statistically significant evidence that conflict is affected by an increase in the value of rice and the domestically consumed banana varieties Lacatan and Saba, all of which are marketed in highly decentralized domestic markets. There is, however, evidence that an increase in the value of sugar production leads to an increase in the number of violent incidents. A 10% increase in the world market sugar price leads to 0.189 additional violent incidents in provinces with 1 standard deviation higher average sugar production. Columns (2) and (4) show that this effect is concentrated in provinces with low to medium baseline NPA control. Estimates are negative though not statistically significant in provinces with high NPA control. These results are consistent with the pattern we found for Cavendish bananas in Table 8.

Figure 5 explores how conflict evolved over time in provinces with high/low baseline production of different crops. The figure presents estimates of a version of equation (2) that simultaneously includes interactions between year indicators and baseline production levels of all five crops included in Table 10. As in Table 10, baseline production levels are expressed as standard deviations from the sample mean. The five panels plot the θ_j coefficients associated with each crop together with the evolution of the crop's price over time. The θ_j coefficients capture the slope of the relationship between province-level crop intensity and conflict violence in a given year. For Cavendish bananas and sugar, the evolution of the θ_j coefficients closely follows the price trend over the period of observation. For the other three crops, rice, Lacatan bananas, and Saba bananas, the two trends appear more divergent, consistent with the results in Table 10.

Overall, we believe that our results are best explained by the indirect predation effect described in Section 3. Rebel groups, particularly the NPA, extort banana exporters and use the proceeds to fund additional recruits, arms, and equipment, which leads to an increase in their local capacity. This increase is particularly strong in provinces where rebel capacity was already high, most likely because the group is able to extort a larger portion of the surplus from banana production. Consistent with the predictions of contest–success models (Hirshleifer 1989; Skaperdas 1996), this leads to an increase in violence in provinces where rebel capacity was initially low and a decrease in provinces where it was initially high.

Of course, our results do not rule out the presence of other mechanisms. It is, for example, possible that the increase in violence in areas with initially low rebel capacity was due to the direct effect of predation, such as extortion-related attacks on banana and sugar facilities (Vanzi 2003; Apuzzo 2007; GMA News 2009, 2011; MindaNews 2010; Unson 2011, 2015; Lim 2012, 2014). Still, our results suggest that, at least in areas with high baseline rebel capacity, a possible direct predation effect was outweighed by a reduction in violence due to an increase in rebel capacity. The fact that the effect of crop values on conflict flips changes its sign as we move from low to high rebel capacity is difficult to explain with an opportunity cost mechanism or a direct predation mechanism alone.

A related explanation is that the concentrated nature of the banana sector gives plantation owners substantial market power in local labor markets. This might make

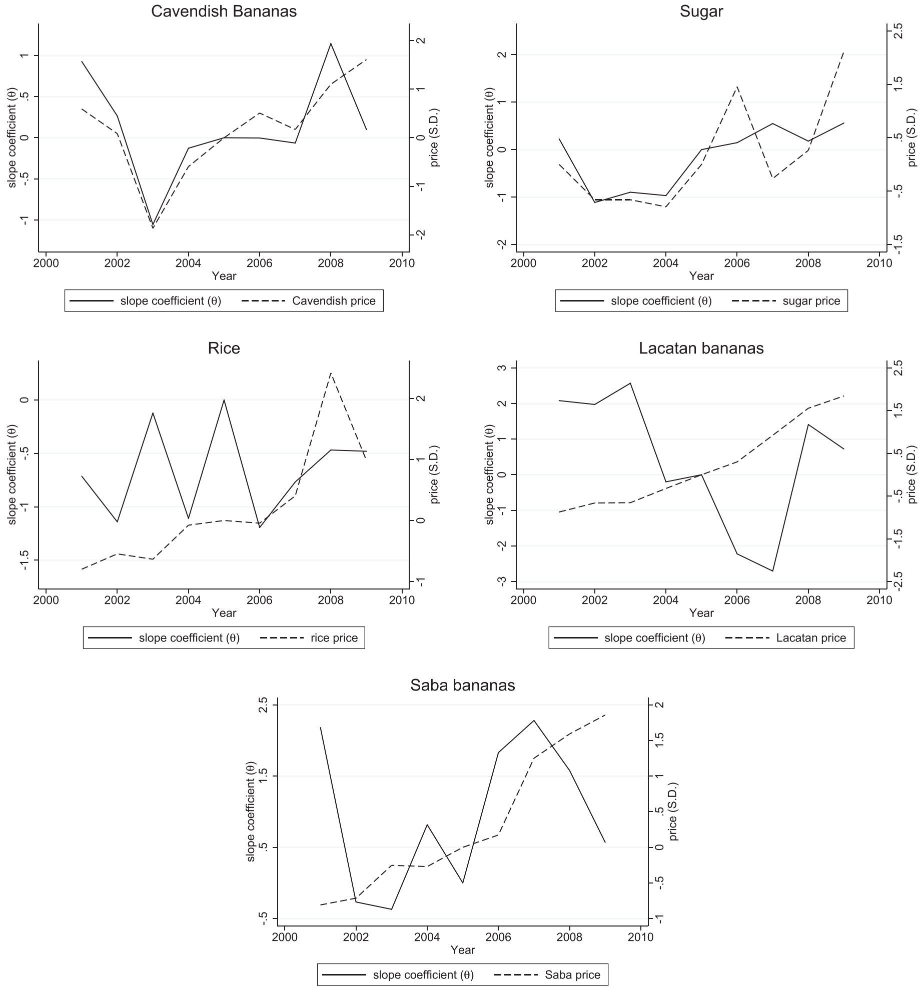

FIGURE 5. Crop prices and conflict intensity. The figure shows the evolution of crop prices as well as slope coefficients (θ_j) from a regression analogous to equation (2), which includes interactions between year indicators and baseline production levels of all five crops. The θ_j coefficients capture the slope of the relationship between province-level crop intensity and conflict violence in a given year. 2005 is the omitted category, so the other θ_j coefficients capture the slope in year j relative to the slope in 2005. Baseline production levels are converted to standard deviations from the sample mean. Crop prices are expressed as standard deviations from the average price over the period 2001–2009.

wages and employment less responsive to changes in output prices, as suggested by models of labor monopsony. An increase in the price of bananas would thus have a smaller effect on the opportunity cost of conflict than an increase in the price of other commodities with less concentrated labor markets. To test for this, we estimated the effect of changes in the price of different crops on wages (results are presented in Appendix Table B.1. Unfortunately, data on wages is only available at the region level, which limits the statistical power of this analysis. We find a positive relationship between agricultural wages and the prices of most crops (with the exception of Lacatan bananas). However, none of the estimates are statistically significant at conventional levels and we cannot rule out the hypothesis that the wage effect of price movements is equally large for all crops.

The indirect predation mechanism also offers an explanation for why we find no effect of increases in the value of nonexport crops like rice and domestically consumed bananas. These crops are produced in decentralized systems with many farmers and traders, so that the transaction costs of extortion are likely to be high relative to the potentially extractable surplus. If transaction costs are prohibitively high, extortion in these markets becomes unappealing as a revenue-generating activity and we would not expect it to affect violence through a direct or indirect predation channel.

6. Conclusion

Many fragile and conflict-affected countries are making substantial investments in the production of high-value export crops such as fruits and vegetables, often following the advice of influential donor organizations like the World Bank and USAID. This advice is partly based on the expectation that high-value export crops will reduce conflict by creating employment in the peaceful economy, which raises the opportunity cost of joining armed groups. Although the literature on export commodities and conflict generally finds mixed results (Deaton and Miller 1995; Besley and Persson 2008; Brückner and Ciccone 2010; Bazzi and Blattman 2014), this optimistic view is supported by recent evidence that increases in the value of agricultural commodities lead to a decrease in conflict (Dube and Vargas 2013; Berman and Couttenier 2015).

Our results suggest that the effect of changes in crop values on conflict depends on the type of crop, as well as on local conditions. Using data from the Philippines, we find that increases in the value of two of the country's most important export crops, Cavendish bananas and sugar, led to increases in conflict-related violence. This conflict-increasing effect is concentrated in provinces with low insurgent capacity at baseline. In provinces with high baseline insurgent capacity, an increase in crop value led to a reduction in conflict violence. Furthermore, we find direct evidence that increases in crop value led to increases in insurgent territorial control. Finally, we find that the conflict-increasing effect of banana values was concentrated in provinces where the crop is produced in large plantations. Consistent with this result, we find no evidence that conflict is affected by changes in the value of nonexport crops such as domestically consumed banana varieties and rice, which tend to be produced in smaller farms.

Our estimates are consistent with the hypothesis that a locally dominant rebel group can gain capacity from extorting agricultural exporters, and that rebel capacity has a nonmonotonic effect on conflict intensity. This mechanism is consistent with previous work suggesting that increases in the value of a taxable commodity led rebel groups to establish local monopolies of violence in the Democratic Republic of Congo (Sánchez de la Sierra 2015).

This discussion is of course not intended to suggest that the opportunity cost channel, which posits that agricultural commodities decrease conflict by creating opportunities in the peaceful economy, is irrelevant. Guardado and Pennings (2016), for instance, find strong evidence that conflict in Iraq and Pakistan is less intense during the harvest season, when labor demand for agriculture is high. Our results do, however, suggest that in certain contexts the opportunity cost channel can be outweighed by the predation channel even for highly labor-intensive agricultural commodities. This opens up opportunities for future research to understand which characteristics of conflict settings and production systems determine the ways in which commodity values affect conflict. It should also be noted that our results do not imply that export agriculture will always lead to an increase in conflict. In particular, we would only expect this effect in contexts where the government does not have the capacity to prevent extortion attempts by rebel groups.

Our analysis highlights the importance of looking beyond measures of violence when studying the mechanisms through which economic conditions affect conflict dynamics. Depending on local conditions, both the opportunity cost and the predation channel can explain a violence-reducing effect of increased commodity values, which makes them difficult to empirically distinguish with data on violence alone. The two channels do, however, make different predictions about the relationship between economic conditions, insurgent capacity and conflict violence, which allows us to disentangle them in practice.

In addition to shedding light on the mechanism through which commodity values affect conflict, our results have important implications for agricultural and development policies in fragile and conflict-affected countries. They lay out the conditions under which a move towards export crops can have the unintended consequence of exacerbating civil conflict, strengthening insurgent groups, and weakening the ability of the state to control its own territory.

Appendix A: Robustness to Dropping Observations before 2003

Our analysis is limited by the fact that the Philippines Department of Agriculture did not disaggregate banana production data by variety before 2002, so that we cannot use Cavendish production before the start of the period of observation as a measure of crop intensity (the period of observation begins in 2001, the first year for which conflict data is available). It is therefore possible that our measure of baseline Cavendish production in 2002 was affected by price-movements or conflict in the years 2001 or 2002, leading to concerns about reverse causality. To address these concerns, the tables in this section reproduce the entire empirical analysis of the paper for the period of observation 2003–2009. Our estimates from this analysis are very similar to those presented in the body of the paper, which suggests that the paper's results are not due to a reverse causal effect of conflict or prices on Cavendish production in 2002.

TABLE A.1. The value of banana production and civil conflict, 2003–2009.

	Dependent variable Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish prod. (kg per cap.) × Log Price	0.14**	0.16**	0.13	0.21***
	(0.066)	(0.069)	(0.088)	(0.074)
Cavendish prod. × Lead of Log Price			0.010	–0.069
			(0.17)	(0.16)
Mean of dependent variable	7.12	7.12	7.12	7.12
Control variables	No	Yes	No	Yes
No. of provinces	77	77	77	77
No. of observations	539	539	539	539

Notes: The period of observation is 2003–2009. Control variables are rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

TABLE A.2. Robustness test: instrumenting price with rainfall in Ecuador, 2003–2009.

	IV Violent incidents		First stage Cavendish prod. × Log US banana price	
	(1)	(2)	(3)	(4)
Cavendish prod. (kg per cap.) × Log Price	0.20	0.19***		
	(·)	(0.071)		
Cavendish prod. × Rainfall in Ecuador			1.18***	1.18***
			(0.11)	(0.11)
F-stat. of first-stage			119.6	118.0
Mean of dependent variable	7.12	7.12	3.51	3.51
Control variables	No	Yes	No	Yes
No. of provinces	77	77	77	77
No. of observations	539	539	539	539

Notes: The period of observation is 2003–2009. All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. ***Significant at 1%.

TABLE A.3. Robustness tests for spatially correlated shocks, 2003–2009.

	Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish prod. (kg per cap.) × Log Price	0.17**	0.19**	0.21**	0.16***
	(0.077)	(0.080)	(0.083)	(0.036)
Mean of dependent variable	7.12	9.18	12.3	7.12
Island-group-by-time FE	Yes	Yes	Yes	No
Mindanao and Visayas only	No	Yes	Yes	No
Mindanao only	No	No	Yes	No
Conley standard errors	No	No	No	Yes
No. of provinces	77	40	24	77
No. of observations	539	280	168	539

Notes: The period of observation is 2003–2009. All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors are in parentheses. In columns (1)–(3), standard errors are clustered at the province level. In column (4), standard errors are robust to spatial and temporal autocorrelation, as described by Conley (2008), with a spatial bandwidth of 5000 km and a maximum lag of 9 years. **Significant at 5%; ***significant at 1%.

TABLE A.4. Who initiates and who suffers the violence? 2003–2009.

	Initiated by		Casualties suffered by		
	Government (1)	Insurgents (2)	Armed forces (3)	Insurgent (4)	Civilian (5)
Cavendish prod. (kg per cap.) × Log Price	0.077	0.081***	0.13**	0.019**	0.024***
	(0.047)	(0.024)	(0.065)	(0.0090)	(0.0074)
Mean of dependent variable	2.76	4.31	3.82	2.19	1.97
No. of provinces	77	77	77	77	77
No. of observations	539	539	539	539	539

Notes: The period of observation is 2003–2009. All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

TABLE A.5. Effect on conflict with different rebel groups, 2003–2009.

	Violent incidents involving		
	NPA (1)	MILF (2)	ASG (3)
Cavendish prod. (kg per cap.) × Log Price	0.13	0.0084	0.0057*
	(0.081)	(0.017)	(0.0029)
Mean of dependent variable	3.94	0.78	0.45
No. of provinces	77	77	77
No. of observations	539	539	539

Notes: The period of observation is 2003–2009. All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. *Significant at 10%.

TABLE A.6. Heterogeneity analysis, 2003–2009.

	Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish prod. (kg per cap.) × Log Price	0.032	0.13*	–0.0096	0.62
	(0.054)	(0.071)	(0.021)	(0.44)
Cavendish prod. × Log price × Poverty rate	–0.0068			0.12
	(0.0062)			(0.078)
Cavendish prod. × Log price × Road density			–3.27***	–3.33
			(0.17)	(9.12)
Cavendish prod. × Log price × Percent Muslim population		–0.64*		–4.67*
		(0.34)		(2.77)
Mean of dependent variable	7.12	7.12	7.12	7.12
Control variables	No	Yes	No	Yes
No. of provinces	75	77	77	75
No. of observations	525	539	539	525

Notes: The period of observation is 2003–2009. All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Data on percentage Muslim population and road density (percentage of villages with highway access) come from the 2000 Census. Data on the poverty rate come from the 1997 Family Income and Expenditure Survey (FIES). All three variables are expressed as deviations from the sample mean, so that the coefficient in the first row represents the difference-in-differences estimate for the average province. Standard errors, clustered at the province level, are in parentheses. *Significant at 10%; ***significant at 1%.

TABLE A.7. The role of baseline insurgent control, 2003–2009.

	Violent incidents	# of villages controlled by NPA	
	(1)	(2)	(3)
Cavendish prod. (kg per cap.) × Log Price		1.42*	
		(0.78)	
Cavendish prod. × Log Price × Low control	0.16**		1.42*
	(0.069)		(0.78)
Cavendish prod. × Log Price × Medium control	0.49		3.11
	(0.34)		(3.30)
Cavendish prod. × Log Price × High control	–1.25**		–1.16
	(0.62)		(10.3)
Mean of dependent variable	7.12	13.2	13.2
No. of provinces	77	77	77
No. of observations	539	154	154

Notes: The period of observation is 2003–2009. All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. *Significant at 10%; **significant at 5%.

TABLE A.8. The role of banana plantations, 2003–2009.

	Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish prod. × Log price × Plantation percentage below median	–1.07**	–0.78		
	(0.50)	(0.58)		
Cavendish prod. × Log price × Plantation percentage above median	0.15**	0.16**		
	(0.067)	(0.070)		
Banana trees in plantations (per cap.) × Log price			2.20**	2.37***
			(0.84)	(0.82)
Banana trees (per cap.) × Log price			0.046	0.074
			(0.27)	(0.27)
Mean of dependent variable	7.12	7.12	7.12	7.12
Control variables	No	Yes	No	Yes
No. of provinces	77	77	77	77
No. of observations	539	539	539	539

Notes: The period of observation is 2003–2009. For this analysis, we define banana plantations as farms larger than 25 hectares, the largest size category recorded in the Agricultural Census of the Philippines. Control variables are rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

TABLE A.9. Other crops and civil conflict, 2003–2009.

	Violent incidents			
	(1)	(2)	(3)	(4)
Cavendish Prod. (SD) × Log Cavendish Price	2.94**	2.95**	2.83**	2.84**
	(1.29)	(1.29)	(1.23)	(1.23)
Saba Prod. (SD) × Log Saba Price			1.03	1.08
			(3.40)	(3.48)
Lacatan Prod. (SD) × Log Lacatan Price			0.60	0.52
			(3.43)	(3.44)
Rice Prod. (SD) × Log Rice Price	0.16	0.072	0.044	–0.039
	(1.07)	(1.04)	(1.07)	(1.04)
Sugar Prod. (SD) × Log Sugar Price	1.68**		1.70**	
	(0.76)		(0.77)	
Sugar prod. × Log Sugar Price × Low control		1.32***		1.34***
		(0.33)		(0.34)
Sugar prod. × Log Sugar price × Medium influence		5.87***		5.89***
		(0.53)		(0.55)
Sugar prod. × Log Sugar price × High influence		–1.49		–1.47
		(0.92)		(0.94)
Mean of dependent variable	7.12	7.12	7.12	7.12
No. of provinces	77	77	77	77
No. of observations	539	539	539	539

Notes: The period of observation is 2003–2009. All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Note that production levels are expressed in standard deviations to make estimates comparable across crops. Standard errors, clustered at the province level, are in parentheses. **Significant at 5%; ***significant at 1%.

Appendix B: Effect of Crop Prices on Wages

Table B.1 shows estimates of the effect of changes in the price of different crops on wages. Unfortunately, data on wages is only available at the region level, so that the unit of observation in these regressions is the region-year. The crop production variables are averages of per capita crop production in 2002 (expressed in standard deviations from the mean) over all provinces in a region. The point estimates suggest a positive relationship between agricultural wages and the prices of most crops (with the exception of Lacatan bananas). However, none of the estimates are statistically significant at conventional levels. Furthermore, we cannot rule out the hypothesis that the wage effect of price movements is equally large for all crops.

TABLE B.1. Crop prices and agricultural wages.

	Ln(Ag. wage) (1)
Cavendish Prod. (SD) × Log Cavendish Price	0.096 (0.15)
Saba Prod. (SD) × Log Saba Price	0.10 (0.34)
Lacatan Prod. (SD) × Log Lacatan Price	–0.18 (1.05)
Rice Prod. (SD) × Log Rice Price	0.17 (0.16)
Sugar Prod. (SD) × Log Sugar Price	0.024 (0.018)
No. of regions	16
No. of observations	144

Notes: All regressions control for rainfall and temperature during the wet and dry season, as well as an indicator that takes the value 1 if the province was hit by a major typhoon. Note that production levels are expressed in standard deviations to make estimates comparable across crops. Standard errors, clustered at the province level, are in parentheses.

References

Abadie, Alberto and Javier Gardeazabal (2003). "The Economic Costs of Conflict: A Case Study of the Basque Country." *American Economic Review*, 93(1), 113–132.

Akresh, Richard, Leonardo Lucchetti, and Harsha Thirumurthy (2012). "Wars and Child Health: Evidence from the Eritrean-Ethiopian Conflict." *Journal of Development Economics*, 99, 330–340.

Angrist, Joshua and Adriana Kugler (2008). "Rural Windfall or A New Resource Curse? Coca, Income, and Civil Conflict in Colombia." *Review of Economics and Statistics*, 90, 191–215.

Appuzzo, Matt (2007). "Chiquita to Pay $25M Fine in Terror Case." *Washington Post*.

Apuzzo, Matt (2007). "Chiquita to Pay $25M Fine in Terror Case." *The Associated Press*.

Arezki, Rabah and Markus Brueckner (2014). "Effects of International Food Price Shocks on Political Institutions in Low-Income Countries: Evidence from An International Food Net-Export Price Index." *World Development*, 61, 142–153.

Bazzi, S. and C. Blattman (2014). “Economic Shocks and Conflict: Evidence from Commodity Prices.” *American Economic Journal: Macroeconomics*, 6, 1–38.

Berman, Eli, Joseph Felter, Ethan Kapstein, and Erin Troland (2012). “Predation, Economic Activity and Violence: Evidence from the Philippines.” NBER Working Paper No., 18375, National Bureau of Economic Research, Boston, MA.

Berman, Eli, Jacob N. Shapiro, and Joseph H. Felter (2011). “Can Hearts and Minds Be Bought? The Economics of Counterinsurgency in Iraq.” *Journal of Political Economy*, 119, 766–819.

Berman, Nicolas and Mathieu Couttenier (2015). “External Shocks, Internal Shots: the Geography of Civil Conflicts.” *Review of Economics and Statistics*, 97, 758–776.

Berman, Nicolas, Mathieu Couttenier, Dominic Rohner, and Mathias Thoenig (2017). “This Mine is Mine! How Minerals Fuel Conflicts in Africa.” *American Economic Review*, 107(6), 1564–1610.

Besley, T. and T. Persson (2008). “The Incidence of Civil War: Theory and Evidence.” NBER Working Paper, National Bureau of Economic Research, Boston, MA.

Bhaumik, Subir (2009). “India Rebels ’Got Corporate Fund’.” *BBC News*.

Blattman, C. and E. Miguel (2010). “Civil War.” *Journal of Economic Literature*, 48, 3–57.

Brückner, M. and A. Ciccone (2010). “International Commodity Prices, Growth, and Civil War in Sub-Saharan Africa.” *Economic Journal*, 120, 519–534.

Calí, M. (2015). “Trading Away from Conflict: Using Trade to Increase Resilience in Fragile States.” Tech. rep., The World Bank, Washington, D.C.

Camacho, A. (2005). “Stress and Birth Weight: Evidence from Terrorist Attacks.” *American Economic Review*, 98(2), 511–515.

Campbell, Colin (1982). “Thai Journalist Tackles Country’s Seamier Side.” *New York Times*.

Colina, Antonio (2018). “NPAs Earned P1.48 B in 2017 Thru Extortion—AFP.” *Manila Bulletin*.

Collier, P. (2000). “Rebellion as a Quasi-Criminal Activity.” *Journal of Conflict Resolution*, 44, 839–853.

Collier, Paul and Anke Hoeffler (2004). “Greed and Grievance in Civil War.” *Oxford Economic Papers*, 56, 563–595.

Conley, Timothy G. (2008). “Spatial Econometrics.” In *The New Palgrave Dictionary of Economics*, edited by Steven N. Durlauf and Lawrence E. Blume. Palgrave Macmillan, London, UK.

Couttenier, Mathieu and Raphael Soubeyran (2014). “Drought and Civil War in Sub-Saharan Africa.” *Economic Journal*, 124, 201–244.

Crismundo, Mike (2017). “AFP, PNP Urge Businessmen Not To Give Extortion Money To NPA.” *Manila Bulletin*.

Crost, B., J. H. Felter, and P. B. Johnston (2016). “Conditional Cash Transfers, Civil Conflict and Insurgent Influence: Experimental Evidence from the Philippines.” *Journal of Development Economics*, 118, 171–182.

Crost, Benjamin, Claire Duquennois, Joseph H. Felter, and Daniel I. Rees (2018). “Climate Change, Agricultural Production and Civil Conflict: Evidence from the Philippines.” *Journal of Environmental Economics and Management*, 88, 379–395.

Crost, Benjamin and Joseph H. Felter (2018). “Natural Resource Policy and Civil Conflict: Evidence from Mining Liberalization in the Philippines.” Working paper, University of Illinois, Urbana-Champaign, IL.

Crost, Benjamin, Joseph H. Felter, and Patrick B. Johnston (2014). “Aid Under Fire: Development Projects and Civil Conflict.” *American Economic Review*, 104(6), 1833–1856.

Dal Bo, E. and P. Dal Bo (2011). “Workers, Warriors, and Criminals: Social Conflict in General Equilibrium.” *Journal of the European Economic Association*, 9, 646–677.

Daly, Steve (2003). “Indonesia/Central Aceh: JSC Calls for Immediate Action by Police.” *Joint Security Committee Press Release*.

De Mesquita, Ethan Bueno (2005). “The Quality of Terror.” *American Journal of Political Science*, 49, 515–530.

Deaton, A. and R. Miller (1995). “International Commodity Prices, Macroeconomic Performance, and Politics in Sub-Saharan Africa.” Working Paper, Princeton Studies in International Finance.

Dube, Oeindrila, Omar García-Ponce, and Kevin Thom (2016). "From Maize to Haze: Agricultural Shocks and the Growth of the Mexican Drug Sector." *Journal of the European Economic Association*, 14, 1181–1224.

Dube, Oeindrila and Juan F. Vargas (2013). "Commodity Price Shocks and Civil Conflict: Evidence from Colombia." *Review of Economic Studies*, 80, 1384–1421.

Dudwick, N. and R. Srinivasan (2013). "Creating Jobs in Africa's Fragile States: Are Value Chains the Answer?" Tech. rep., The World Bank, Washington, D.C.

Fearon, James (2008). "Economic Development, Insurgency, and Civil War." In *Institutions and Economic Performance*, edited by Elhanan Helpman. Harvard University Press.

Fearon, James D. and David D. Laitin (2003). "Ethnicity, Insurgency and Civil War." *American Political Science Review*, 97, 75–90.

Felter, Joseph H. (2005). *Taking Guns to a Knife Fight: A Case for Empirical Study of Counterinsurgency*. Ph.D. thesis, Stanford University, Stanford, CA.

Frankel, Alison (2018). "Chiquita Must Face Jury in Colombian Terror-Funding Case – Miami Judge." https://www.reuters.com/article/legal-us-otc-chiquita/chiquita-must-face-jury-in-colombian-terror-funding-case-miami-judge-idUSKBN1ET2C8, retrieved 1 May 2019.

Ghobarah, H. A., Paul Huth, and Bruce Russett (2004). "The Post-War Public Health Effects of Civil Conflict." *Social Science & Medicine*, 59, 869–884.

GMA News (2009). "1 Dead, 6 Hurt in Suspected MILF Attack in Cotabato." *GMA News*.

GMA News (2011). "Rebels Attack Banana Plantation in Surigao Sur – Police." *GMA News*.

Grossmann, H., D. Bagwitz, R. Elges, G. Kruk, and R. Lange (2009). "Sustainable Economic Development in Conflict-Affected Environments: A Guidebook." Tech. rep., GTZ – Deutsche Gesellschaft fur Technische Zusammenarbeit, Eschborn, Germany.

Guardado, Jenny and S. Pennings (2016). "The Seasonality of Conflict." Working paper, Georgetown University, Washington, D.C.

Harari, Mariaflavia and Eliana La Ferrara (2018). "Conflict, Climate and Cells: A Disaggregated Analysis." *Review of Economics and Statistics*, 100, 594–608.

Hirshleifer, Jack (1989). "Conflict and Rent-Seeking Success Functions: Ratio vs. Difference Models of Relative Success." *Public Choice*, 63, 101–112.

Hsiang, Solomon, Marshall Burke, and Edward Miguel (2013). "Quantifying the Influence of Climate on Human Conflict." *Science*, 341, 125367.

Hsiang, Solomon M. (2010). "Temperatures and Cyclones Strongly Associated with Economic Production in the Caribbean and Central America." *Proceedings of the National Academy of Sciences*, 107, 15367–15372.

Humphrey, J. (2005). "Shaping Value Chains for Development: Global Value Chains in Agribusiness." Tech. rep., GTZ – Deutsche Gesellschaft fur Technische Zusammenarbeit, Eschborn, Germany.

Jones, Matthew (2016). "Dole-Stanfilco Closes two Philippine Operations." http://www.fruitnet.com/asiafruit/article/169561/dole-stanfilco-closes-two-philippine-operations, retrieved 1 May 2019.

Kalyvas, Stathis (2006). *The Logic of Violence in Civil War*. Cambridge University Press.

Larrahondo, J. E., C. O. Briceño, M. Rojas, and M. Palma (2006). "An Assessment of After Harvest Sucrose Losses from Sugarcane Field to Factory." *Sugar Tech*, 8, 233–238.

Leon, Gianmarco (2012). "Civil Conflict and Human Capital Accumulation: The Long Term Effects of Political Violence in Peru." *Journal of Human Resources*, 47(4), 991–1022.

Lim, Frinston (2012). "6 NPA Rebels Killed in Attack on Japanese Banana Plantation." *Inquirer Mindanao*.

Lim, Frinston (2014). "NPA Rebels Ransack Banana Plantation in Compostela Valley." *Inquirer Mindanao*.

Limodio, Nicola (2018). "Terrorism Financing, Recruitment and Attacks: Evidence from a Natural Experiment in Pakistan." Working Paper, Bocconi University, Milan, Italy.

Lopez, H. and Q. Wodon (2005). "The Economic Impact of Armed Conflict in Rwanda." *Journal of African Economies*, 14, 586–602.

Mansour, Hani and Daniel I. Rees (2012). "Armed Conflict and Birth Weight: Evidence from the al-Aqsa Intifada." *Journal of Development Economics*, 1, 190–199.

Miguel, Edward and Shanker Satyanath (2011). "Re-examining Economic Shocks and Civil Conflict." *American Economic Journal: Applied Economics*, 3, 228–232.
Miguel, Edward, Shanker Satyanath, and Ernest Sergenti (2004). "Economic Shocks and Civil Conflict: An Instrumental Variables Approach." *The Journal of Political Economy*, 112, 725–753.
Mindanao Examiner (2014). "Armed Men Raid Banana Plantation in Southern Philippines." *Mindanao Examiner*.
MindaNews (2010). "Alleged NPA Rebelsc Attack Banana Plantation in Magpet." *MindaNews*.
Parker, J. C. (2008). "A Synthesis of Practical Lessons from Value Chain Projects in Conflict-Affected Environments." Tech. rep., United States Agency for International Development (USAID), Washington, D.C.
Ranada, Pia (2017). "Duterte to Mining Firms: Face Closure if You Pay NPA Tax." https://www.rappler.com/nation/189154-duterte-mining-companies-npa-revolutionary-tax.
Rediff (2009). "India Tea Firms Accused of Paying off Separatist Rebels." *rediff.com*.
Sánchez de la Sierra, Rául (2015). "On the Origin of States: Stationary Bandits and Taxation in Eastern Congo." Working Paper, University of California, Berkeley, CA.
Shapiro, Jacob N. and David A. Siegel (2007). "Underfunding in Terrorist Organizations." *International Studies Quarterly*, 51, 405–429.
Skaperdas, Stergios (1996). "Contest Success Functions." *Economic Theory*, 7, 283–290.
Soares, Claire (2007). "Chocoholics May Be Funding War in Africa." *The Independent*.
Sugar Regulatory Authority (2016). "Milling Schedule." http://www.sra.gov.ph/industry-update/milling-schedule/, retrieved 1 May 2019.
Unson, John (2011). "Blast Hits N. Cotabato Banana Farm." *Philippine Star*.
Unson, John (2015). "NPA Attacks Farm, Army Detachment in North Cotabato." *Philippine Star*.
Vanzi, Sol Jose (2003). "Pampanga Sugar Mill Ransacked by NPA." *Philippine Headline News*.
Webber, C. M. and P. Labaste (2010). "Building Competitiveness in Africa's Agriculture: A Guide to Value Chain Concepts and Applications." Tech. rep., World Bank, Washington, D. C.
Weinberger, K. and T. A. Lumpkin (2005). "Horticulture for Poverty Alleviation – the Unfunded Revolution." Working Paper 15, AVRDC – The World Vegetable Center, Tainan, Taiwan.
Wijenayake, Lal (2013). "Wide Spread Incidents of Extortion Taking Place Throughout the Country - LfD." *Colombo Telegraph*.
World Bank (2008). *World Development Report 2008: Agriculture for Development*. World Bank, Washington, D. C.
World Bank (2011). *World Development Report 2011: Conflict, Security, and Development*. World Bank, Washington, D. C.
World Economic Forum (2014). "The Role of the Private Sector in Fragile States: Catalyzing Investment for Security and Development." Discussion paper, World Economic Forum, Global Agenda Council on Fragile States and Conflict Prevention 2013-2014, Davos, Switzerland.

Supplementary Data

Supplementary data are available at *JEEA* online.