Export Crops and Civil Conflict

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Abstract

Many experts consider a move towards 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 intensity to show that increases in the value of two major export crops – bananas and sugar – caused increases in conflict violence and insurgent-controlled territory in the Philippines. Our results are consistent with a mechanism in which insurgents fund their operations by extorting large agricultural export firms.

Keywords: Export Crops, Civil Conflict, Insurgent Control, Bananas, Sugar

JEL Classification: O13, Q17, H56, D74

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1. Introduction

Many governments and international experts see a move towards 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 (Weinberger and Lumpkin, 2005; Humphrey, 2005; World Bank, 2008; Webber and Labaste, 2010; World Bank, 2011; Dudwick and Srinivasan, 2013). To take advantage of this opportunity, developing countries invest heavily in the production of non-traditional export crops like fruits and vegetables. The Least 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 improve 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]

The evidence on how a move towards export crops affects fragile and conflict-affected countries is, however, limited. 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 and the opportunity cost of joining an armed group (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

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

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 towards export crops will increase conflict by increasing opportunities for armed groups to raise funds 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, qualitative evidence suggests 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). An increase in civil conflict due to these predation incentives could have devastating effects on human welfare, which could more than offset any possible gains due to increased employment and profits from 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, but we also 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 Philippines (Berman et al., 2011; Crost et al., 2014). Our results show that

[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; Mansour and Rees, 2012; Akresh et al., 2012).

provinces where average banana production is high experience an increase in violent conflict in years with high world market banana prices, relative to provinces that produce few or no bananas. Robustness tests find no evidence that this result is due to non-parallel time trends between provinces with different levels of average crop production. We address the possible endogeneity of banana prices and quantities by instrumenting banana production with its baseline level before the period of observation and instrumenting the world market banana price with rainfall in Ecuador, the world's leading banana exporter.

To our knowledge, this is the first study to document a conflict-increasing effect of increases in the value of legal agricultural exports.[3] Previous studies have found mixed evidence on the relationship between commodity values and civil conflict. While Brückner and Ciccone (2010) found that increases in the value of export commodities increase the incidence of civil conflict across countries, Besley and Persson (2008) found the opposite effect and Deaton and Miller (1995) found no effect. However, all three studies estimate the effect of changes in the value of different types of export commodities taken together and do not distinguish between agricultural and mineral commodities. 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 micro-level studies based on within-country analyses (Blattman and Miguel, 2010; Bazzi and Blattman, 2014). Bazzi and Blattman (2014) specifically estimate the effect of increases in the value of agricultural exports and find no evidence that they affect the incidence and onset of civil conflict but some evidence that they make existing conflicts more likely to end. In a seminal within-country study, Dube and Vargas (2013) showed that increases in the price of coffee led to decreases in conflict in the coffee-producing regions of Colombia, while an increase in the price of oil led to an increase in conflict in oil-producing regions. This result is consistent with a model in which an increase in commodity prices

[3]Angrist and Kugler (2008) found that increases in the value of coca led to increases in conflict. It is, however, difficult to extrapolate from this context to that of legal exports, since coca production and export are entirely in the hands of clandestine armed groups.

leads to an increase in incentives for predation, but also an increase in wages and therefore the opportunity cost of joining armed groups Dube and Vargas (2013); Dal Bo and Dal Bo (2011). The opportunity cost effect dominates for labor-intensive commodities such as coffee, while the predation effect dominates for capital-intensive commodities such as oil.

We explore two possible explanations for the difference between our results and those found by Dube and Vargas (2013) in the context of Colombian coffee. The first is that the value chain for bananas is highly centralized with only a small number of large export firms, whereas that of coffee is relatively decentralized, consisting of many small farmers and traders. 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 exporters (Collier, 2000), which might explain why the predation effect dominates in the case of bananas while the opportunity cost effect dominates in the case of coffee. To test this explanation, we estimate the effect of changes in the value of two other banana varieties, Lacatan and Saba, which are grown for domestic consumption and distributed through highly decentralized markets with many small traders and wholesalers. 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 traded almost exclusively in decentralized domestic markets. These results are consistent with anecdotal evidence that armed insurgent groups fund themselves to a large extent by extorting big agricultural export companies, most likely because this is more cost-effective than extorting a large number of small farmers (Vanzi, 2003; Apuzzo, 2007; MindaNews, 2010; GMA News, 2009, 2011; Lim, 2012, 2014; Unson, 2011, 2015).

As a second explanation for the difference between our results and those of Dube and Vargas (2013), we explore a possible role of baseline insurgent capacity. Theoretical models suggest that insurgent capacity has a non-monotonic relationship with conflict intensity (Hirshlei-

fer, 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. This might explain the difference to the results of Dube, if insurgent capacity was high in the coffee-producing regions of Colombia, so that an increase in crop values would have led to a decrease in conflict violence.

We explore this mechanism 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 under the control of 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 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 increased crop values depends on baseline insurgent control in 2001, at the beginning of our period of observation. We find that the violence-

increasing effect 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 insurgent capacity has a non-monotonic relationship with conflict intensity, perhaps because strong insurgent groups can establish local monopolies of violence that the government can no longer contest. [4]. While such a non-monotonic relationship is predicted by several influential models of conflict, our study is among the first to test this prediction with quantitative empirical evidence.

Our results have important implications for agricultural and development policies in fragile and conflict-affected countries. They suggest that a move towards export crops can have the unintended consequence of strengthening insurgent groups and exacerbating civil conflict. They further highlight the importance of local context – one should be careful when extrapolating the effect of one agricultural commodity on conflict in one country to the effect of a different commodity in a different country – and contribute to a deeper and more nuanced understanding of the mechanism through which export crops affect civil conflict.

2. Background

Global agricultural trade has rapidly expanded in recent years. 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

[4]This mechanism is consistent with the results of Sánchez de la Sierra (2015), who found that rebel groups in the Democratic Republic of Congo were able to establish local monopolies of violence in response to increases in the value of a taxable commodity.

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, while the value of horticultural exports has 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 all bananas for the world market in 2011, followed by Colombia, Guatemala and the Philippines. 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, usually by truck or cableway. The bunches are then 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 the processing plant.

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% percent 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 2 shows the geographic distribution of Cavendish bananas across the country. The figure shows that production mostly takes place in Mindanao and the Visayas.

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, 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 2 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 reaches back to Spanish colonial rule. After a decline in the late 1990s and early 2000s, sugar exports have experienced a resurgence – in 2011 their valued was just over 350 million US dollars, approximately 7.5 % of the country's total agricultural exports. Like 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; MindaNews, 2010; GMA News, 2009, 2011; Lim, 2012, 2014; Unson, 2011, 2015). The following section describes the country's major armed groups and their main funding sources.

2.1. 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 of the Philippines and replace it with a communist system. The group is becoming increasingly involved, however, in extortion and intimidation of landowners, politicians, as well as firms involved in construction, mining and large-scale agriculture.

There are numerous media reports that the NPA has been involved in attacks on sugar mills, banana plantations and packing plants (Vanzi, 2003; MindaNews, 2010; GMA News, 2011; Lim, 2012, 2014; Unson, 2015), often allegedly because an export firm refused to pay protection money. 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 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 2000's: "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.[5]"

Another long-running conflict in the country is taking place between the government and 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 group split off from the

[5]Interview with Armed Forces of the Philippines field commander April 24, 2016.

Moro-National Liberation Front (MNLF) in 1976, after that group entered a peace agreement with the government of the Philippines that led to the establishment of the Autonomous Region in Muslim Mindanao (ARMM). During the period of observation of this paper, 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. Theoretical Background on Mechanisms

The previous literature identifies two basic mechanisms through which changes in commodity values, or other economic shocks, can affect civil conflict: by changing the payoff of fighting relative to peaceful activities and by changing the capacity to fight. An increase in the payoff of fighting has been referred to as the predation , rapacity, or greed mechanism (Berman et al., 2012; Dube and Vargas, 2013; Collier and Hoeffler, 2004). 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, such as attacks on enemy positions (Dal Bo and Dal Bo, 2011; Berman et al., 2012). An increase in the return to peaceful activities, which leads to a decrease in the relative return to fighting, is usually referred to as the opportunity cost mechanism. Through this mechanism, rising commodity values are thought to decrease violence by increasing rural employment and wages, which increases the opportunity cost of engaging in conflict (Dal Bo and Dal Bo, 2011).

The effect of commodity values on the capacity to fight can be further divided into two mechanisms. The first is tied to the opportunity cost mechanism. By generating employment in the peaceful economy, an increase in commodity values makes recruiting more costly for insurgent groups and thereby decreases their capacity to fight (Dal Bo and Dal Bo, 2011; Dube and Vargas, 2013). While this mechanism should, in principle, equally affect the ability of government forces and insurgents to recruit, it is generally thought to decrease the relative strength of insurgents since their tactics are usually more labor-intensive. Second, an increase in commodity values can increase the revenue of any group, government or insurgents, that can appropriate the surplus generated by the commodity. The literature has generally discussed this in terms of a "state capacity" effect: an increase in commodity values leads to an increase in tax revenue, which the government can invest in its security

apparatus, perhaps by increasing the size of its army or investing in better equipment. The increase in the strength of the security forces makes it harder for insurgent groups to contest the government, leading to a reduction in conflict violence (Fearon and Laitin, 2003).

While the literature usually frames this effect in terms of state capacity, it should in principle apply symmetrically to all groups engaged in a conflict. The effect of an increase in commodity values on the relative capacity of government and insurgents should therefore depend on which group can appropriate more of the surplus generated by it, whether through taxation, extortion or other forms of predation. We will thus refer to this mechanism as the indirect predation effect, meaning the violence caused (or avoided) by changes in group capacity that occur as a result of appropriation, as distinct from the direct predation effect, meaning the violence caused by the appropriation attempts themselves.

It should further be noted that an increase in the capacity of an insurgent group will not necessarily lead to an increase in violence. Theoretical models of conflict, particularly the class of models 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). Imagine, for example, a contest between the government of a state and a rebel group for control of a valuable prize.[6] If the prize is located in a region where the government's capacity is much higher than that of 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, so both groups believe that they have a sufficiently high probability of winning the contest. The effect of an increase in insurgent capacity therefore

[6]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.

depends on the initial level of capacity.

This argument is graphically presented in the diagram in Figure 3. 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, perhaps due to an increase in the opportunity cost of joining the insurgency, 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 of distinguishing the opportunity cost channel from the indirect predation channel using only data on conflict violence. The observation that an increase in commodity values leads to a decrease in violence can be explained by both mechanisms. It could result from an increase in opportunity cost that leads to a decrease in insurgent capacity in a region where it was initially low (point A to A'). But it could also result from an increase in extortion revenue, leading to an increase insurgent capacity in a region where their capacity was initially high (point B to B').

Data on insurgent capacity, however, allows us to distinguish between the two channels. 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 the direct predation or the opportunity cost channel. We test these predictions in the section 6.1 of the paper, using data on insurgents' control of villages as a proxy for their local capacity.

4. Empirical strategy

Our empirical strategy is a difference-in-differences type approach based on movements in world market prices combined with province-level variation in crop production, 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 intensity of Cavendish production, defined as its average annual production of Cavendish bananas during the period 2002-2009,[7] $Price_t$ denotes the natural logarithm of the crop's world market price in year t, and α_i and λ_t are province and year fixed effects. The focus of our analysis is on Cavendish bananas, but we also obtain estimates for sugar as another example of an export crop and rice as an example of a staple crop grown for the domestic market. We also estimate the effect of two banana varieties, Lacatan and Saba, which are grown almost exclusively for a decentralized domestic market. The outcome of interest, Y_{it}, is the number of violent conflict incidents, defined as incidents that led to at least one casualty. Standard errors are clustered at the province level.[8]

Intuitively, the coefficient β_1 is identified by comparing the relationship between the world

[7]Data on Cavendish production is unavailable before 2002, so that we cannot use baseline Cavendish production as a measure of crop intensity. Below, we present several robustness tests to rule out that our estimates are affected by reverse causality from conflict to crop production.

[8]Robustness tests show that our results remain qualitatively unchanged when using the spatially clustered standard errors developed by Conley (2008) and previously used by Hsiang et al. (2011); Crost et al. (2015) in the study of civil conflict.

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 value 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 includes the "lead" of the interaction term, i.e. $Cavendish_i \times Price_{t+1}$ into equation 1. If our results were driven by non-parallel time trends, we would expect the lead coefficient to be significantly different from zero. We show, however, 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.

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

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

Here, the coefficient θ_j captures the slope of the relationship between a province's Cavendish intensity and conflict in year j. If conflict in Cavendish producing regions is driven by changing prices, the time-profile of the $theta_j$ coefficients should match the evolution of the world market price. We test this prediction below by graphing the $theta_j$ coefficients together with world market prices against time.

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 for 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 overly wet soil. This decrease in supply leads to an increase in the world market price of bananas that is exogenous to the conflict in the Philippines.

A further limitation comes from the fact that data on Cavendish production is only available starting in 2002, during the period of observation. Data on baseline Cavendish production is therefore unavailable – instead we measure a province's Cavendish intensity as the average production over the entire period of observation. A potential concern about this approach is that crop production might itself be affected by civil conflict. Since our regressions include province and time fixed effects, this does not generally bias our estimates, as long as the effect of conflict on Cavendish production does not depend on the world market price. It is, however, possible that conflict leads to a larger reduction in crop production when the world market price is low. In that case, provinces that experience conflict in high price years would have higher average crop production over the period of observation than provinces that experience conflict in low price years, which would bias our estimates upward due to reverse causality.

We do not believe that this is likely, since provincial production levels of bananas and are very stable during the period of observation and do not appear to respond to changes in conflict, regardless of the world market price. To provide evidence for this, we conduct a robustness test in which we regress annual province-level Cavendish production on the number of conflict incidents and their interaction with the world market Cavendish price. We find no statistically significant evidence that the relationship between conflict and crop production

differs between years with high and low prices. Furthermore, the point estimates suggest that conflict is associated with a larger decrease in production in high price years, which would bias our estimates downward. As an additional robustness test, we show that our estimates remain positive and statistically significant when we instrument average $Cavendish_i$ with baseline Cavendish production in 2002 and limit the period of observation to 2003-2009.[9]

A final concern for our analysis is the relatively strong spatial concentration of export crop production in the Philippines. For instance, the map in Figure 2 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, e.g. only using data from Mindanao, to rule out that our results are driven by unobserved shocks to a particular island group.[10]. Second, we estimate the spatial autocorrelation robust standard errors described by Conley (2008) and previously implemented by Hsiang (2010).

5. Data and Summary Statistics

Data on conflict incidents 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); Crost et al. (2014, 2015) 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

[9] A major drawback of this approach is that we lose the substantial variation in Cavendish prices that resulted from the drop in prices between 2001 and 2003, which is why we treat these results as a robustness test rather than our preferred specification.

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

combatant and civilian casualties. While it is possible that military units had incentives to misreport incidents, the fact that the reports were not originally intended for public release and were used by the armed forces to plan their own operations makes them an unusually reliable source of data on conflict events.[11] 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. (2015) to study the effect of seasonal rainfall on conflict in the Philippines.

Our analysis also makes use of 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 that group's local capacity. Data on this measure was collected from intelligence assessments conducted by the Armed Forces of the Philippines in support of their campaign planning in 2001, 2004 and 2008.[12] 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.[13] Data derived from intelligence assessments of this type have been used by Crost et al. (2015) 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 reported to be in 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., 2015). We believe that this measure is a good proxy for the NPA's

[11] 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.

[12] 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.

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

local capacity, since only a locally dominant insurgent force will 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.[14]

Data on agricultural production come from the Philippine Bureau of Agricultural Statistics and is available through the CountryStat database.[15] As described in Section 4, our main measure of a crop's production intensity in a given province is the average annual amount produced over the period of observation, 2001-2009. To deal with the possible endogeneity of this measure to conflict, we also conduct robustness tests that use baseline production in 2000 as the measure of crop intensity. Data on production of different banana varieties is unfortunately only available from 2002 onwards. Our robustness tests for endogeneity of Cavendish banana production therefore use production in 2003 as the baseline measure and restrict the period of observation to 2003-2009.

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. (2015). 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

[14]The median province with a non-zero number of villages in the highest influence category has 2.1 % of villages in this category.

[15]`http://countrystat.bas.gov.ph/`. This website was last accessed in February of 2015.

World Bank's Commodity Price Data (the "Pink Sheet"). Prices are adjusted for inflation and reported in 2010 US dollars.

Table 1 presents summary statistics. There are 29 Cavendish producing provinces in the country, which on average produce 85,000 metric tons of the crop per year. 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 the 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 New People's Army is by far involved in the most incidents, followed by Lawless Elements and the Moro-Islamic Liberation Front. The Abu-Sayyaf Group is only involved in a very small fraction of incidents.

Figure 1 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 the unobserved variables that follow different linear trends in Cavendish-producing and non-producing 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, however, 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.

6. Results

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 that produces 100,000 metric tons of Cavendish bananas per year experiences approximately 0.24 excess 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 in the price of Cavendish bananas during the period of observation are responsible for a substantial increase in the total number of violent incidents. For example, between 2003 and 2009 Cavendish prices increased by approximately 87%. According to our estimates this increase led to 51 excess violent incidents per year in the 29 Cavendish-producing provinces, which produce on average 85,000 metric tons of the crop per year ($2.4 \times 0.85 \times 29 \times 0.87 = 51$).[16]

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 value.

Figure 4 shows estimates of the θ_j coefficients from equation 2 plotted next to the time series

[16]The magnitudes of our estimates are similar to those found by Dube and Vargas (2013) for the case of coffee in Colombia. They 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.

of world market Cavendish prices. As discussed in Section 4, the θ_j coefficients reflect how the slope of the relationship between province-level Cavendish intensity and conflict evolves over time. 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 world market 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.

Table 3 shows that our estimates are robust to controlling for spatially correlated unobserved shocks in the form of island-group-by-time fixed effects. Columns 4 through 6 further show 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.

Table 4 tests whether Cavendish production was affected by changes in conflict at the province-level. As discussed in Section 4, this could lead to an upward bias in our estimates if conflict leads to a greater decrease in crop production when world market prices are low relative to when they are high. The results in Table 4 show no evidence that conflict (measured as either the number of violent incidents or the number of casualties) affects Cavendish production, regardless of world market prices. Furthermore, the point estimate associated with the interaction of conflict and price suggests that conflict leads to a larger decrease in production in high price years, which would bias our estimates downward.

Table 5 shows estimates of our Instrumental Variables approach in which we instrument banana production with its baseline level in 2002 and the world market banana price with

rainfall in the banana-producing regions of Ecuador. The estimated coefficients are very similar in magnitude to the OLS coefficients in Table 2, even in the specifications in columns 2 and 3, for which we have to drop the first two years of observations because data on Cavendish production is not available before 2002. This suggests that our baseline estimates did not suffer from bias due to the potential endogeneity of world market prices and province-level banana production.

In Table 6, we separately present estimates of the effect of Cavendish value on violence initiated and suffered by different groups. Columns 1 and 2 of Table 6 show that the effect is approximately equal for incidents initiated by the government and by insurgent groups. Columns 3 through 5 show, however, that the effect is largest for incidents with at least one government casualty. The effect on incidents with at least one insurgent casualty is substantially smaller and not statistically significant at conventional levels. The effect on incidents with civilian casualties is also small in absolute numbers, but statistically significant and large relative to the low mean of such 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 are opposed to their agenda.

Next, we present separate estimates for different insurgent groups in Table 7. It shows that the effect is by far largest for incidents involving the New People's Army, consistent with the large amount of anecdotal 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 and Lawless Elements. For the Abu Sayyaf Group, the effect is statistically significant and small in absolute numbers, though large relative to the low mean of incidents involving the group.

6.1. Exploring 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 increase 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 non-monotonic relationship between control and violence, as discussed in Section 3 and depicted in Figure 3. To test this explanation, we compare the effects of crop values in areas with different levels of insurgent control at baseline.

Table 8 Column 1 shows that an increase in Cavendish value 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 aggregate violence because the government has less ability to contest the territory. Columns 2 and 3 show direct evidence for this hypothesis. They show that an increase in Cavendish value leads to an increase in the number of villages controlled by the New People's Army. The estimates in column 1 show that a 10% increase in Cavendish prices increases the number of NPA controlled villages by 2.4 in a province that produces 100,000 metric tons of Cavendish

bananas (recall that the average Cavendish-producing province produces 85,000 tons of the crop). The results in column 2 suggest that the size of the effect depends on the baseline level of NPA control: it is equal to 2.3, 2.9 and 7.8 in provinces with low, medium, and high baseline control, respectively. These effects are sizable, considering that the mean numbers of NPA-controlled villages are 8, 10 and 24 in provinces with low, medium, and high baseline control, respectively.

Next, we explore the role of market concentration. The value chain for bananas is highly centralized with only a small number of large export firms whereas that of coffee, the context studied by Dube and Vargas (2013), is relatively decentralized, consisting of many small farmers and traders. The transaction costs of extortion may therefore be higher for coffee, which might explain why the opportunity cost effect dominates in that context while the predation effect dominates in the case of bananas. To test this explanation, Table 9 estimates the effect of increases in the value of several crops that differ in market structure. 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, both 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. Specifically, a 10% increase in the world market sugar price on average leads to 0.147 excess violent incidents in provinces with 1 standard deviation higher average sugar production. Column 4 shows that this effect is concentrated in provinces with low to medium baseline NPA control, and 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.

Overall, we believe that our results are best explained by the indirect predation effect described in Section 3. Insurgents, particularly the NPA, extort resources from banana exporters and use them to fund additional recruits, arms and equipment, which leads to an increase

in their local capacity. This increase is particularly strong in provinces where NPA capacity was already high, most likely because the group is able to extort a larger portion of the surplus from banana production there. Consistent with the predictions of contest-success models (Hirshleifer, 1989; Skaperdas, 1996), this leads to an increase in violence in provinces where the NPA's capacity was initially low and a decrease in provinces where its capacity 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 low initial NPA capacity was due to the direct effect of predation, such as extortion-related attacks on banana and sugar facilities (Vanzi, 2003; Apuzzo, 2007; MindaNews, 2010; GMA News, 2009, 2011; Lim, 2012, 2014; Unson, 2011, 2015). Our results suggest, however, that at least in areas with high initial NPA capacity, a possible direct predation effect was outweighed by a reduction in violence due to an indirect predation effect. Importantly, the fact that the effect of crop values on conflict flips signs from positive to negative as we move from low to high baseline insurgent capacity is difficult to explain with the opportunity cost mechanism or the direct predation mechanism alone.

The indirect predation mechanism also offers an explanation for why we find no effect of increases in the value of non-export crops like rice and domestically consumed bananas. These crops are traded in decentralized markets 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 an increase in violence through the direct or indirect predation channel.

7. 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 can reduce conflict by creating employment in the peaceful economy, which raises the opportunity cost of joining armed groups. While the evidence on the effect of export commodities on conflict is generally mixed (Deaton and Miller, 1995; Besley and Persson, 2008; Brückner and Ciccone, 2010; Bazzi and Blattman, 2014), this optimistic view is supported by evidence from Colombia, which shows that increases in the value of coffee led to a decrease in conflict violence (Dube and Vargas, 2013).

Our results suggest that the effect of an increase in the value of export crops on civil conflict is highly dependent 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 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 no evidence that changes in the value of non-export crops, such as domestically consumed banana varieties and rice, affect the intensity of conflict.

Our findings are consistent with the hypothesis that a locally dominant insurgent group can gain capacity from extorting agricultural exporters, and the capacity of that group has a non-monotonic effect on conflict intensity. This mechanism is consistent with previous findings that increases in the value of a taxable commodity have 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 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 value chains determine the ways in which commodity values affect conflict.

Our analysis also 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 effect of economic conditions on insurgent capacity and the interaction of economic conditions and control on 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 suggest that 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.

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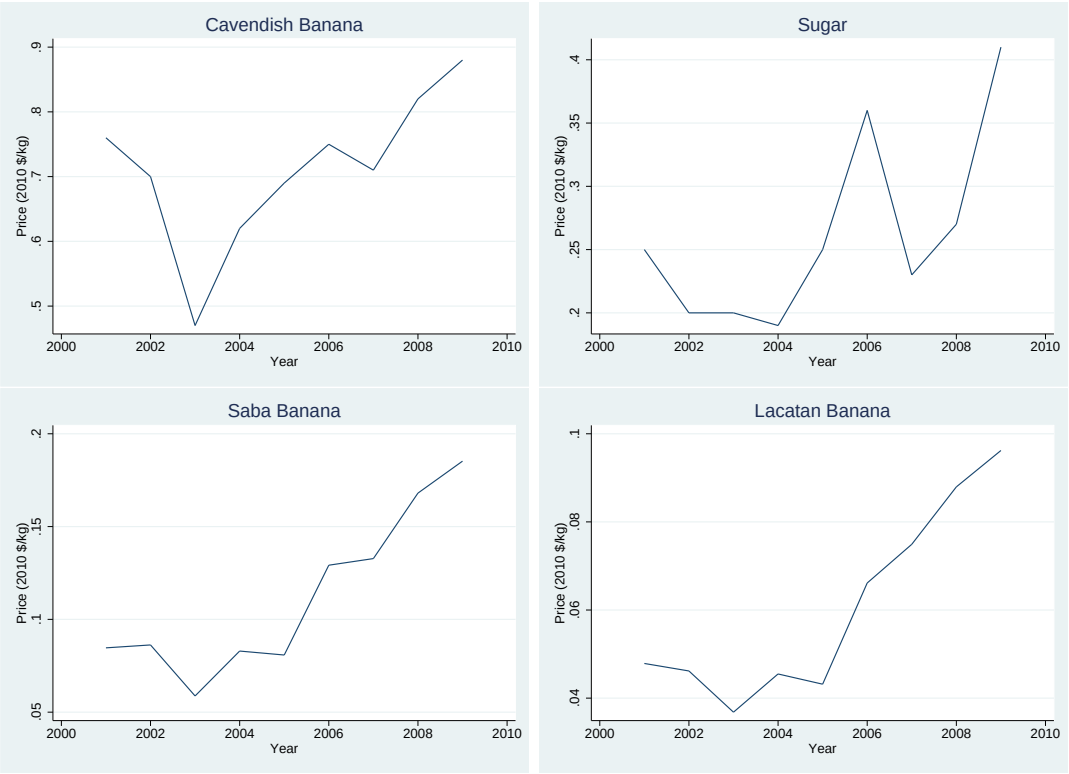
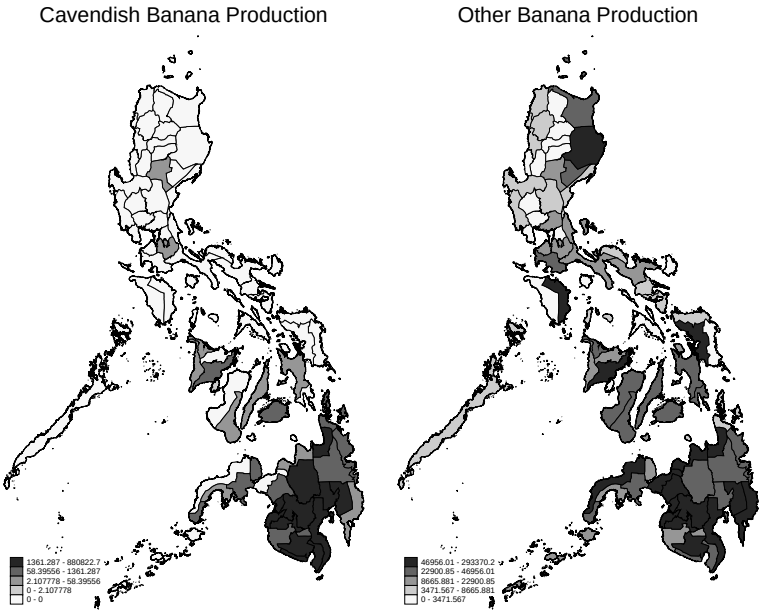
Figure 1. Commodity Prices, 2001-2009



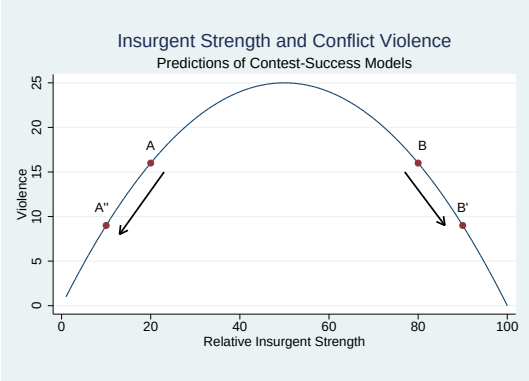
The figure shows average annual crop prices for the period 2001-09. For Cavendish bananas and sugar, we report world market prices from the World Bank's Commodity Price Data (the "Pink Sheet"). For Lacatan and Saba, we report domestic prices from the Philippine Bureau of Agricultural Statistics. All prices are converted to 2010 US dollars.

Figure 2. Mean Banana Production by Province



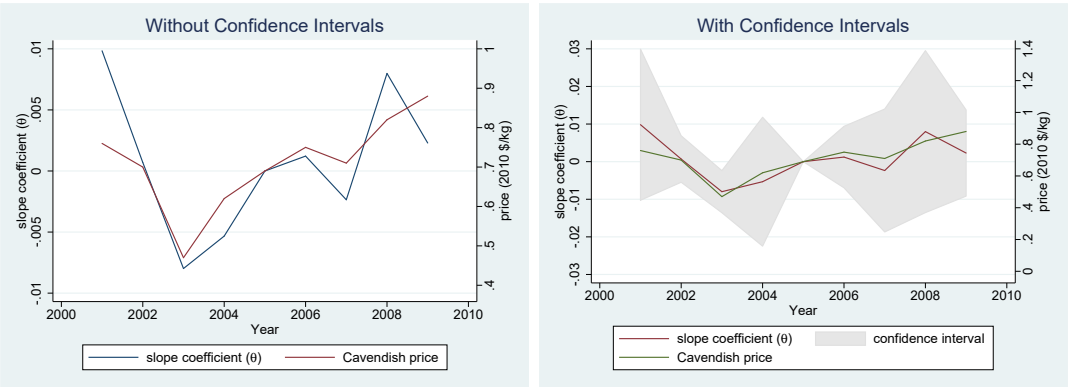
The figure shows mean production of Cavendish and other bananas by province during the period 2001-09, based on data from the Philippine Bureau of Agricultural Statistics.

Figure 3



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).

Figure 4. 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.

Table 1. Summary Statistics

	Cavendish producing province:	
	Yes	No
Cavendish production (1000 metric tons)	85.7	0
	(246.7)	
Lacatan Production (1000 metric tons)	16.8	4.3
	(25.7)	(13.4)
Saba Production (1000 metric tons)	40.0	16.9
	(53.8)	(31.9)
Sugarcane Production (1000 metric tons)	279.8	322.3
	(660.0)	(1617.7)
Rice Production (1000 metric tons)	188.6	194.8
	(170.4)	(258.0)
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

The unit of observation is the province-year.

Table 2. The Value of Banana Production and Civil Conflict

	Dependent Variable: Violent Incidents			
	(1)	(2)	(3)	(4)
Cavendish Prod. (100k tons) × Log Price	2.21**	2.36**	2.18***	2.90***
	(1.00)	(1.05)	(0.52)	(0.91)
Cavendish Prod. × Lead of Log Price			0.058	
			(1.08)	
Control variables	No	Yes	No	Yes
No. of provinces	77	77	77	77
No. of observations	691	691	691	614

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 parenthesis. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 3. Robustness Tests for Spatially Correlated Shocks

	Dependent Variable: Violent Incidents			
	(1)	(2)	(3)	(4)
Cavendish Prod. (100k tons) × Log Price	2.79**	3.00**	3.25**	2.36***
	(1.27)	(1.31)	(1.36)	(0.38)
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

Reported values are average marginal effects of Poisson regressions. Standard errors are in parenthesis. 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 5000km and a maximum lag of 9 years. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 4. Civil Conflict and Cavendish Production

	Dependent Variable: Log Cavendish Production			
	(1)	(2)	(3)	(4)
Violent Incidents	0.014	0.029		
	(0.018)	(0.022)		
Violent Incidents × Log Cavendish Price	–0.0083	–0.030		
	(0.030)	(0.035)		
Casualties			0.0050	0.0094
			(0.0057)	(0.0066)
Casualties × Log Cavendish Price			–0.0049	–0.011
			(0.0083)	(0.0093)
Control variables	No	Yes	No	Yes
No. of provinces	77	77	77	77
No. of observations	616	616	616	616

Control vaiables 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. The dependent variable is the natural logarithm of annual province-level Cavendish production in metric tons (adding one ton to deal with observations with zero production). Standard errors, clustered at the province level, are in parenthesis. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 5. Robustness Test: Instrumenting Price and Quantity

Dependent Variable:	IV Violent incidents			First Stage Cavendish prod. × Log. U.S banana price		
	(1)	(2)	(3)	(4)	(5)	(6)
Cavendish Prod. (100k tons) × Log Price	2.52**	2.15**	2.68**			
	(1.26)	(1.02)	(1.21)			
Baseline Cavendish prod. × Log Price					0.11***	
					(0.0050)	
Cavendish prod. × Rainfall in Ecuador				0.017***		
				(0.000082)		
Baseline Cavendish prod. × Rainfall in Ecuador						0.19***
						(0.0089)
Price IV: Rainfall in Ecuador	Yes	No	Yes			
Quantity IV: Cavendish production in 2002	No	Yes	Yes			
Excluding 2001-02	No	Yes	Yes	No	Yes	Yes
No. of provinces	77	77	77	77	77	77
No. of observations	691	539	539	691	539	539

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 parenthesis. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 6. Who Initiates and Who Suffers the Violence?

	Initiated by:		Casualties suffered by:		
	Government	Insurgents	Armed Forces	Insurgent	Civilian
	(1)	(2)	(3)	(4)	(5)
Cavendish Prod. (100k tons) × Log Price	1.20	1.58***	1.69*	0.85**	0.44*
	(0.79)	(0.51)	(0.94)	(0.39)	(0.22)
No. of provinces	77	77	77	77	77
No. of observations	691	691	691	691	691

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 parenthesis. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 7. Effect on Conflict with Different Rebel Groups

	Violent Incidents Involving:			
	NPA	MILF	LE	ASG
	(1)	(2)	(3)	(4)
Cavendish Prod. (100k tons) × Log Price	2.21*	–0.086	0.12	0.095*
	(1.22)	(0.15)	(0.29)	(0.051)
No. of provinces	77	77	77	77
No. of observations	691	691	691	691

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 parenthesis. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 8. The Role of Baseline Insurgent Capacity

	Dependent Variable:		
	Violent Incidents	# of Villages Controlled by NPA	
	(1)	(2)	(3)
Cavendish Prod. (100k tons) × Log Price		24.3*	
		(13.5)	
Cavendish prod. × Log Price × Low NPA capacity	2.04**		23.0
	(1.01)		(14.6)
Cavendish prod. × Log Price × Medium NPA capacity	5.42***		28.6**
	(0.64)		(13.8)
Cavendish prod. × Log Price × High NPA capacity	–6.52***		78.1***
	(1.86)		(27.6)
No. of provinces	77	77	77
No. of observations	691	229	229

Data on villages controlled by NPA come from intelligence assessments by the AFP in 2001, 2004 and 2008. Provinces are divided into three categories of NPA capacity according to the fraction of villages controlled by the group in 2001 (low: no villages controlled by NPA, medium/high: below/above median of provinces with at least one village controlled by NPA). Standard errors, clustered at the province level, are in parenthesis. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 9. Other Crops and Civil Conflict

	Dependent Variable: Violent Incidents			
	(1)	(2)	(3)	(4)
Cavendish Prod. (SD) × Log Cavendish Price	3.20**	3.54**	3.16**	2.59**
	(1.45)	(1.59)	(1.34)	(1.25)
Other Banana Prod. (SD) × Log Cavendish Price	–0.16			
	(0.89)			
Saba Prod. (SD) × Log Saba Price		–8.26		
		(5.61)		
Lacatan Prod. (SD) × Log Lacatan Price		–0.40		
		(3.83)		
Rice Prod. (SD) × Log Rice Price			–0.11	–0.20
			(0.50)	(0.48)
Sugar Prod. (SD) × Log Sugar Price			1.47***	
			(0.37)	
Sugar prod. × Log Sugar Price × Low control				0.014***
				(0.0021)
Sugar prod. × Log Sugar price × Medium influence				0.076***
				(0.015)
Sugar prod. × Log Sugar price × High influence				–0.016
				(0.011)
No. of provinces	77	77	77	77
No. of observations	691	691	691	691

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 parenthesis. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively.