



CEDE

DOCUMENTO CEDE 2006-46
ISSN 1657-7191 (Edición Electrónica)
DICIEMBRE DE 2006

RESOURCE CURSE IN REVERSE: THE COFFEE CRISIS AND ARMED CONFLICT IN COLOMBIA *

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Abstract

Between 1998 and 2003 production increases in Brazil and Vietnam drove down the price of coffee by 73 percent in global markets, triggering the “international coffee crisis”. We examine the effect of this exogenous price shock on Colombia’s civil war, exploring whether politically-motivated violence presented different dynamics in the coffee -growing regions relative to the non- coffee regions, during the pre-crisis and crisis periods. Using a difference-in-differences framework, we find causal evidence that the steep decline in coffee prices substantially increased both the incidence and intensity of Colombia’s civil war. We also propose a simple model linking the price shock to violence and empirically examine the relative importance of three potential mechanisms. While crop substitution from coffee to coca explains very little of the variation, a disproportionate increase in poverty in coffee areas is associated with greater violence, as is a lower state capacity.

Key Words: Colombia, Conflict, Coffee Crisis, Resource Curse, Difference-in-Differences

JEL Classification: D74, Q1.

* A number of scholars provided very useful feedback to previous versions of this paper. We are especially Bustos, Arin Dube, Leopoldo Fergusson, Maria del Pilar Fernandez, Ed Glaeser, Ricardo Hausman, Lakshmi Iyer, Asim Khwaja, Michael Kremer, Carolina Mejia, Sendil Mullainathan, Rohini Pande, James Robinson, Dani Rodrik, Philipp Schnabl, Matthias Schündeln and Michael Spagat. We would also like to thank participants of Harvard’s Lunches in Development Policy, International Development Lunch, and the Civil Conflict and Political Economy Workshops. All remaining errors are our own. Vargas acknowledges financial support from Banco de la República, Colombia and ORSAS, UK.

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UNA ‘MALDICION DE LOS RECURSOS’ AL REVÉS: LA CRISIS CAFETERA Y EL CONFLICTO ARMADO EN COLOMBIA

Resumen

Entre 1998 y 2003 el precio del café en los mercados internacionales cayó 73 por ciento debido al aumento de la producción del grano en Brasil y Vietnam, lo que originó la llamada “crisis cafetera”. En este trabajo exploramos el efecto de dicho choque exógeno sobre el conflicto armado colombiano. La pregunta es si la violencia política presentó una dinámica distinta en las regiones cafeteras en comparación con las no cafeteras, antes y durante la crisis. Haciendo uso de una metodología de *diferencia en diferencias*, encontramos que la caída del precio del café a niveles históricamente bajos generó un aumento importante tanto en la incidencia como en la intensidad del conflicto armado colombiano. También proponemos un modelo sencillo sobre la relación entre los choques de precio y el conflicto armado. De éste se desprenden tres mecanismos posibles de transmisión, cuya importancia relativa examinamos empíricamente. La sustitución de cultivos de café por cultivos ilícitos no parece explicar el aumento desproporcional de la violencia durante la crisis. En cambio, sí hay evidencia de que el aumento diferencial de la pobreza en los municipios cafeteros así como el debilitamiento de la institucionalidad, están asociados con mayor violencia política.

Palabras clave: Colombia, conflicto, maldición de los recursos, crisis cafetera, diferencia en diferencias.

Clasificación JEL: D74, Q1.

1 Introduction

Between 1998 and 2003, coffee, one of the world’s largest lawfully-traded commodities, lost 73 percent of its value in the international market. We explore the extent to which this negative price shock affected armed conflict in Colombia, where a substantial share of rural families continue relying on coffee for their livelihood, and where civil war has persisted for decades. We use a unique event-based dataset which details the attacks and casualties in disaggregated geographic regions of Colombia, over 1988 to 2004. Our empirical strategy exploits exogenous shocks to international prices to assess whether the conflict had different dynamics in geographic areas that grow coffee, relative to areas that do not grow coffee. By applying this *difference-in-differences* methodology, we find considerable evidence that declines in the international price of coffee have *increased* both the incidence and intensity of politically-motivated violence in Colombia. We show that this result is not driven by the overall upsurge in violence during the late nineties or by other potentially confounding factors such as a 1999 earthquake in the main coffee-growing region or the implementation of *Plan Colombia*, a US-backed aid package aimed at illegal crop eradication. In addition, we use a geography and climate-based instrument predicting the municipality’s coffee production capability to show that the finding is not driven by potential endogeneity in the municipality’s actual coffee production.

We propose a simple theoretical framework linking price shocks to violence and empirically examine the relative importance of three potential channels. First, a decline in the price of coffee may have led coffee farmers to substitute into illicit crops like coca, which is used to manufacture cocaine.¹ Armed groups, in turn, may have moved into traditionally coffee areas to control rents from drug production and trade.² Second, the coffee price shock may have lowered the income and employment of coffee cultivators, which lowers the opportunity cost of supporting operations undertaken by illegal armed groups, either indirectly by providing supplies and information or directly by actively joining their ranks. Third, because of the particular institutional arrangements that govern the coffee business in Colombia, the coffee crisis may have exacerbated the civil war by deteriorating state capacity in the coffee region. In particular, the National Federation of Coffee Growers (NFCG) is a powerful

¹Several major newspapers have provided journalistic accounts of how falling coffee prices led farmers to switch to coca in Colombia and Peru, and to poppies in Colombia and Nicaragua (Bose et al., 2001; Krauss, 2001; Wilson, 2001a; Wilson, 2001b; Fritsch, 2002).

²Since coca bushes can grow in a wide variety of geographical conditions including those needed to plant coffee, this substitution is ecologically feasible.

quasi-governmental organization that has historically provided many critical public goods such as hospitals and roads in the coffee areas. A decline in public investment by this organization may have lowered institutional state capacity in the coffee producing municipalities, inviting illegal groups to scale up violence in these places.

Although Colombia witnessed a dramatic rise in coca cultivation during the period of our analysis, we find no evidence of disproportionate substitution toward coca in the coffee municipalities relative to the non-coffee municipalities, which indicates that illicit crop substitution cannot account for the negative link between coffee prices and excess violence in the coffee regions. Rather, our findings suggest that coffee price declines have fuelled civil war in Colombia's by raising poverty. State capacity also appears to mitigate against the extent to which the price shock raises guerilla attacks disproportionately in the coffee municipalities.

While the bulk of our results focus on the effect of the coffee crisis, we also present preliminary results on the link between oil price shocks and violence in Colombia. We focus on oil since this is Colombia's largest export, while coffee ranks third. In contrast to coffee, we find that there is a *positive* relationship between oil prices and violence: when the price of oil increases, the civil war intensifies disproportionately in municipalities with oil reserves and oil pipelines. Because oil prices affect two-way clashes involving government forces but do not appear to affect one-sided attacks by illegal armed groups, we posit that an increase in the price of oil raises government revenue and finances military expansion, which in turn fuels conflict through more clashes. The contrasting evidence on coffee and oil suggests that an increase in the value of a commodity is not necessarily associated with greater violence, as implied by the 'resource-curse' hypothesis. Rather the effect of a price shock will depend critically on the factor intensities of the commodities. As coffee is a labor intensive agricultural commodity, the negative link between prices and violence is mediated through the effect of prices on the income of agricultural laborers. In contrast, oil is a capital-intensive commodity, which reduces the importance of the income channel in the context of a peasant-based insurgency. This suggests that the production structure of the commodity is a key determinant of the value-to-violence relationship, and as demonstrated by the case of Colombia, not all resources are cursed.

The remainder of the paper is organized as follows. Section 2 provides background in three areas. First, we discuss the empirical literature on the economic causes of conflict. We then provide background on Colombia's civil war, and finally discuss the nature and causes of the international coffee crisis. In the latter subsection we establish that prices in the international

market have been determined by factors exogenous to Colombia's coffee production during the period of our study, which is an important assumption for our empirical strategy. In Section 3 we describe the data and present descriptive statistics. Section 4 contains the results. In section 5 we explore, theoretically and empirically, the mechanisms linking coffee prices to violence. In section 6, we present preliminary evidence on the effect of oil price shocks on violence in Colombia. In section 7 we conclude and discuss policy implications and possible lines of research for the future.

2 Background

2.1 The Economic Causes of Violence

Several authors have explored the economic causes of civil war. Collier and Hoeffler (2004) find a negative association between per capita income and the probability of civil war incidence in a cross-section of countries. They suggest that lower income facilitates rebel recruitment by lowering the opportunity cost of joining illegal armed groups. Fearon and Laitin (2003) find that such association holds for a larger sample but suggest that poor countries having a weaker state capacity which makes them more vulnerable to civil war. It is difficult to interpret these findings in a causal manner because of potential reverse causality: while income affects conflict, conflict in turn may affect income. Alternatively, third factors such as the quality of institutions might affect both income and conflict, leading to potential omitted variable bias. Miguel, Satyanath and Sergenti (2004) address these endogeneity concerns by showing that negative income shocks, instrumented by rainfall, substantially raise the likelihood of conflict in Sub-Saharan Africa. However, the mechanism linking poverty to conflict remains a black box, and these cross-country studies are subject to the criticism that the causes and characteristics of civil conflict may vary greatly from one country to another. In this sense, within-country studies may be more suitable for understanding the underlying causes of civil war, but the scarcity of within-country conflict data has limited the use of this approach.

To our knowledge, Deininger (2003) is the first within-country study of the causes of conflict. Using community-level data for Uganda over 1992 -1999, the author finds that lower levels of human capital are associated with a greater propensity for civil strife, suggesting that the availability of a large pool of unemployed workers increases rebel activity. However, the negative association between human capital and violence may reflect reverse causality,

since violence levels also affect the decision to invest in schooling. A rise in the share of coffee producers is also found to raise conflict, which the author interprets as indicating that an increase in taxable wealth finances more rebel activity. However, given that coffee prices fell sharply during the latter half of this period (see Figure 1), it is equally plausible that an increase in the share of coffee farmers proxies for higher rates of poverty in the community, and coffee-related poverty is what explains the positive relationship between coffee dependence and violence during the period of the analysis. Deininger's measure of civil strife is constructed on the basis of interviews, where households were asked to distinguish between attacks that were politically-motivated versus those that were not. Barron, Kaiser and Pradhan (2004) use a similar measure to analyze the causes of local conflict in Indonesia, and also report a positive correlation between violence and unemployment, as well as violence and income inequality. Do and Iyer (2006) examine determinants of the intensity of Nepal's civil war, as measured by the number of conflict-related deaths at the district level. The significant correlates of greater conflict intensity include higher rates of poverty and lower levels of literacy in the district prior to the outbreak of the Maoist insurgency. This is consistent with the idea that the Maoists had greater recruiting success in areas with lower economic opportunities, and that the state used more repressive measures in poor areas. However, causality has to be interpreted with caution given that there is potential omitted variables bias within the cross-sectional analysis.

The idea that resources are a 'curse' for developing countries has been popular in the literature. The first strand of this literature focuses on the impact of resources on economic growth. Building on the seminal paper by Sachs and Warner (1995), several authors have confirmed that, on average, countries abundant in natural resources experience a lower rate of economic growth relative to countries with fewer resources (Tornell and Lane, 1999; Sachs and Warner, 1999; Mehlum, Moene and Torvik, 2006).³ A second strand of the literature has explored the link between natural resources and civil war. Collier and Hoeffler (1998 and 2004) were the first to show that there is a positive correlation between the share of primary commodity exports to GDP and the incidence of civil war in a cross-country study. They interpret this as evidence that rebels use stolen rents from the export of commodities to finance their armed struggle.⁴ Although their finding could be considered a third potential

³The potential mechanisms linking resource abundance and economic growth are, however, more contested. While Sachs and Warner emphasize a pure economic mechanism, namely the Dutch Disease, other authors have proposed alternative explanations that highlight the importance of institutions (Mehlum et al., 2006; Robinson, Torvik and Verdier, 2006).

⁴The primary commodity exports to GDP measure aggregates all natural commodities including agri-

explanation of the Sachs and Warner results under the assumption that internal conflict hampers economic growth, the association between resources and the probability of civil war has itself been termed the ‘resource curse’ hypothesis. A direct implication of this hypothesis is that an increase in the value of commodities should also lead to increased violence.

A number of authors have contributed to this branch of the resource-curse literature, although most have examined the quantity of commodity exports, rather than the value as given by the price of the commodity. Ross (2004) and Fearon (2005) demonstrate that the Collier and Hoeffler result is heavily driven by oil, which cannot be looted easily unless rebels gain control of the national distribution system. Fearon also argues that holding income constant, oil proxies for weaker state capability, and challenges the rebellion-financing role of resources proposed by Collier and Hoeffler on these grounds.⁵ The authors also point out that the export of many other primary commodities, especially agricultural products, does not correlate with civil war. Lujala, Gleditsch and Gilmore (2005) find little support for a positive link between the presence of diamonds and the likelihood of war after controlling for other variables, and Snyder and Bhavnani (2005) suggest that it is physical characteristics and the extraction technology that makes some primary commodities more lootable than others.

These findings suggest that extent to which a commodity is cursed will depend on physical attributes relating to lootability, and the production structure of the commodity, which determines which factor gains when the value of the commodity increases in international markets. The resource curse hypothesis seems particularly inappropriate for agricultural commodities. Since agricultural goods such as coffee, cotton and cocoa serve as a major source of income for the rural population of developing nations, and income shocks have been shown to promote conflict (Miguel et al., 2004), we might expect to see a *negative* association between the value of labor-intensive products and conflict. If anything, we might expect to resource curse in reverse, as indicated by a negative association between violence and the price of agricultural products. Although this may seem intuitive, to date, no study has presented definitive micro-empirical evidence on the causal mechanisms linking the price of commodities to violence within a given country.

cultural goods, but excludes illicit drug crops or other commodities such as diamonds and precious stones that are traded illegally and are more commonly associated with war financing. Thus, this measure largely reflects cash crops such as coffee and wheat, as well as oil production (Fearon, 2005).

⁵Humphreys (2005) explores the empirical relevance of competing potential channels explaining the association between resources and conflict and, in accordance with Fearon (2005) concludes that state weakness is the predominant mechanism.

This paper explores the causal link between primary commodities and conflict and builds on the within-country conflict literature by examining the effect of coffee prices on Colombia's civil war. We assess how a dramatic fall in the price of coffee in the late 1990s affected conflict dynamics in the coffee producing areas relative to the non-coffee areas. The use of within-country data also allows us to test the mechanisms through which the price shock affects civil war. To examine the idea that the coffee crisis raised conflict by lowering income and thus the opportunity cost of joining rebellion, we assess whether the coffee price drop raised poverty disproportionately in the coffee growing areas, and then examine the association between poverty and conflict. To test the idea that weak state capacity is a key determinant of conflict, we examine whether conflict activity rose disproportionately in coffee areas that had lower public spending levels prior to the conflict. Finally, we explore a mechanism that is specific to Colombia, namely, whether the fall in coffee prices raised the economic incentive to switch to high-return illicit crops such as coca, which is used to produce cocaine. It is especially important to explore the latter hypothesis given a recent study by Angrist and Kugler (2005) which finds that coca-growing regions in Colombia witnessed an increase in violent deaths once coca production shifted from other Andean nations to Colombia in the early 1990s.

While our core results focus on the effect of coffee prices, we also present contrasting evidence using oil prices. We find that an increase in the price of oil is associated with greater conflict in municipalities that produce oil and contain oil pipelines. By establishing a positive association between oil prices and conflict, and a negative association between coffee prices and conflict, we present further evidence for the idea that some resources are cursed, while others are not.

2.2 Colombia's civil war

Colombia's civil war involves left-wing guerillas, right-wing paramilitaries, and government forces.⁶ The origins of the current insurgency lie in *La Violencia*, a civil war that took place from 1946-66, when the country was radically divided in its support for the Liberal and Conservative parties. Guerilla groups active today were formed on the basis of leftist self-defense peasant organizations originally aligned with the Liberals during *La Violencia*. While most of these organizations surrendered their weapons when offered amnesty during the late 1950s, those who continued to operate were subsequently organized by the Colombian

⁶For a detailed of the conflict see Rabassa and Chalk (2001).

Communist Party.

The Armed Revolutionary Forces of Colombia (FARC by its Spanish acronym) was formed in 1964. It describes itself as Marxist-Leninist and is estimated to have between 16,000 to 20,000 combatants, making it the largest guerilla in the world. The National Liberation Army (ELN) was formed in 1965 with support from the Cuban government, and is the second largest guerilla in Colombia, with 4,000 to 6,000 combatants. ELN was heavily influenced by Roman Catholicism and the Liberation Theology. Both organizations are largely rural and have active supporters in the countryside. The FARC states that its primary objective is to overthrow the government and establish a communist-agrarian state. Both groups primarily target infrastructure and government military positions. However they carry out bombings and road blocks for extortion purposes, which often result in civilian casualties (Restrepo and Spagat, 2004). ELN targets oil pipelines, as much of the oil industry is dominated by foreign firms. It derives most of its income from kidnappings and ransom, often of individuals employed in international corporations. In contrast, drugs are a major source of finance for the FARC, which is known to tax coca crops, and to control the production, processing and export of cocaine and heroine. The FARC also collects ‘war taxes’ from businesses and agricultural producers in their areas of operation.

Throughout the 1970s and early 1980s, the conflict effectively served as a cold war proxy, with the Soviet block supporting the guerillas and the US supporting counter-insurgency efforts. Rise in public support for the guerillas and leftist politics led former president Betancur to negotiate a cease-fire in 1984, when the FARC formed a legitimate political party, the Unión Patriótica (UP). However, as the UP won more elections, it became a target for the right-wing paramilitaries, and over 3,000 UP members including mayors and legislators were assassinated and disappeared in the wake of elections during the late 1980s. The FARC resumed violence and ended this brief foray into formal political participation after a leading presidential candidate, a UP member, was assassinated in 1989.

Although the early 1990s was a period of low conflict intensity, the guerillas expanded their operations dramatically starting in the mid-1990s. The FARC successfully seized control of the drug trade after the defeat of the *Medellin* and *Cali* drug cartels, and both FARC and ELN scaled up the number of kidnappings and extortion. Due to concerns about the guerillas’ rising military strength, former President Pastrana initiated peace talks with the FARC in 1998 and as a concession, ceded control over five municipalities in a demilitarized zone (DMZ) south of Bogotá. The DMZ was effectively controlled by the guerrillas for over four years of peace talks. From there, the FARC continued staging attacks during the ne-

gotiations, and thus the talks were generally regarded as a failure. After several high-profile kidnappings in 2002, the talks were discarded completely and the government re-launched a military campaign to gain control over the DMZ. The FARC have reportedly changed tactics after the talks ended, from targeting the state exclusively, to hitting urban areas that result in more casualties. The current president, Alvaro Uribe, was elected on the basis of taking a harder line against the guerilla, which he has done through stepped up military pressure.

The other major armed groups active in the civil war are the right-wing paramilitaries. The first paramilitaries were organized by the military during the late 1970s, when the armed forces took advantage of a law allowing self-defense organizations to arm the civilian population for combat against insurgents. Subsequently, rural elites formed private armies which emerged on a widespread scale during the eighties when drug lords started becoming landowners and started facing extortion from the guerillas. Today, the paramilitaries include drug traffickers, disaffected former members of the armed forces and those who have been victimized by the guerilla. They continue to be financed through drugs as well as business owners and landlords who face extortion. The paramilitaries were declared illegal in 1989, after which the Colombian conflict technically became three-sided, with the government, guerillas and paramilitaries all battling one another. However, the vast majority of the fighting occurs between the guerillas and the other two groups, and there are numerous allegations of collusion between paramilitaries and the government forces. In 1997, the disparate paramilitaries came together under an umbrella alliance called the United Self-Defense Groups of Colombia (AUC), which contributed substantially to the dramatic expansion of conflict-activity during the 1990s. In this period, the paramilitaries acquired notoriety for their attacks against civilians. They employed a strategy of targeting the 'human infrastructure' of the rebels which involved selective assassination of individuals who were perceived to support leftist groups. At the peak of their strength, they were described to have 12,000 members. However, a major demobilization of the paramilitaries was initiated in 2003, but the evidence is mixed as to how effective this campaign has been in disarming these groups.

2.3 The Coffee Crisis

Coffee prices were stable and relatively high during the period from 1963 to 1989, when the International Coffee Organization (ICO) set quotas for coffee exporters on the basis of an agreement signed by the major coffee producing nations in 1962. US support for this price stabilization was an integral part of the ICO's success. As a consumer nation, the US had

little economic motivation for raising coffee prices. However, Bates (1997) documents that US support for stabilization was motivated by security interests. In particular, after the Cuban revolution, the US feared that low producer prices would spread ‘Castroism’ in the Latin American coffee exporting nations, including Brazil and Colombia.

The quota system under the ICO was replaced by a more flexible system in 1980, but then abandoned altogether in 1989. One factor behind the end of the coffee agreement was limited US incentive to continue supporting higher coffee prices in the wake of the Cold War era. After the demise of this system, no new agreement restraining exports could be reached again. Consequently, from 1989 to 1994, excess supply drove the real price of coffee to historically low levels, with production increases among all the major producers, including Colombia. A brief recovery was triggered after an intense Brazilian frost episode in 1994, which reduced Brazil’s coffee exports. Although prices climbed between 1994 and 1997, they plummeted sharply starting 1997 when dramatic production increases in Vietnam and Brazil triggered what has come to be called the “international coffee crisis” of the 1990s.

From 1997 to 2003, the real price of coffee fell by 73 percent, reaching its lowest value ever. The expansion in Vietnam was fuelled by an aggressive government-led strategy, including export subsidies initiated in 1995. According to ICO (2006) Vietnam’s exports had climbed from 4,000 tons in 1982 to 850,000 tons in 2001. In fact, Vietnam overtook Colombia as the second largest coffee producer in 2000. Brazil increased its output in the wake of the 1994 frost, which motivated the government to promote planting in frost-free areas. The harvest of the additional output also coincided with a 66 percent devaluation of the Brazilian currency (the Real) in January 1999 which further boosted exports (Evangelist and Sathe, 2006). Brazilian coffee exports rose from 1,000,000 tons in 1997 to nearly 1,700,000 in 2002.

Figure 1 shows the evolution of the international real price of coffee and the exports of the three main producers for the period 1994-2004.⁷ We choose to focus on these years for our analysis since, as discussed above, this is the period when coffee price shocks have been plausibly exogenous to Colombia’s production. Prices were exogenously high from 1994 to 1997 due the Brazilian frost, and exogenously low after 1998 due to Brazil and Vietnam’s supply increases. As indicated by Figure 1, Colombia’s coffee exports have been relatively stable during this 10-year period, while prices have dropped dramatically. In fact, Colombia is the only one of the three producers where a rise in coffee exports is associated with a rise in international coffee prices, leading to a small *positive* correlation between Colombian exports and the international price of coffee.

⁷Figure 1 plots the price of Arabica, the Colombia-relevant coffee variety.

This is important for our analysis because it mitigates against the possibility of reverse causality driving the results. For example, if taxes on coffee production were used to finance violence, and an increase in coffee production fuelled greater conflict and lowered the price of coffee in international markets, then we might find a spurious negative relationship between these two variables. For this reason, we eliminate the 1989 to 1994 period from our analysis, since Colombia’s production levels were increasing, and could have contributed to the price fall during these years. A more subtle endogeneity problem would arise if governments in Vietnam and Brazil based their coffee-relevant policy decisions on violence levels in Colombia, which in turn would be related to international prices through Colombian coffee production levels. However, this is also unlikely as the Vietnamese government consistently promoted coffee throughout the 1990s, while Colombia’s civil war fluctuated, ebbing during the early 1990s and rising again during the late 1990s (Restrepo, Spagat and Vargas, 2004). Moreover, the Brazilian government’s decision to promote expansion into frost-free areas was related to technological advances such as new hybrid plants and mechanization that allowed coffee to be harvested from these regions (Oxfam, 2002), while the 1999 devaluation was a major policy change that followed on the heels of the East Asian financial crisis and massive speculative pressure in capital markets. In short, these governmental policies were unlikely to be motivated by Colombia’s civil war.

3 Data

Our data comes from several different sources. We obtain the time series of coffee prices paid to Colombian coffee growers and the international price received by exporters from the National Federation of Coffee Growers (NFCG). These are graphed in Figure 2 in real terms. The international price is higher than the internal price because it includes transportation and marketing costs that have to be incurred by exporters as well as the “contribución cafetera” (coffee contribution), an export tax on coffee, the revenues from which accumulate in the National Coffee Fund (NCF). The NCF has been used by the NFCG as a policy instrument to stabilize prices against the effect of external shocks and to guarantee a minimum price paid to growers. Prior to 2001, the NFCG was able to enact a price floor by guaranteeing the purchase of all coffee which met quality requirements at this price (Giovannucci et al., 2002).⁸ In January 2001, the price floor had to be abandoned because plummeting inter-

⁸A ‘fair price’ was calculated on the basis of the sales price and anticipated marketing costs to exporters. If this fair price fell below the price floor which was considered the minimum necessary for coffee farmers

national prices had reduced revenues and bankrupted the NCF. In that year, the Colombian government began offering a direct subsidy to growers.⁹ Even though these policies protected Colombian growers to some degree by reducing price volatility, Figure 2 shows that the internal price inclusive of both policies follows the same trend as the international price. In fact, the real internal price dropped to a historical low during the crisis. The 73 percent fall in the international price of coffee from its peak in 1997 to its nadir in 2003 translated into a 49 percent fall in the real internal price paid to growers.

Although the internal price reflects the actual degree to which producers were exposed to the coffee crisis, potential endogeneity may arise if the minimum internal price set by the NFCG responds to violence levels in the coffee regions. This is especially a concern given that the FARC list agricultural prices support as one of their policy objectives.¹⁰ Thus, throughout the analysis, we instrument the internal price with the international price, which is plausibly exogenous to the dynamics of Colombia-specific violence.

We obtain data on coffee cultivation from the NFCG's National Coffee Census, a nationwide enumeration of all coffee growers conducted once over the 1993-1997 period. Colombia has over 1,000 municipalities, which we classify as coffee growing if they contain any coffee-producing units during this period.¹¹ In addition we have data on the hectares of land devoted to coffee cultivation which gives us a continuous measure of the coffee intensity of each municipality. Data for coca cultivation comes from two sources. For the year 1994, we have a measure of the hectares of land devoted to coca cultivation in each municipality from *Dirección Nacional de Estupefacientes*. For 1999 to 2004, we obtain an equivalent measure from the United Nations Office of Drug Control, which collects this data on the basis of satellite imagery. Data on other municipality-specific characteristics is from CEDE, an economic research center in Bogotá, Colombia. This includes a time-varying measure of poverty, available for the period 1998 to 2002, which represents the percent of people who are eligible for free health care. From the National Planning Department (*Departamento Nacional de Planeación*, DNP) we also have data on municipal expenditures undertaken by

considering country-averaged production costs, the price floor would be offered instead. Because this daily NFCG price was posted publicly, private exporters and other purchasing agents used it as a benchmark for calculating their own prices.

⁹The subsidy, which is still in operation, activates when the price of parchment coffee is below US\$.80/lb and it is proportional to the gap between this floor and the actual price.

¹⁰However, it is worth noting that we did not find any anecdotal evidence for the idea that the National Coffee Committee of the NFCG considers security issues in setting the internal price.

¹¹A coffee-producing unit does not have any particular size. It is essentially a producer who grows coffee on a plot of land, small or large.

each municipality in 1995, which we use as a proxy for state capacity in our analysis.

For the results on oil, we obtain data on the average FOB price of oil imports from the United States Energy Information Administration. We classify municipalities as oil-related based on data from DNP, which tells us if the municipality has oil refineries or oil pipelines.

Finally, the conflict data comes from the Conflict Analysis Resource Center (CERAC by its Spanish acronym), a Bogotá-based conflict think tank. This dataset is unique in charting geographically-disaggregated conflict dynamics within a given country over a long period of time. The methodology for the dataset construction is described extensively in Restrepo et al. (2004), which also reports the aggregate dynamics of the conflict over time. The data is event-based, and covers over 21,000 civil-war related incidents over the period 1988-2005. For each event, the dataset records the date, location, type, perpetrator, and victims involved in the incident. In term of type, it records whether the incident was an uncontested *attack*, carried out by an identified politically-motivated armed group against a specific military or civilian target, or a *clash*, which involves an exchange of fire between two or more groups. In terms of perpetrators, it records whether attacks were carried out by the guerilla, the paramilitary or the government, and details the groups involved in a clash.¹² In terms of victims, it reports the number of casualties separately for combatants and civilians. The number of guerrilla attacks, paramilitary attacks and clashes give us municipality-level measures of the *incidence* of conflict, while the number of casualties give us a municipality-level measure of conflict *intensity*.

The dataset is constructed mainly on the basis of events listed in the annexes of periodicals published by two Colombian NGO's, *CINEP* and *Justicia y Paz*. Most of the event information in these annexes comes from two primary sources, a network of priests with representation in almost all of Colombia's 1,120 municipalities, and over 25 newspapers with national and local coverage. The CERAC data includes every municipality that has ever experienced an attack or a clash based on these sources. The inclusion of reports from the Catholic priests, who are often located in rural areas that are unlikely to receive press coverage, broadens the municipality-level representation, giving us violence data for 966 municipalities in the country. CERAC follows a stringent regime to guarantee the quality and representativeness of the data. As a first step it randomly samples a large number of events and compares these against the original source, to check for correct coding from the annexes

¹²The vast majority of attacks are carried out by the illegal groups, although there are very rare incidents of government attacks. Most clashes involve the government forces, although there are some events when just the paramilitary and guerilla exchange fire.

into the dataset. Second, it looks up a different random sample in press archives to confirm whether incidents should have been included in the annexes. This step checks the quality of the raw information provided by the NGO's, which turns out to be quite high. Third, the largest events associated with the highest number of casualties are carefully investigated in press records. Finally, without double-coding, CERAC complements the dataset with additional events provided in reports by Human Rights Watch and reports by Colombian Government agencies.

3.1 Descriptive Statistics

Based on the 1993-1997 National Coffee Survey, we classify just over half of the 1,120 municipalities as coffee producing, which gives us 581 coffee municipalities, and 539 non-coffee municipalities. Table 1 summarizes descriptive statistics for key variables in these two types of regions. The coffee municipalities are smaller in terms of population. The average coffee farm size is 1.7 hectares and the total land devoted to coffee production is 1,606 hectares per municipality. This reflects the fact that, on average, coffee farming in Colombia is characterized by smallholder production. We map the variation of the land devoted to coffee production across municipalities in Figure 5 to show that coffee production is not exclusively concentrated in one specific part of the country.

The coca variable indicates that the average hectares of land devoted to coca is almost 10-fold larger in the non-coffee areas relative to the coffee areas. It is surprising to find this differential in mean coca production given extensive anecdotal discussions in the press about the extent to which coffee farmers have substituted toward coca in the years of the coffee crisis (see references in footnote 1). This will be analyzed further in the results subsection where we examine the mechanism through which coffee prices are linked to violence.

Public Investment is on average much higher in non-coffee municipalities, reflecting the fact that most of the biggest urban centers are not coffee-producing. Mean poverty levels, as measured by the share of people eligible for free health care, are higher in the coffee municipalities relative to the non-coffee areas. Government military initiative, as measured by the combination of (the rare) government attacks and the number of clashes initiated by the government (i.e., clashes that do not respond to a previous attack in the same location within a narrow window of time) is very similar in the two sets of municipalities. Finally, for the aggregate period, all four measures of conflict are higher in the coffee regions. However, we begin the discussion of our empirical strategy by examining the mean levels of violence

in the pre-crisis and crisis years.

4 Results

4.1 Identification Strategy

We begin by presenting a simple two-by-two table that describes the essence of our identification strategy. Table 2 reports the means of our four outcome variables in coffee municipalities and non-coffee municipalities for the period before the crisis (1994 to 1997) and the period of the crisis (1998 to 2004). Attacks by guerrilla groups are described on the top-left quadrant of the table. Before the crisis, the average number of guerrilla attacks per municipality per year was 0.55 in coffee-growing areas and 0.47 in non-coffee areas. This pre-crisis difference of 0.09 is not significant at conventional levels. Violence levels surged upward in both types of municipalities in the post-crisis period, but increased disproportionately in the coffee areas. Guerilla attacks increased by 0.21 more per municipality per year in the coffee growing regions, and this difference is significant at the 1 percent level. This *difference-in-differences* (DD) analysis summarizes the essence our empirical strategy.

Table 2 reports comparable results for the other two measures of conflict incidence (paramilitary attacks and the number of clashes) as well as conflict intensity (the number of casualties). In all cases the DD estimate is positive and significant. For the three incidence measures the difference in means between coffee and non-coffee municipalities is positive in both periods, but this difference is only significant for the post-crisis period. For casualties, the results are even stronger in the sense that coffee municipalities had about 0.47 *fewer* casualties than non-coffee areas before the crisis, but the coffee areas experienced a 140% increase in the number of casualties while the non-coffee areas witnessed a 64% increase, which translates into a differential increase of 0.7 casualties in the coffee areas relative to the non-coffee areas.

Table 2 also documents an overall increase in conflict activity in Colombia from 1998 to 2004. This trend has been described by Restrepo et al. (2004) and could be associated with a large set of explanations.¹³ However, our empirical strategy allows us to estimate the impact of the world coffee crisis on conflict activity, in the context of this widespread trend. Our results can be interpreted as causal under the assumption that violence levels would

¹³We illustrate the magnitude of the violence upsurge in Figure 6 where we map the number of guerrilla attacks to every municipality for 1994 (before the start of the coffee crisis) and 2002 (the worst crisis year as measured by the level of the real coffee price).

not have changed differently in coffee and non-coffee areas in the absence of the coffee price shock.

To investigate the validity of this assumption, we plot the four measures of violence over time in Figure 4, distinguishing between coffee and non-coffee areas. For this visual representation, we go back as far as our violence data allows, starting in 1988. The idea is to see whether violence levels follow a common trend in the two types of regions prior to the price shock, but then diverge with the onset of the crisis. The northwest quadrant shows that until 1998, the number of guerilla attacks in coffee and non-coffee areas was similar in both changes and levels, although it was more volatile in the coffee municipalities. During the crisis years there is a clear divergence and the number of attacks is systematically higher in coffee municipalities. The gap starts closing by the end of the crisis period, when the price of coffee begins its slow recovery (see Figure 2). The same pattern applies to the other three measures of political violence, although the divergence starts one year later, in 1999, for paramilitary attacks and clashes. For casualties, the pattern is not quite as neat, but mean casualties in coffee regions overtake those in non-coffee regions starting 2000 and continue diverging over 2001 to 2002 which are the worst years of the crisis.

4.2 Benchmark Fixed Effects Difference-in-differences

In this next section, we build on the visual representation in Figure 4 and generalize the result based on means in Table 2 into a regression framework. We estimate a DD model that includes both municipality and year fixed-effects, which exploits variation over time within a given municipality. In particular, the municipality fixed effect removes any unmeasured time-invariant municipality-specific characteristics that may be correlated with coffee production and political violence. For example, coffee tends to be grown in more rural areas where the bulk of attacks are targeted, and the terrain can be more hilly in coffee areas, which may confer strategic military advantage. In addition, year fixed effects control for arbitrary annual change in conflict levels. We estimate:

$$y_{it} = \alpha_i + \beta_t + (Coffee_i \times Crisis_t)\delta + X_{it}\phi + \varepsilon_{it} \quad (1)$$

where y_{it} is the measure of conflict incidence or intensity in municipality i and year t ; α_i and β_t are the municipality-specific and year-specific effects respectively. $Coffee_i$ is a dummy variable that equals 1 for coffee-producing municipalities and $Crisis_t$ is a dummy variable that equals 1 for the years from 1998 to 2004. X_{it} is a vector of time-varying controls. In

particular, it is important to control for the time-varying ‘scale’ of the municipalities. For this we use (the log of) population. The main quantity of interest is the coefficient on the interaction of the *Crisis* and *Coffee* dummies, δ . This is the DD estimate, or the differential increase in violence in coffee regions relative to non-coffee regions during the crisis.

Estimates for δ are presented in Table 3. In all specifications, we cluster the standard errors at the department level.¹⁴ Given that Colombia’s 1,120 municipalities are aggregated into 33 departments, this is a fairly stringent step which controls for any potential autocorrelation over time and across all municipalities within a given department. The coefficient is positive and significant at the 1% level for all four measures of political violence. On average, guerrilla attacks increased by 0.31 more in coffee areas relative to non-coffee areas in the post-crisis years. This number is quite substantial considering that the annual mean of guerrilla attacks across all municipalities is 0.51 in the pre-crisis period. The equivalent DD estimate for paramilitary attacks is 0.12. Because the annual mean paramilitary attacks is 0.05 over 1994 to 1997, this coefficient actually implies a larger percentage change in paramilitary attacks, relative to guerilla attacks. The disproportionate upsurge in paramilitary activity in coffee areas helps account for the positive coefficient (of 1.68) in the casualties model, since the bulk of paramilitary attacks are massacres of civilians. Multiplied by 581 (the number of coffee producing municipalities in our dataset) this coefficient implies that the coffee region experienced 976 additional casualties per year, relative to the non-coffee areas. Finally, the DD estimate for clashes is 0.32 and should be compared with an overall pre-crisis average of 0.55, and translates into 186 additional clashes per year in the coffee municipalities.

4.3 Price and Coffee Intensity Fixed Effect Difference-in-differences

One limitation of specification (1) is that it represents the coffee crisis as a single categorical variable and thus leads to potentially subjective classifications about which years should be included in the crisis period. For instance, the international price of coffee reverses its downward fall in 2003, which marks the beginning of a period of slow recovery (see Figure 2). Similarly, the use of the coffee municipality dummy doesn’t account for the variation in the intensity with which coffee is cultivated in each municipality. In this section, we address the limitation of this simple DD framework in two steps. First, we exploit the full time-variation

¹⁴Bertrand, Duflo and Mullainathan (2004) point out that serial correlation may drive down standard errors in the DD context, particularly when the treatment changes very little within a unit over time. Our formulation of the price shock as a pre-crisis and crisis dummy variable is subject to this criticism. The standard errors reported in Table 2 are indeed bigger than those we obtain when failing to cluster at the department level (not reported).

in our data and link the analysis more explicitly to the level of coffee prices by replacing the simple *Crisis* dummy with the continuous price of coffee. Second, we show that the results remain unchanged when we replace the *Coffee* dummy with a (continuous) measure of the coffee intensity of the municipality, as measured by hectares of land devoted to coffee production in the year before the start of the coffee crisis.

Table 4 extends the DD estimation presented in Table 3. In panel A, the treatment effect is now the interaction of the *Coffee* dummy and the price of coffee. The essence of this estimation strategy is to assess whether changes in coffee prices induce a differential change in political violence in coffee versus non-coffee municipalities. Therefore, we estimate:

$$y_{it} = \alpha_i + \beta_t + (Coffee_i \times Price_t)\delta + X_{it}\phi + \varepsilon_{it} \quad (2)$$

where $Price_t$ is the internal price *instrumented by the international price* in year t .

The results presented in panel A of Table 4 confirm those reported in Table 3. One again, we cluster the standard errors at the department level.¹⁵ Note, however, that in contrast to Table 3, the signs on the estimated δ are now negative. The negative coefficient suggests that a *higher* coffee price translates into differential *declines* in conflict incidence and intensity in coffee municipalities relative to non-coffee municipalities, which is exactly analogous to a differential rise of conflict in coffee areas during the crisis years when the price of coffee was low. Contrary to the resource-curse argument which postulates a positive association between the value of primary commodities and civil strife, these results establish a negative association between coffee prices and politically-motivated violence in Colombia. The magnitude of the effect implied by the coefficients in panel A is again quite substantial, though somewhat smaller than those presented in Table 3. The cumulative additional guerrilla attacks per coffee-growing municipality due to the price fall over 1998-2003 is 1.1. The corresponding figure is 0.4 for paramilitary attacks and 2.0 for clashes. For casualties, the cumulative average additional casualties is 7.9 in coffee-growing areas over the period 1998-2003. Multiplied across the 581 municipalities of the sample in this regression, this translates into 767 additional lives lost per year in the coffee regions.

Thus far, we have assigned any municipality that grows any amount of coffee into the ‘treatment’ group through a simple indicator variable. In panel B of Table 4 we exploit cross-sectional variation in the intensity of coffee production, as measured by the hectares

¹⁵Even though serial correlation will be less of a concern since coffee prices change over time within a given geographic unit, it is nonetheless important to account for the potential correlation of standard errors across a municipality within a department.

of land devoted to coffee cultivation during 1993-1997. The production structure represented by these quantities thus reflects the potential vulnerability of each municipality to the price shock and does not reflect the differential impact of the crisis on the amount of coffee cultivated in the growing areas in the post 1998 period. We estimate:

$$y_{it} = \alpha_i + \beta_t + (Quantity_i \times Price_t)\delta + X_{it}\phi + \varepsilon_{it} \quad (3)$$

where $Quantity_i$ is the hectares of land devoted to coffee production in each municipality.¹⁶ Our DD estimate is now the interaction between this variable and the (instrumented) internal price. Once again, the coefficient on the interaction term is significant at the 1% level for all of the conflict measures. Considering the fall in the internal price of coffee from 1998 to 2003, a municipality with the mean coffee intensity within the coffee regions experienced 0.6 additional guerilla attacks, 0.3 additional paramilitary attacks and 0.8 additional clashes. The coefficient for casualties implies 4.2 additional deaths in the average coffee municipality for the 1998-2003 period.

4.4 Potential Confounding Factors

4.4.1 Controlling for *Plan Colombia*

In this section, we explore the possibility that other regime changes contemporaneous with the coffee crisis may have induced a differential change in the violence levels of coffee versus non-coffee areas. First, we address the possible confounding effect of *Plan Colombia*, a US-backed aid package launched in 2000 that was initially directed toward eradicating coca and poppy crops. As we will show in section 5.2, coca strongholds and core coffee areas have traditionally had little overlap in Colombia. If coca production is associated with more violence (see Angrist and Kugler, 2005), this raises the possibility that a successful eradication program may be accompanied by a reduction of violence in the non-coffee regions. In other words, our results may reflect an eradication-induced reduction in the violence level

¹⁶Hectares of coffee production is the appropriate measure of intensity rather than coffee hectares normalized by total land because the municipality could contain inhabitable areas. For example, consider two municipalities each with the same population, but one of which is entirely habitable while the second is only half habitable, with the habitable areas being of equal size. If all of the habitable land is devoted to coffee production in both municipalities, the normalized variable would inappropriately yield a coffee intensity that is half as large for the second municipality, relative to the first municipality. However, they should be classified as having the same intensity, because ultimately, what we are trying to capture is coffee production per capita. In the absence of production data, the land devoted to coffee production with a control for log of population on the right hand side is the best approximation.

of the ‘control’ group rather than a coffee-induced rise in violence within the ‘treatment’ group.

To control for this potential contamination, we estimate a model similar to (3) but include an additional control variable which is the interaction of pre-crisis coca intensity with the price of coffee. The coca intensity variable is a municipality-specific measure of the land devoted to coca growing in 1994. The interaction term controls for any differential changes in violence in the traditional coca areas that were contemporaneous with changes in coffee prices. Panel A of Table 5 reports the results from estimating this specification. First, the interaction of the coca intensity with coffee price is of interest on its own. If *Plan Colombia* reduced violence in the (pre-coffee crisis) coca regions, we should see a positive and significant DD coefficient for this interaction. Moreover, if this effect were driving our previous results, then the coefficient on the coffee intensity interaction should fall in magnitude and possibly in terms of significance. Comparing the coefficient on the coffee intensity interaction in Panel B of Table 4 and Panel A of Table 5 shows that for all violence outcomes, the coefficient estimates remain significant. For casualties, guerilla attacks and paramilitary attacks the coefficient are reduced slightly in magnitude. However, for clashes, the magnitude actually increases. An examination of the DD coefficient for coca in Panel A of Table 5 explains this outcome. First, the coefficient on coca is only significant for clashes and casualties. It actually has a *negative* sign for clashes, indicating that clashes *increased* disproportionately during the coffee crisis in coca-producing municipalities. This, in turn, explains why the DD estimate on coffee actually increases in magnitude after we include the coca control in the clashes model. As for casualties, the DD estimate on coca does indeed suggest that casualties fell in the control group during the coffee crisis, but this effect only reduces 12% of the originally estimated DD effect for this variable. One plausible interpretation of the opposite coefficients in these two models is that more military was stationed in the traditional drug crop areas as a result of *Plan Colombia* (during the coffee crisis years), which resulted in more clashes but also reduced casualties by limiting the activity of illegal armed groups in these areas.

4.4.2 Eliminating Municipalities Affected by 1999 Earthquake

Panel B deals with the potentially confounding effect of a major earthquake which hit the heart of the coffee producing regions in 1999. Theoretically, the earthquake may upward or downward bias the estimated coefficient. On the one hand, illegal groups may have decided to take advantage of the chaos generated by the earthquake and the availability of

relief resources to predate upon the state and launch more attacks in earthquake-affected municipalities, which would exert an upward bias on our results. On the other, illegal groups might refrain from attacking towns that were recently affected by a natural disaster, in which case including the earthquake affected municipalities would downward bias the results. Thus, we estimate model (3) after eliminating the 27 municipalities affected by this disaster, which are all coffee-producing. The resulting DD coefficients are slightly higher for all conflict measures, except for paramilitary attacks (Table 5, panel B), which suggests that the predation story is unlikely, and that previous results, were if anything, downward biased. However, the difference with the benchmark estimates presented in Table 4 is not significant for any of the four measures at conventional levels.

4.4.3 Addressing Change in Government Regimes

Finally, we address the issue that the rise in violence coincides with the time of the peace talks from 1998 to 2002, while the ebb in violence begins in 2003 when Uribe’s hard-line government took over. If one makes the additional assumption that the coffee areas are more strategically valuable because they are more centrally located within the country (see Figure 5), then this introduces the possibility that it was the weaker stance of the Pastrana government (rather than low coffee prices) that resulted in greater violence in the coffee areas. However, the peace talk years do not seem to be associated with a retraction of military power, since the dynamics of government clashes follow the same trend as the attacks by illegal groups, rising from 1998 to their peak in 2002, but declining after 2003 (see Figure 4). If the government was retracting during this period, we would expect to see a rise in attacks by illegal groups along with a decline in government-related clashes. To explore this hypothesis farther, we create a new variable that represents government military activism. This variable combines very rare incidents of government attacks with clashes that are not carried out in response to a previous attack but rather clashes that are actively initiated by the government, which we are able to discern within the CERAC dataset. First, we look at the mean of this variable throughout our sample and confirm that it increased each year from 1998 to 2002, and like the other conflict measures, declined during the start of the Uribe regime in 2003. Then, we re-estimate equation (3) with government military initiative as the outcome variable, and eliminate the Uribe years (2003 and 2004) from the analysis. The results, summarized in Panel C of table 5, show a significant negative coefficient on the coffee interaction term. Thus, these results confirm that when the price of coffee fell, conflict incidence initiated by state forces increased disproportionately in the coffee areas, which runs

counter to the notion that the Pastrana government scaled down military presence in the strategic coffee municipalities. Thus, we find little evidence behind the idea that changes in government regime are driving the results.

4.5 Additional Results

4.5.1 Department-Level Time Trends

In panel A of Table 6 we report the results from estimating (3) with the inclusion of department-specific linear time trends. This is a stringent test that controls for the possibility that violence has different degrees of persistence over time in different municipalities due to unobserved department-specific factors that are not accounted for. Our benchmark results remain significant albeit the size and significance of the effect is mitigated slightly for guerrilla and paramilitary attacks, relative to those presented in Panel B of Table 4. The implied impact on these variables for an average coffee-municipality in cumulative terms for the period 1998-2003 is 0.46 additional guerrilla attacks and 0.19 additional paramilitary attacks.

4.5.2 Instrumental Variables Difference-in-differences

Our last robustness check deals with the potential endogeneity of coffee production. By using the 1993-1997 National Coffee Survey as the basis of our coffee measure, we treat coffee intensity as a time invariant feature of a municipality. However, coffee cultivation changes over time. A potential endogeneity concern may arise if the decision to grow coffee in 1997 was a response to previous conflict incidence, which in turn, may depend on previous periods of low or high coffee prices. Finally, the latter may also have a direct impact on how much coffee is grown in each municipality in 1997. For example, if the most productive coffee farmers decided to continue planting coffee in 1997 while the least productive farmers stopped planting coffee in response to a previous low price period, then violence may increase in places with greater coffee intensity because the guerilla want to target areas where they can tax the most productive farmers. Alternatively, farmers may have stopped producing coffee in areas that witnessed high violence levels prior to 1997, and these municipalities may have experienced less conflict after 1997 if territorial control was achieved through previous fighting.

To address these potential concerns, we instrument the actual presence of coffee production with the geographical conditions needed for growing coffee in Colombia. In particular,

a municipality is classified as potentially coffee producing if rainfall ranges between 1,800-2,800 cubic millimeters per year and if the temperature is between 16 and 26 degrees Celsius. This classification is based on de Graaf (1986). Panel B of Table 6 reports the instrumental variables (IV) results. Because our instrument is the dichotomous presence or absence of coffee, the relevant comparison for the instrumented results are estimates of (2), which are presented in Panel A of Table 4. The DD estimate using the instrument of coffee production is remarkably similar to the non instrumented version for guerrilla attacks, but somewhat smaller in magnitude for the other three measures of conflict.

5 Exploring the Mechanisms

In this section, we explore the channels through which a price shock on agricultural commodities such as coffee can affect the dynamics of an internal conflict. The empirical cross-country literature on civil war reviewed in section 2 points toward two key mechanisms: a reduction in income affects violence by reducing the opportunity cost of rebel recruitment, while weak state capacity may also result in greater civil strife. In the case of Colombia, the coffee price shock reduced the income of coffee farmers and may have reduced the demand for labor in the coffee sector, and raised the unemployment rate of groups such as coffee pickers. Thus, the price fall may have lowered the opportunity cost of supporting illegal armed groups for these individuals. This support can range from providing supplies and information to actively joining the armed ranks of the group (Kalyvas, 1999). In terms of state capacity, as discussed in section 3, the NFCG invests a share of the international coffee price in the NCF which is reinvested in coffee regions in the form of public goods such as schools, roads and health clinics. Hence, the coffee crisis may be associated with a deterioration of institutional quality in the coffee producing municipalities, which in turn makes these more vulnerable to civil conflict. There can be a direct link between this institutional deterioration and conflict if the provision of fewer public goods promotes civil unrest. However, there can also be a more indirect link if retraction in NFCG funding forces the municipality to redirect its funding away from local law enforcement and toward public goods previously provided by the coffee federation.

As mentioned in Section 2, the advantage of a within-country study on commodities and conflict is that it allows for consideration of factors that may be idiosyncratic to a particular commodity or a particular country. Thus, we explore a third mechanism that has been widely publicized by the international press (see references in footnote 1): crop substitution

from coffee to coca. Low coffee prices decrease the opportunity cost of growing illegal crops like coca, which is able to survive under a variety of ecological conditions including those apt for coffee cultivation. As demonstrated by Angrist and Kugler (2005), violence in turn thrives from the competition of illegal armed groups over the proceeds from coca. We divide the rest of this section in two parts. In the first we present a reduced-form model of coffee prices and conflict activity to clarify how these three mechanisms would operate. In the second we assess their relative importance empirically.

5.1 A Model of Potential Mechanisms

Imagine a rural economy in which there are two main agricultural products, a legal one (coffee), and an illegal one (coca). There is a continuum of mass 1 of farmers. A fixed proportion θ of them have crop-suitable land and the rest constitute the fixed $(1 - \theta)$ landless labor supply. There is an illegal armed group which we will refer to as ‘rebels’ although in the case of Colombia it can also capture the role of right-wing militias.

We parametrize institutions. Let $\lambda \in [0, 1]$ be a measure of the overall quality of a broad set of institutions of this economy, or what we call ‘state capacity’. In the case of the Colombian coffee economy this set of institutions is represented by role of the NFCG. We assume that λ is an increasing function of the price of the legal good, p . The idea is that the capacity of the state is financed by taxing the coffee which occurs at a fixed rate τ .

The Rebels

The rebels’ objective function is to gain full control of the territory.¹⁷ The probability P of taking over a territory is a function of the support the rebels get from the population. Support in this model can materialize in two different forms: some farmers can become combatants in the illegal group while others can grow the illegal crop. Rebels buy the illegal crop from the farmers before selling it in the international market at a fixed exogenous price, and use the proceeds to finance their control-seeking strategy.¹⁸ While it is obvious that only

¹⁷This simplification is actually meaningful in the case of the Colombian civil war where there are both left-wing guerrillas and right-wing paramilitaries and considerable variation in the objectives between groups and within different factions of the same group. Arguably, territorial control might be proxying for a broad set of different underlying *ultimate* objectives like control of local rents, control of local natural resources, or territorial control as a means of securing bargaining power in an eventual negotiation.

¹⁸Either by fighting or by providing a revenue source to rebels through coca cultivation, greater support translates into a greater probability of gaining control *through greater armed conflict*. We assume that there is no deterrence in this model and that fighting has to take place for the balance of power to change in a given territory. Thus P is the key variable in the model in as pertains to the rest of the paper since it corresponds to the incidence and the intensity of conflict activity.

the land-owning farmers can become coca growers, we also assume that they do not become combatants, and that only the non-landed farmers eventually do.

Rebels choose the compensations of combatants and coca farmers to maximize their expected net payoff. That is, they solve following static optimization problem:

$$\begin{aligned} \max_{w_C, w_F} & P(n_C, n_F, \lambda) - w_C n_C - w_F n_F \\ \text{s.t. :} & R(n_F) \geq w_C n_C + w_F n_F \end{aligned} \tag{4}$$

where we have normalized the ‘value of territorial control’ to 1. In (4), the probability of gaining territorial control is assumed to be an increasing function of support both in terms of combatants, n_C , and coca farmers, n_F , as well as a decreasing function of the state capacity. That is, the stronger the institutional arrangement including the security apparatus, the lower the probability of success of illegal groups. In addition, w_C and w_F are respectively the compensations that the rebel group offers to combatants and coca farmers and R is the total amount of resources to invest in the armed struggle which is increasing in the quantity of coca produced and hence in the number of coca farmers.

The Farmers

As mentioned, land-owning farmers can grow coffee or turn to coca. If a farmer stays in the legal economy she will receive the after tax net value of the crop: $(1 - \tau) pY_L - c_L$, where Y_L stands for coffee output and c_L accounts for all production costs of the legal crop. In addition we recognize that coffee farmers diversify their production to a certain extent. The value of this complementary non-coffee output, σ , depends in turn on the price fluctuations of other commodities. We assume that diversification strategies are farmer-specific. That is, they respond to idiosyncratic decisions of the farmers given their private knowledge and the quality of their land. Hence we model the value of σ as stochastic, assuming it is distributed according to a probability density function (p.d.f.) $f_\sigma(\sigma)$.

On the other hand, if a farmer decides to use her land to grow coca, her expected compensation is $[1 - \lambda(p)] w_F - c_I$, where w_F is the compensation paid by the rebels in exchange for the coca and c_I accounts for the production costs of the illegal crop. This expression captures the idea that stronger state capacity, in particular a stronger state military, raises the probability of detecting and stopping illegal activities. In the extreme case of $\lambda = 1$ the expected payoff from turning to the illegal activity is $-c_I$ and hence is simply not carried out.

A landed farmer i would then choose to grow coca instead of coffee as long as:

$$(1 - \tau)pY_L - c_L + \sigma^i < [1 - \lambda(p)]w_F - c_I \quad (5)$$

Let $\sigma^* = [1 - \lambda(p)]w_F - c_I - (1 - \tau)pY_L + c_L$. Inequality (5) implies that a farmer will grow coca if and only if $\sigma^i < \sigma^*$, So the number of farmers who will grow coca rather than coffee is given by $n_F = \int_{-\infty}^{\sigma^*} f_\sigma(\sigma)d\sigma \leq \theta$.

It is easy to see that n_F is decreasing in the price of coffee. An increase in p has in fact two reinforcing mechanisms to reduce incentives for turning to the illegal crop. On the one hand it increases the opportunity cost by increasing the value of the legal good, and on the other it increases ‘state capacity’ which in turn translates into a better law enforcement amidst which illegal business are not that appealing.

Non land-owning farmers can either become casual workers in coffee plantations or join the rebels as informants or combatants. Given the fixed labor supply $(1 - \theta)$, the wage they would get in the legal economy depends exclusively on labor demand, which in turn is a function of the value of coffee, or its price. We denote this wage by w_L . On the other hand, by becoming a rebel supporter, a non-landed farmer runs into the risk of being killed or captured, a risk that is increasing in the state capacity. The risk of death is discounted differently by different potential combatants and we assume that, on top of the common compensation to all combatants w_C , the rebel group makes use of *individually targeted* incentives in the form of carrots and sticks (Kalyvas, 1999). We denote by δ^j the monetary value of these incentives for individual j and treat δ as a random variable distributed according to the p.d.f. $f_\delta(\delta)$.

A non land-owning farmer j would then choose to work in the coffee economy rather than become a combatant as long as:

$$w_L(p) > [1 - \lambda(p)]w_C + \delta^j \quad (6)$$

Let $\delta^* = w_L(p) - [1 - \lambda(p)]w_C$. Inequality (6) implies that a farmer will become a combatant if and only if $\delta^j > \delta^*$. Thus, the number of non-landed farmers who will support the rebels as informants or actual fighters rather work as casual coffee-pickers is given by $n_C = \int_{\delta^*}^{\infty} f_\delta(\delta)d\delta \leq (1 - \theta)$.

It is easy to see that n_C is decreasing in the price of coffee. There are two reasons why an increase in p reduces the incentive to become combatant. On the one hand it increases the opportunity cost by increasing the demand for labor in coffee plantations and thus the wage, and on the other hand it increases state capacity and thus the probability of being

killed or captured by supporting the rebels.

Hence, both n_F and n_C are decreasing in the price of coffee. But they are both positively associated with the probability of taking control in (4), which also proxies for the amount of conflict that takes place. This means that the price of coffee is negatively associated with the amount of conflict, meaning that a drop in the price will exacerbate conflict. There are three mechanisms that give rise to this correlation in this theoretical framework:

1. **Crop Substitution.** A reduction in the price of coffee decreases the value of the coffee production, making it more attractive to switch to other crops such as coca. In addition, by decreasing state capacity it reduces law enforcement and hence the attractiveness of illegal business.
2. **Income-Shock in the Legal Economy.** A reduction in the price of coffee decreases the demand for labor in the coffee economy and hence the expected wage of potential coffee farmers, making it more attractive to turn to alternatives such as supporting illegal groups. In addition, by undermining state capacity this negative shock reduces the probability of being captured or killed by the government military while supporting illegal groups.
3. **Overall State Capacity.** A reduction in the price of coffee can directly affect the incidence of conflict by reducing the quality of institutions and strengthening the security apparatus, which increases the probability that illegal armed groups gain territorial control of coffee areas.

In the next section we explore the relative importance of each of these factors.

5.2 Empirical Test of Mechanisms

5.2.1 Crop Substitution

First, we explore the possibility that the differential rise of violence in the coffee producing areas stems from substitution into coca production. The posited mechanism is that a fall in coffee prices induces farmers to switch from coffee into coca production, and violence increases as illegal groups fight to control rents from the drug trade. We have a crude indicator variable for whether the municipality produces coca in a given year, and an intensity measure of the hectares of land devoted to coca production. Simple cross-tabulations using the indicator

variable show that the number of coffee municipalities that also produced coca increased from 18 in 1994 to 66 in 2002. However, this increase was even greater for the non-coffee areas, and the equivalent figures are 38 in 1994 and 102 in 2002. Thus, the relevant question is whether the rise in coca cultivation has been greater in coffee areas relative to non-coffee areas, and we turn to our coca intensity variable to explore this question.

The time-varying data on coca cultivation is only available for a subset of years: 1994, and 1999-2002. Thus, we begin this section by re-estimating (2) for this smaller sample, and confirm that the DD coffee coefficient remains statistically significant with all four violence outcomes in this subset of years (results not presented). Next, we test for the crop-substitution hypothesis by re-estimating equation (2), but with coca intensity rather than violence, as the outcome measure. The first column of Table 7 reports these results. Although the coefficient on the coffee interaction term is negative (which suggests that a fall in the coffee price is associated with greater coca cultivation in the coffee areas), the estimate is not statistically significant. Taken together, these two findings indicate that although the coffee price induced a greater increase in violence in the coffee areas during this period, it did not induce greater crop substitution in the coffee areas over these years.

In the remaining columns of Table 7, we repeat estimation of (2) with the four violence outcomes as the dependent variables, but now eliminate the 128 coffee producing municipality that were ever recorded as producing coca during the years in the sub-sample. Although the coefficients are smaller in magnitude, the effect is still statistically significant, which further confirms that crop substitution is not the central mechanism linking coffee prices to conflict in Colombia.

5.2.2 Income Shock

Next we turn to the possibility that the fall in coffee prices increased poverty in the coffee-producing municipalities, thus easing recruitment into the illegal armed groups. Our municipality-level measure of poverty is the share of the population eligible for free health services at state clinics, and is available for the 1998-2002 period. To directly test the hypothesis that the coffee price drop induced greater violence in the coffee regions through its effect on poverty, we assess whether poverty, instrumented by the interaction of coffee price and coffee intensity, affects violence outcomes. We present the results in Panel B of Table 8. We also control for coca intensity in this specification (but do not report these coefficients) because the coffee interaction is a valid instrument for poverty conditional on controlling for other channels through which it may affect violence, such as coca production.

The coefficients on poverty are not significant for the guerilla and paramilitary attacks, but are significant at the 1 percent level for clashes and casualties.

In Panel A of Table 8, we present the first stage of this IV estimate, which is essentially an estimation of (3), but with poverty as the dependent variable. The highly significant negative coefficient on the coffee interaction term confirms that poverty increased more in coffee-dependent municipalities during the crisis. Although poverty was increasing throughout Colombia during the late-90s due to a recession, the coefficient indicates that the rise in poverty was 30% higher for a municipality with average coffee intensity, relative to the non-coffee areas. Because our poverty measure is available for just four years, we also re-estimate (3) for this sub-sample, and confirm that our core results hold over these years (results not shown). Taken together, the results suggest that poverty may in fact be an important mechanism through which the coffee price shock resulted in disproportionate violence in coffee municipalities.

5.2.3 State Capacity

In this section, we explore the extent to which weakened state capacity plays a role in explaining how the coffee crisis affected violence levels. The coffee crisis may have weakened the legal and institutional environment of the coffee municipalities by lowering expenditure on local law enforcement. This would occur if the drop in coffee prices reduced social sector spending by the NFCG, and required local governments to re-direct funding from enforcement, and toward social expenditure to compensate for the fall in NFCG outlays. Illegal armed groups would take advantage of this institutional deterioration to target areas where the state is weaker. Given that the Federation came under enormous financial strain during the coffee crisis, and that the NCF went bankrupt in 2001, the NFCG's social sector spending did in fact decline during this period.¹⁹ However, we are not able to discern the extent to which this occurred as we do not have data on municipal level NFCG expenditures.

Indeed, the most direct way of testing for the state capacity hypothesis would be to see if total expenditures at the municipality level changed in the same direction as the violence outcomes, rising disproportionately in coffee areas when the price of coffee is high, and falling disproportionately when the price of coffee is low. However, for this to be a meaningful test, data on both municipal expenditures as NFCG expenditures would be required.

Given data limitations, we take the pre-crisis municipal expenditure as a proxy for state capacity and devise an alternative test: we assess whether the effect of the coffee crisis on

¹⁹Personal Communication, Office of the Manager, National Federation of Coffee Growers.

violence outcomes was larger for municipalities that had lower municipal expenditures prior to the crisis.²⁰ Thus, we estimate (3, but include an additional three-way interaction term between our treatment effect and 1995 municipal expenditure levels, (and also control for the two-way interaction between expenditure and coffee price in this specification). The results are summarized in Table 9. The first column, for guerilla attacks, shows a significant positive coefficient on the three-way interaction term. This indicates that the rise in guerilla attacks due to the coffee treatment was smaller in municipalities that had higher levels of pre-crisis spending. This is consistent with the idea that guerillas disproportionately targeted the coffee municipalities where the state was weaker. However, the second column of Table 9 shows no such effect for paramilitary attacks. The three-way interaction is insignificant and negative, indicating that the rise in paramilitary attacks due to the coffee crisis was greater in areas that had lower pre-crisis expenditures. This is not surprising given anecdotal evidence that the militias often substitute for state enforcement, although we cannot read too much into this coefficient given that it is statistically indistinguishable from 0. Given that the state expenditure variable mitigates against the effect in the guerilla attacks model but potentially exacerbates it in the paramilitaries model, it is also not surprising to see that the three way interaction term is not significant for total clashes and casualties. Results in this sub-section should be taken as incomplete given data limitations. However, the preliminary results suggest that state capacity as reflected in municipal expenditures has a deterrence effect on guerilla activity, mitigating against the extent to which the coffee crisis exacerbates conflict.

6 Oil and Conflict

In this section, we present preliminary results examining the effect of oil price shocks on violence levels in municipalities that have oil extraction plants or oil pipelines, in comparison to those that have neither.²¹ Our motivation for looking at oil is to assess whether the effect of price shocks on violence differ based on the type of commodity used for the analysis. While a fall in the price of a labor intensive commodity such as coffee is likely to affect a rural-based insurgency through its effect on the earnings of rural producers, the income

²⁰Although municipal expenditures devoted to law enforcement would be the ideal variable for this purpose, it is not unreasonable to assume that enforcement is increasing in total government expenditure.

²¹Given that municipalities receive additional funding from the central state not only if they extract petroleum but also if they contain oil pipelines, it is appropriate for us to include the latter in the treatment group rather than comparing municipalities that have oil reserves versus those that do not.

channel is likely to be less important for a capital-intensive commodity such as oil. The rebel financing mechanism also seems unlikely because the Colombian government is firmly in control of the oil extraction process. While there is fighting over the pipelines, this is to prevent guerilla bombings, which are designed to destroy the pipelines in opposition to multi-national operations in Colombia. Theft of petrol does not appear to be an explicit guerilla objective. Moreover, paramilitaries are often hired by private companies to protect the pipelines, and allegedly there are a few instances of collusion between these illegal groups and state forces in achieving this objective. However, the national press has reported a few episodes of theft of oil by the paramilitaries. But the instances of alleged collusion are many more and it seems unlikely that oil theft is predominantly the mechanism through which oil influences violence in the case of Colombia. On the other hand, there is a more direct link between the value of oil and government financing for state military expansion. The state allocates the additional revenue from oil price hikes to municipalities that contain oil reserves and oil pipelines. Thus, a rise in the price of oil may raise security-related conflict incidence (i.e., government-involved clashes as opposed to attacks by illegal armed groups) by strengthening the state military presence.

Figure 3 shows the price of oil (along with the price of coffee) over 1988 to 2004. Because Colombia's oil production does not affect world petroleum prices, we are able to use all years of data in analyzing how a rise in oil prices affects violence in oil-related municipalities versus the rest. Table 10 presents the results from this analysis. First, the oil DD coefficient is positive for all four models, indicating that an increase in the value of oil does lead to larger increases in violence in the oil-related areas. However, the coefficient is insignificant for the model of guerilla and paramilitary attacks, and significant at the 1 percent level for clashes and casualties. We interpret these coefficients as suggesting that an increase in oil revenue allows the government to station more military in oil areas, which in turn leads to increased clashes with illegal groups and produces more casualties as a consequence. Guerillas may also see oil pipelines as a more valuable target when oil prices rise and launch more attempted attacks against the pipelines. However, to the extent that these attempts are contested by the public forces given the rise in government fighting power, we do not see significant increases in these outcome variables. In the context of the coffee crisis, greater state capacity mitigated against the rise in predation-related violence as manifest in the number of guerilla attacks carried out after the drastic fall in coffee prices. In the context of oil price fluctuations, higher oil prices lead to a stronger state that successfully thwarts guerilla attacks, but also leads to more security-related violence. Thus, we see that the predictions of the resource

curse hypothesis are borne out for oil through its effect on government financing for the armed forces.

One additional point is that the price of oil spiked upward sharply starting 1998, which may be seen as an additional potential confounding factor in the coffee crisis analysis. Thus, we re-estimate equation (3) eliminating the oil-related municipalities (results not reported) and find that the coefficient is actually larger for paramilitary attacks and remains virtually unchanged for the other three violence measures. This should not be surprising given that there is little overlap among the set of municipalities that cultivate coffee and have oil pipelines. Thus, to the extent that the oil price shock increased violence in our control municipalities, it would, if anything lead to an underestimate of the effect of the coffee crisis effect.

7 Conclusion

Our analysis shows that negative price shocks in the international coffee market exacerbated civil conflict in Colombia. For coffee, Colombia appears to face a resource curse in reverse. The higher value of this commodity in international markets eases social unrest, while a lower value exacerbates politically-motivated violence. We show that this result is not confounded by the 1999 earthquake in the coffee-growing regions, or the launch of *Plan Colombia*, which reduced casualties but raised clashes in targeted areas. Our results are also robust to the use of a geography-based instrument that predicts potential coffee cultivation, which shows that the results are not driven by potential endogeneity in the coffee production variable.

We find little evidence of disproportionate crop substitution from coffee to coca in coffee-growing regions, and thus establish that crop substitution is not the primary mechanism through which this effect operates. This is important as it runs counter to many journalistic accounts that have highlighted the increase in coca cultivation as a result of the coffee crisis. We also present evidence for the idea that municipal expenditures mitigated the extent to which guerilla attacks increased in response to the crisis, which suggests that state capacity has the potential to reduce predation. Finally, we document a larger increase in poverty in the coffee-growing areas relative to the non-coffee areas during the crisis period and show that poverty is associated with greater violence. This evidence is consistent with the findings of Miguel et al. (2004), and suggests that the coffee price shock reduced the income of rural producers, altering the opportunity cost of joining or aiding the insurgency. However, we intend to use rural household survey data to directly analyze the extent to which the

coffee crisis affected the earnings and employment of agricultural producers in the coffee municipalities, which will shed further light on the income/opportunity cost mechanism.

The findings on coffee present a clear contrast to the findings on oil, where an increase in the value of the commodity is associated with an escalation of security-related conflict. Thus, for the Colombian case, oil faces a positive association between the value of the commodity and political violence. But is this a curse? Not necessarily. Violence increases not through an increase in rebel-financing opportunities, but through an increase in state-strength financing opportunities. The contrast between the effect of price shocks in coffee and oil can be considered in light of the different factor intensities of the two commodities. Given that coffee is labor-intensive, a fall in the price of coffee has a substantial effect on the income of agricultural producers, which affects the decision to support the rural insurgency. Given that oil is capital-intensive, most rents do not accrue to labor, which reduces the importance of the income channel. Rents are channeled partly into government revenue, which finances greater military expansion and *security-related* violence in the oil-related municipalities when oil prices are higher.

The analysis presented in this paper has a number of policy implications. First, it challenges the resource curse perspective that an increase in the value of a commodity necessarily leads to an increase in conflict, and suggests that the income effect of commodity price shocks may outweigh the effect on conflict financing for particular commodities. This implies that social programs designed to mitigate against poverty and unemployment may also have a moderating effect on violence, when workers face a commodity shock that reduces income associated with a legal activity.

Second, it suggests that price stabilization of primary commodities can also play a role in reducing politically-motivated violence. For Colombia, we estimate the extent to which the NFCG's policies have moderated against the rise in violence by estimating the number of casualties that would have arisen if the internal price of coffee had fallen by as much as the international price (in percentage terms). We find that relative to the 767 additional casualties in the coffee municipalities in our baseline estimate, the coffee price shock would have resulted in 1,680 additional casualties under this counterfactual scenario. In other words, violence intensity would have been more than twice as high if coffee prices had fallen by 73 percent internally, as they did in the global market. In short, for peasant-based civil wars such as the one in Colombia, the extent to which primary commodity price shocks affect political violence will depend critically on policies designed to stabilize prices and provide employment alternatives for rural producers affected by the commodity crisis.

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Tables

Table 1. Descriptive Statistics

	Years	<i>Coffee Municipalities</i>		<i>Non-Coffee Municipalities</i>	
		Mean	SD	Mean	SD
Population ^a	1994-2004	37.16	135.99	49.67	325.47
Coffee Farm Size ^b	1997	1.70	1.75	—	—
Coffee Production Land ^b	1997	1,606	1,959	—	—
Coca Production Land ^b	1994 & 1999-2004	27	287	247	1,137
Public Investment ^c	1994-2002	4.18	18.75	11.25	133.91
Poverty ^d	1998-2002	0.49	0.32	0.46	0.28
Government Initiative ^e	1994-2004	0.15	0.67	0.13	0.62
Guerrilla Attacks ^e	1994-2004	0.75	1.82	0.53	1.64
Paramilitary Attacks ^e	1994-2004	0.13	0.55	0.10	0.46
Clashes ^e	1994-2004	0.64	1.53	0.50	1.41
Casualties ^e	1994-2004	2.53	8.09	2.52	8.34

^athousands, ^bhectares, ^cbillions, ^dpercentage, ^ecount

Table 2. Mean Violence in Coffee and Non-coffee Municipalities Before and During Crisis

	Crisis	Pre-crisis	Difference	Crisis	Pre-crisis	Difference
	<i>Guerrilla Attacks</i>			<i>Paramilitary Attacks</i>		
Coffee Municipalities	0.867 (0.028)	0.553 (0.037)	0.314 (0.046)***	0.176 (0.008)	0.045 (0.011)	0.131 (0.014)***
Non-Coffee Mun.	0.568 (0.033)	0.467 (0.043)	0.101 (0.054)*	0.134 (0.009)	0.054 (0.013)	0.080 (0.016)***
Difference	0.299 (0.043)***	0.086 (0.057)	0.213 (0.071)***	0.042 (0.013)***	-0.009 (0.017)	0.051 (0.021)**
	<i>Clashes</i>			<i>Casualties</i>		
Coffee Municipalities	0.770 (0.024)	0.421 (0.031)	0.349 (0.039)***	3.199 (0.132)	1.345 (0.174)	1.854 (0.219)***
Non-Coffee Mun.	0.513 (0.028)	0.489 (0.037)	(0.024) (0.046)	2.967 (0.153)	1.811 (0.203)	1.156 (0.254)***
Difference	0.257 (0.036)***	-0.068 (0.048)	0.325 (0.060)***	0.232 (0.202)	-0.466 (0.267)*	0.699 (0.335)**

* Significant at 10%, ** Significant at 5%, *** Significant at 1%. Standard errors in parentheses.

Table 3. Benchmark DD Estimates

	Guerrilla Attacks	Paramilitary Attacks	Clashes	Casualties
Coffee Mun. \times Crisis Period	0.311 (0.098)***	0.124 (0.041)***	0.316 (0.080)***	1.684 (0.472)***
Observations	10,389	10,400	10,400	10,400

* Significant at 10%, ** Significant at 5%, *** Significant at 1%. All regressions include municipality and year fixed effects and control for the log of population. Robust standard errors are in parentheses and are clustered at the department level.

Table 4. Continuous Price and Coffee Intensity DD Estimates

	Guerrilla Attacks	Paramilitary Attacks	Clashes	Casualties
<i>Panel A: Coffee dummy and continuous price</i>				
Coffee Mun. \times Price	-0.306 (0.112)***	-0.126 (0.041)***	-0.592 (0.131)***	-2.303 (0.695)***
Observations	10,389	10,400	10,400	10,400
<i>Panel B: Coffee intensity and continuous price</i>				
Coffee Intensity \times Price	-0.104 (0.038)***	-0.045 (0.011)***	-0.138 (0.038)***	-0.767 (0.196)***
Observations	10,143	10,158	10,158	10,158

* Significant at 10%, ** Significant at 5%, *** Significant at 1%. Internal price instrumented with international price. All regressions include municipality and year fixed effects and control for the log of population. Robust standard errors are in parentheses and are clustered at the department level.

Table 5. Addressing Potential Confounders.

	Guerrilla Attacks	Paramilitary Attacks	Clashes	Casualties
<i>Panel A: Controlling for Plan Colombia</i>				
Coffee Intensity \times Price	-0.08 (0.036)**	-0.035 (0.015)**	-0.143 (0.042)***	-0.675 (0.219)***
Coca 1994 \times Price	0.045 (0.067)	-0.002 (0.017)	-0.118 (0.042)***	0.59 (0.258)**
Observations	9,844	9,855	9,855	9,855
<i>Panel B: Eliminating municipalities affected by 1999 earthquake</i>				
Coffee Intensity \times Price	-0.107 (0.041)***	-0.044 (0.015)***	-0.18 (0.038)***	-0.844 (0.209)***
Observations	9,883	9,894	9,894	9,894
<i>Panel C: Controlling for change in government regime</i>				
Dependent variable: Government Military Initiative				
Coffee Intensity \times Price		-0.043 (0.009)***		
Observations		8,291		

* Significant at 10%, ** Significant at 5%, *** Significant at 1%. Internal price instrumented with international price. All regressions include municipality and year fixed effects and control for the log of population. Robust standard errors are in parentheses and are clustered at the department level.

Table 6. Additional Results and Robustness (IV and Time Trends)

	Guerrilla Attacks	Paramilitary Attacks	Clashes	Casualties
<i>Panel A: Including department time trends</i>				
Coffee Intensity \times Price	-0.083 (0.037)**	-0.035 (0.015)**	-0.143 (0.042)***	-0.676 (0.219)***
Observations	10,147	10,158	10,158	10,158
<i>Panel B: Ecology-instrumented coffee and department time trends</i>				
IV Coffee Mun. \times Price	-0.31 (0.094)***	-0.083 (0.062)	-0.311 (0.087)***	-1.494 (0.600)**
Observations	10,247	10,258	10,258	10,258

* Significant at 10%, ** Significant at 5%, *** Significant at 1%. Internal price instrumented with international price. Coffee presence in Panel B instrumented with average temperature and rainfall of municipalities (details of instrument in the text). All regressions include municipality and year fixed effects and control for the log of population. Robust standard errors are in parentheses and are clustered at the department level.

Table 7. Exploring the Crop Substitutions Mechanism

	Coca Crop	Guerrilla Attacks	Paramilitary Attacks	Clashes	Casualties
Coffee Mun. \times Price	-0.014 (0.026)	-0.245 (0.102)**	-0.097 (0.046)**	-0.412 (0.092)***	-1.249 (0.370)***
Observations	6,635	8,904	8,915	8,915	8,915

* Significant at 10%, ** Significant at 5%, *** Significant at 1%. Columns 2 to 5 eliminate all coffee municipalities that ever produced coca from 1994 to 2004. All regressions include municipality and year fixed effects and control for the log of population. Robust standard errors are in parentheses and are clustered at the department level.

Table 8. Exploring the Income Shock Mechanism

Panel A: First stage, poverty on coffee crisis

	Poverty
Coffee Intensity \times Price	-0.059 (0.006)***
Observations	4,467

Panel B: Second stage, violence on poverty

	Guerrilla Attacks	Paramilitary Attacks	Clashes	Casualties
Poverty	0.782 (0.658)	0.125 (0.306)	2.018 (0.599)***	7.474 (2.538)***
Observations	3,571	3,575	3,575	3,575

* Significant at 10%, ** Significant at 5%, *** Significant at 1%. Internal price instrumented with international price. All regressions include municipality and year fixed effects and control for the log of population. Robust standard errors are in parentheses and are clustered at the department level.

Table 9. Exploring the State Capacity Mechanism

	Guerrilla Attacks	Paramilitary Attacks	Clashes	Casualties
Coffee Intensity \times Price	-0.137 (0.041)***	-0.013 (0.011)	-0.161 (0.042)***	-0.593 (0.157)***
1995 Public Inv. (PI) \times Price	0.007 (0.000)***	-0.001 (0.001)	0.001 (0.002)	-0.029 (0.008)***
PI \times Coffee Intensity \times Price	0.01 (0.004)***	-0.01 (0.005)*	-0.015 (0.014)	-0.056 (0.042)
Observations	8,228	8,228	8,228	8,228

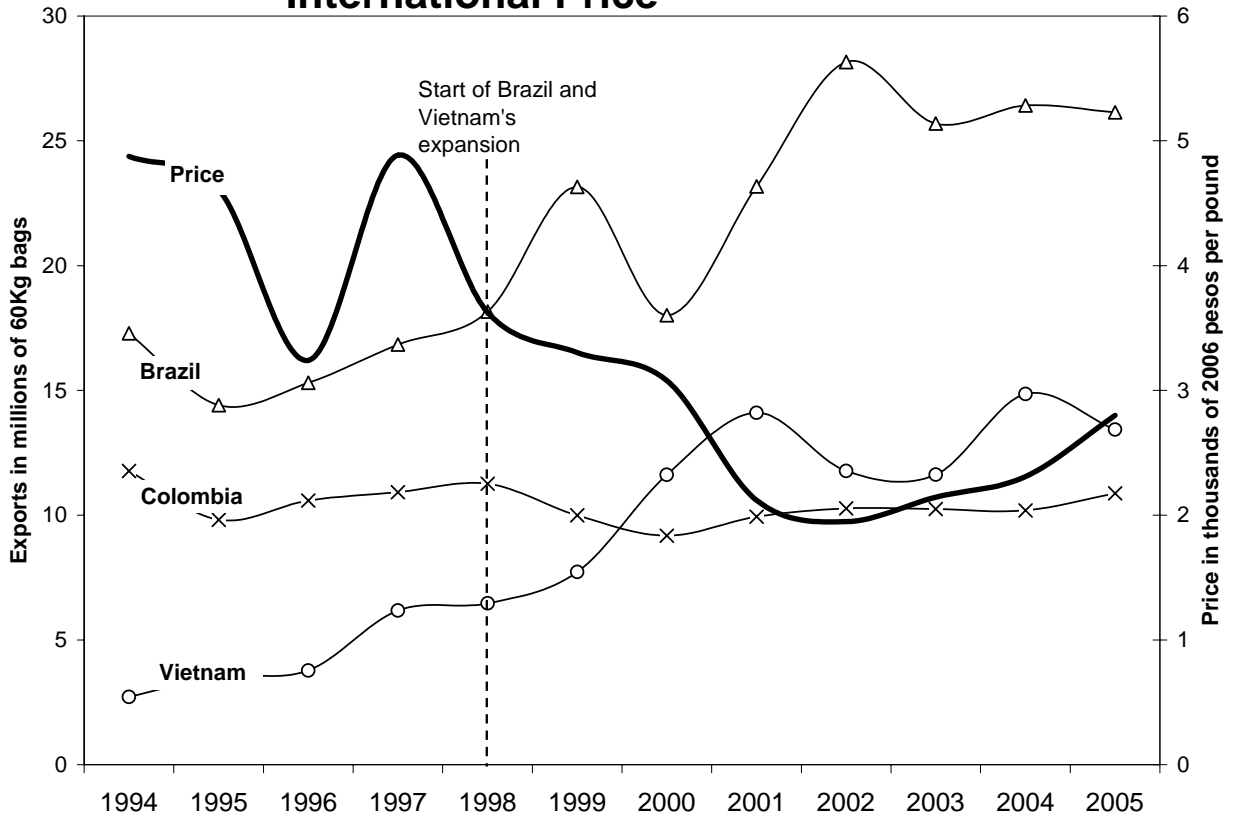
* Significant at 10%, ** Significant at 5%, *** Significant at 1%. Internal price instrumented with international price. All regressions include municipality and year fixed effects and control for the log of population. Robust standard errors are in parentheses and are clustered at the department level.

Table 10. Simple DD Estimate for Oil

	Guerrilla Attacks	Paramilitary Attacks	Clashes	Casualties
Oil Municipality \times Oil Price	0.002 (0.003)	0.001 (0.001)	0.023 (0.005)***	0.007 (0.002)***
Observations	15,552	15,569	15,569	15,569

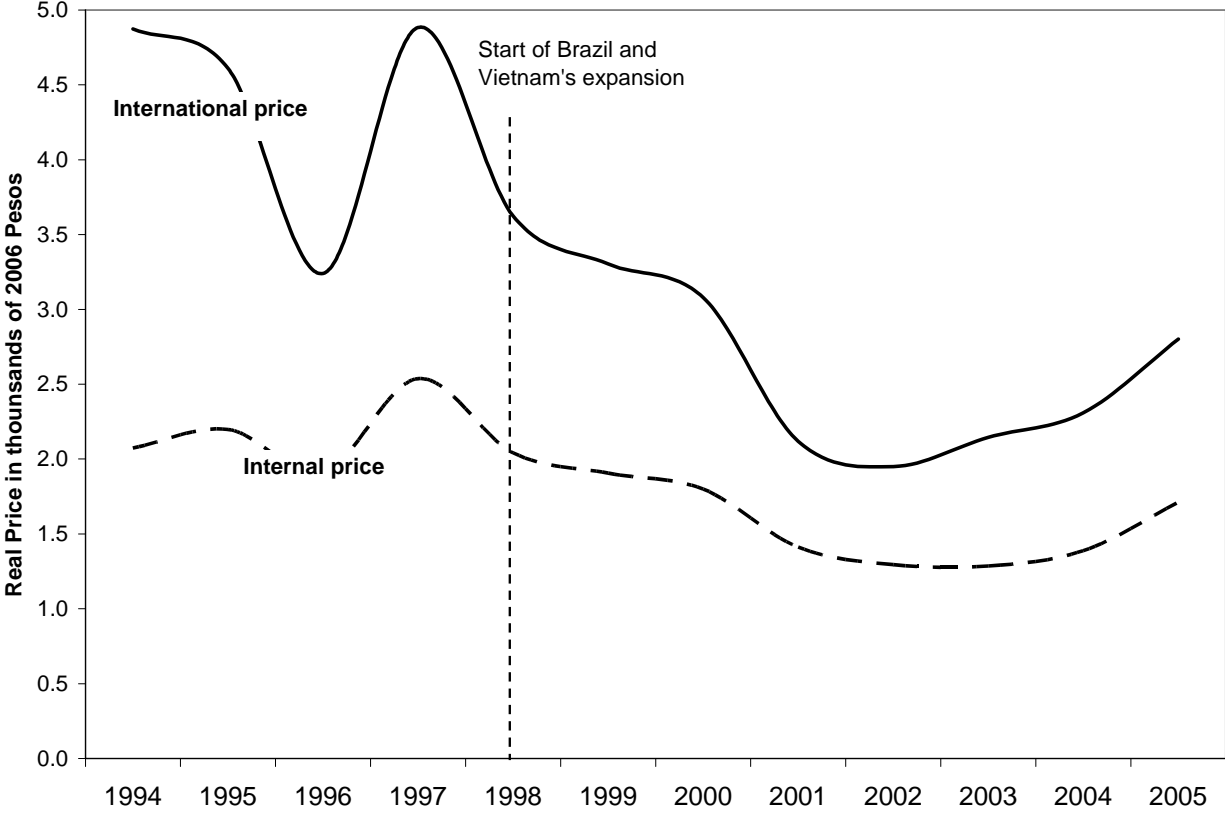
* Significant at 10%, ** Significant at 5%, *** Significant at 1%. All regressions include municipality and year fixed effects and control for the log of population. Robust standard errors are in parentheses and are clustered at the department level.

Figure 1. Coffee Exports of Main Producers and Real International Price



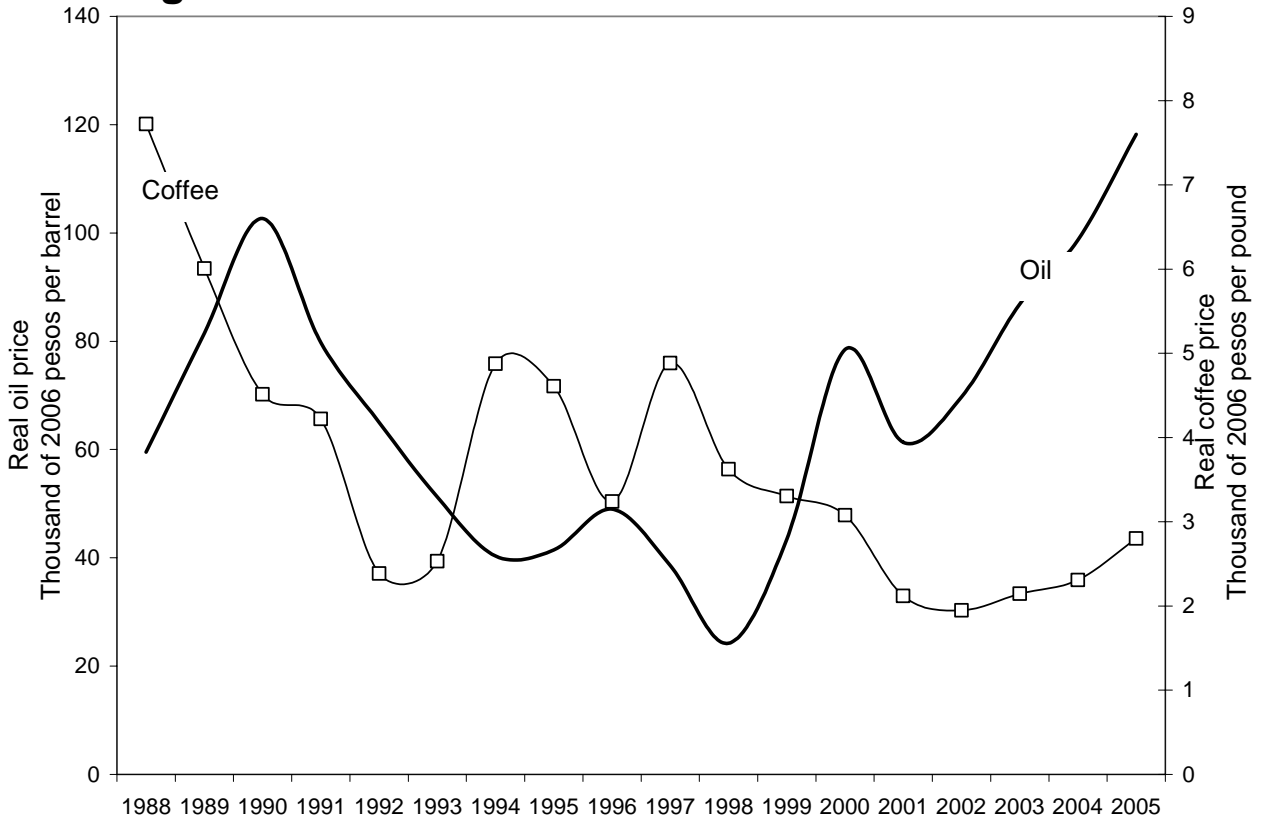
Source: International Coffee Organization and National Federation of Coffee Growers

Figure 2. Real International Price and Internal Price



Source: National Federation of Coffee Growers

Figure 3. Real International Price of Coffee and Oil



Source: National Federation of Coffee Growers and US Department of Energy

Figure 4. Mean Violence in Coffee and Non-coffee Municipalities

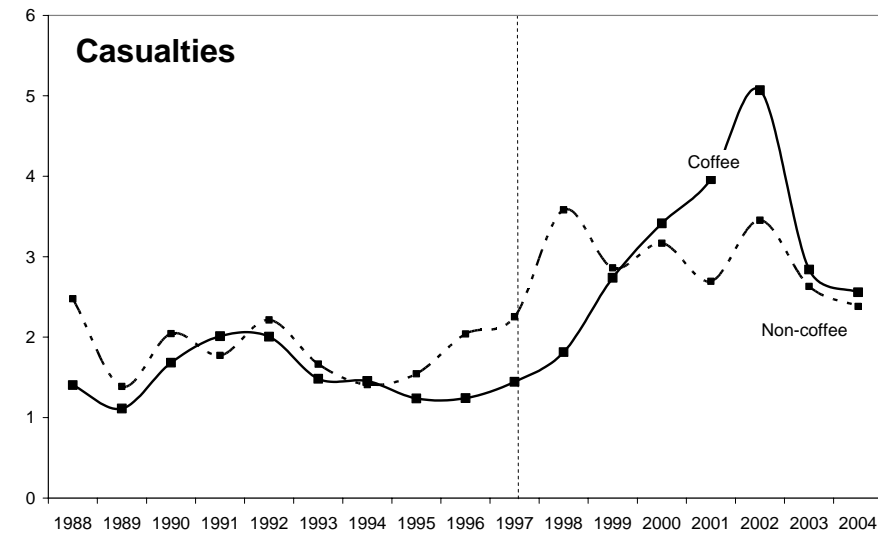
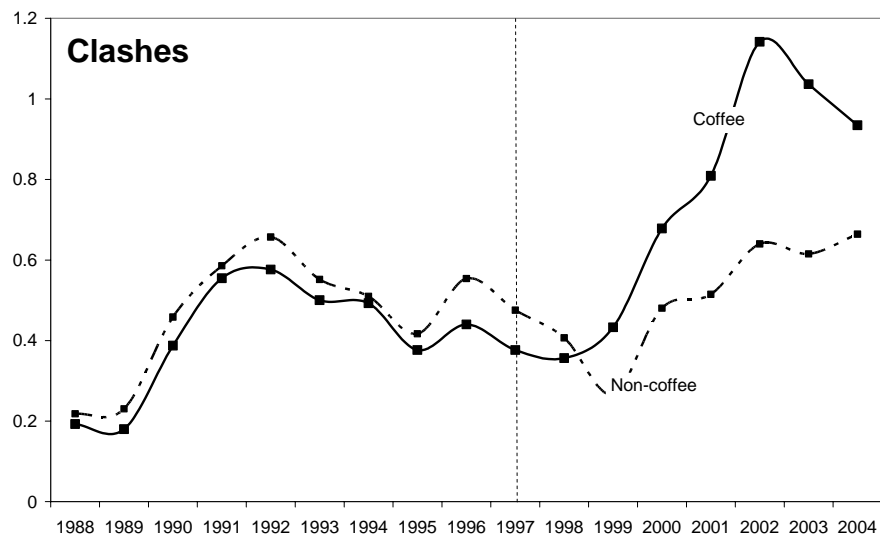
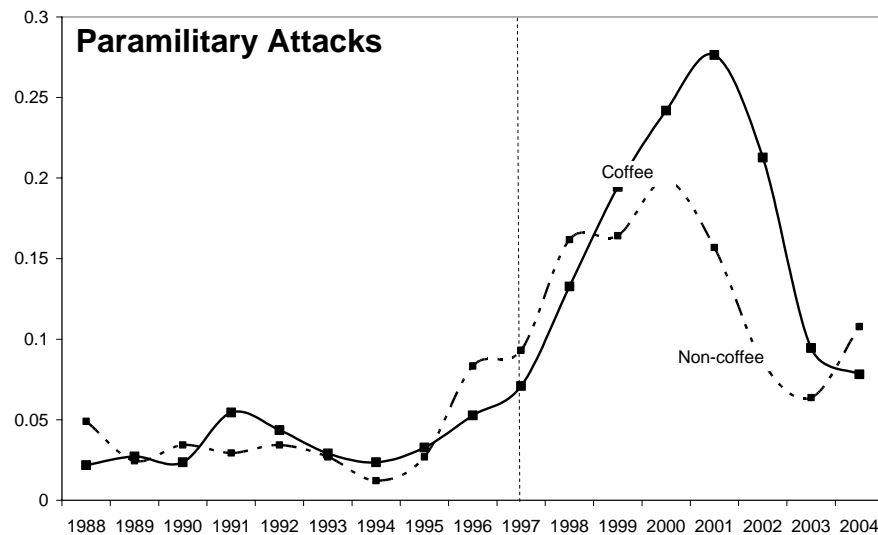
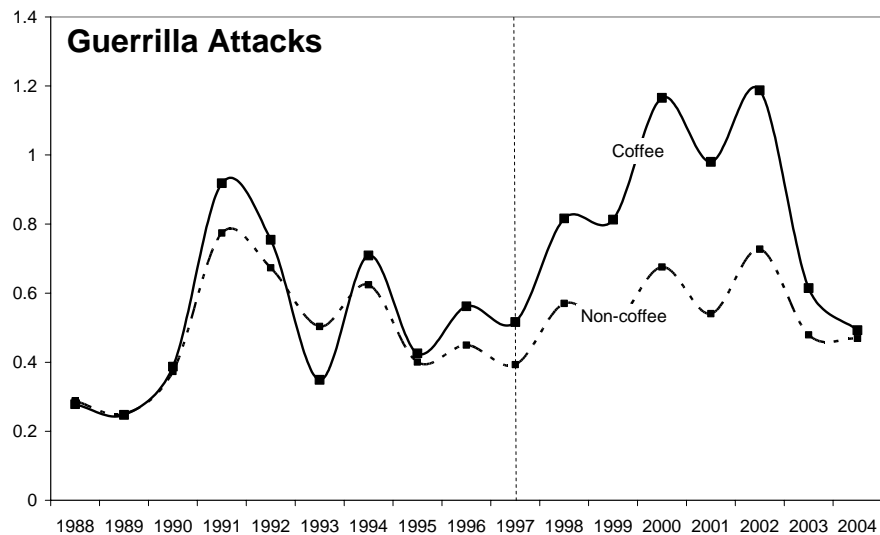
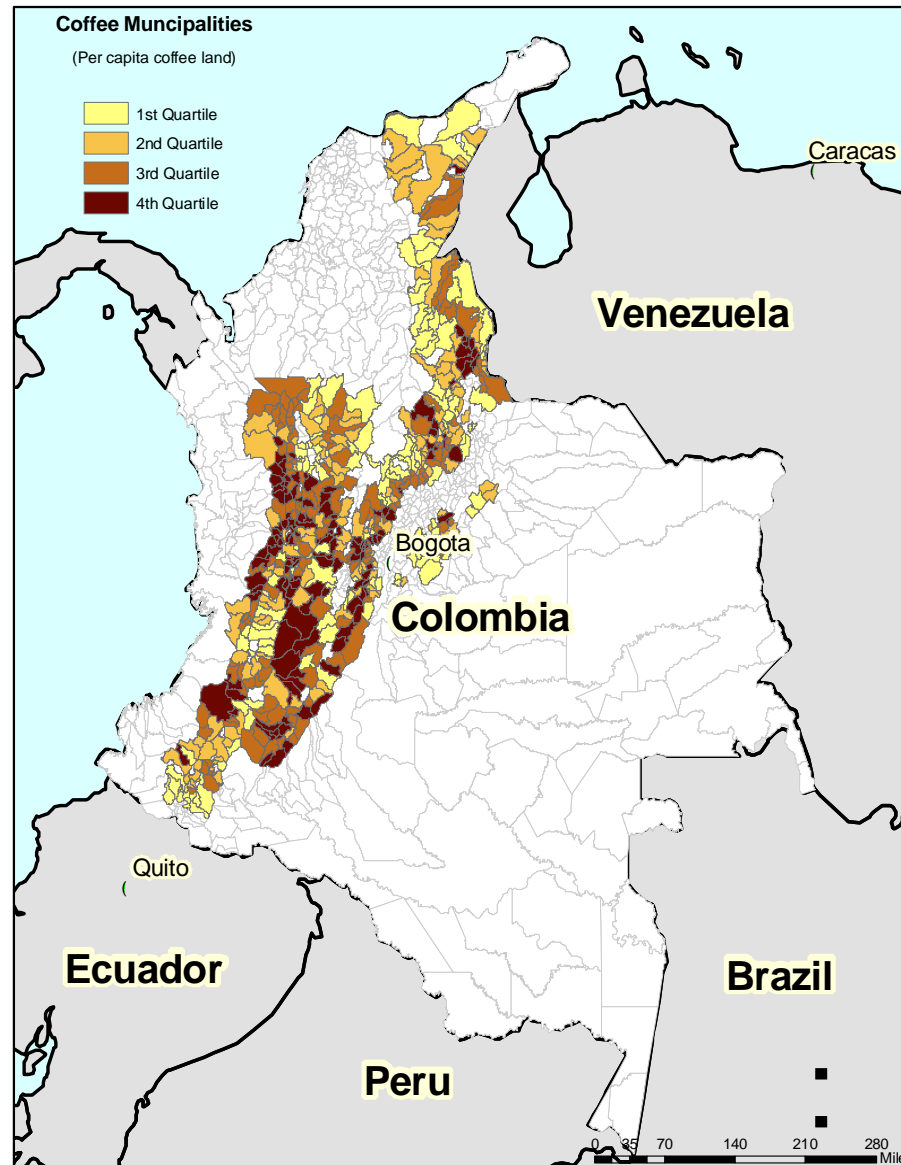
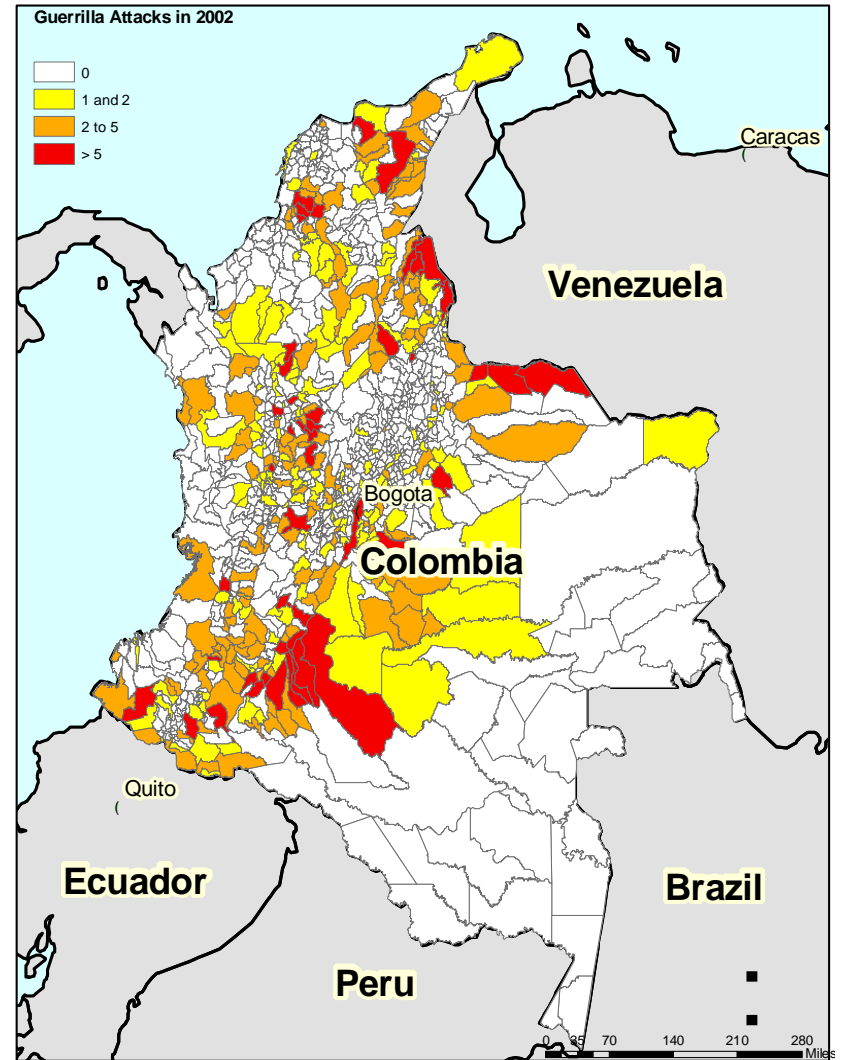
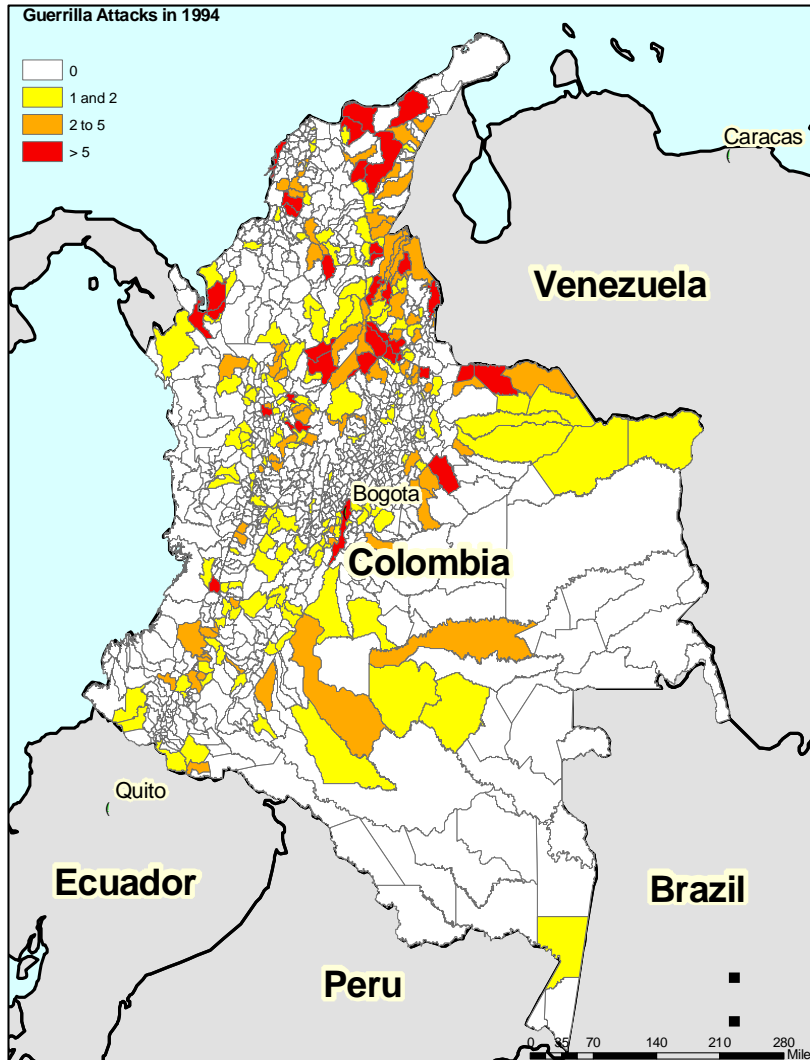


Figure 5. Map of Coffee Municipalities



Source: National Federation of Coffee Growers

Figure 6. Guerrilla Attacks by Municipalities in 1994 and 2002



Source: CERAC