Conflict, Military Aid & Commodity Values

An empirical study on the Colombian civil war

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Abstract

Armed conflicts in any country highlight the frictions within society. Armed conflict brings untold miseries not only to the participants of the conflict but also to the innocent civilians caught up in it.

Economics gives us better tools to understand conflicts. Over the period, researchers tried to understand conflict through different instruments, such as inequality, polarization, ability of groups to appropriate resources and income shocks etc. In my thesis, I have chosen to study conflict through income shocks. Using Colombian civil war and two recent articles as a guide, I try to gauge effect of violence on the internal price and revenue generated by coffee sector. I also use data on military and narcotic aid to augment my analysis.

I study the effect of conflict on the price and value of coffee production in Colombia. I find some evidence that increase in paramilitary attacks is associated with lower internal prices and revenues for coffee production. Then I use military aid as an instrument for conflict specifically for paramilitary attacks and find similar results. The results are robust even to the inclusion of various controls.

Acknowledgements

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I also want to thank University of Oslo for giving me an opportunity to work on this important subject. Thanks to Ministry of Foreign Affairs, Islamabad for allowing me to undertake the economics studies at Oslo. My thanks also go to Conflict Analysis Resource Center (Colombia), Oeindrila Dube, New York University and Suresh Naidu, Colombia University for the data and guidance.

Thanks to my parents for their prayers and my kids for being patient during the process. Special thanks to my wife, Rabia for her support and motivation.

I want to dedicate this study to ***the innocent victims*** of the Colombian civil war.

Any remaining errors and inaccuracies in this thesis are my own responsibility.

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Chapter 1

1.1 Introduction

Armed conflicts are manifestations of frictions in any society. These frictions could be due to number of reasons such as genuine or perceived grievances, inequality, increasing polarization etc. Nevertheless, whatever are the reasons for the armed conflict, they are always devastating not only for participants but also for innocent civilians. In old days, the war was a declared affair and was usually fought between two or more states. With the advent of non-state actors, the lines are continuously being blurred between different types of conflict. Hence, over the period of time the usage of the word "war" has been taken over by the term "armed conflict".

Legally speaking, International humanitarian law refers to two different types of armed conflicts: international armed conflicts and conflicts of a non-international character. An international armed conflict usually refers to an inter-state conflict. Common Article 2 of the 1949 Geneva Convention states that: "In addition to the provisions which shall be implemented in peace-time, the present Convention shall apply to all cases of declared war or of any other armed conflict which may arise between two or more of the High Contracting Parties, even if the state of war is not recognized by one of them. The convention shall also apply to all cases of partial or total occupation of the territory of a High Contracting Party, even if the said occupation meets with no armed resistance" (International Committee of the Red Cross (ICRC) opinion paper 2008). Thus it is generally agreed that a single incident involving the armed forces of two states may be sufficient to be considered an international armed conflict.

On the other hand an armed conflict of a non-international character is well defined by the International Criminal Tribunal for former Yugoslavia (ICTY) as "protracted armed violence between governmental authorities and organized armed groups or between such groups within a state" (ICTY, The Prosecutor v. Dusko Tadic1995). Thus in the view of the ICTY, two key elements should be there in the non-international character, first non-state armed groups must carry out protracted hostilities and second, these groups must be organized. Common Article 3 to the 1949 Geneva Convention and Article 1 of 1977 Additional Protocol II to the 1949 Geneva Conventions forms the legal basis for this type of armed conflict (Geneva Convention, Additional Protocol II 1977). Uppsala university, Sweden and Peace research Institute, Oslo describes armed conflict as "Armed conflict is defined as a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths" (PRIO, Armed conflict dataset 2011).

In my case, Colombian armed conflict is a classic case of non-international character. The conflict has its immediate roots in the start of communist insurgency in the 1960s. It remained

low intensity in the 1980s due to cold war and escalated in the 1990s. In essence, it is a three sided conflict involving government's military, communist guerrilla fighters and right wing paramilitary fighters. The paramilitary fighters are normally allied with government. The guerrillas and paramilitaries have sought territorial dominance via warfare and targeted political killings. They are generally financed by kidnapping, extortion, and predation on natural resource rents, and rely heavily on the lucrative cocaine trade. As a consequence, Colombia is engulfed in the perpetual violence for more than five decades now.

Understanding this classic case of Colombian armed conflict in non-state setting is crucial for dissecting the non-state conflict into pieces and finding the possible remedy to lessen the unending human sufferings, in other war theatres of such type. One important ingredient for understanding conflict from an economic perspective is the role played by income shocks. Income shocks affect armed conflict enormously. Theory suggests two opposite effects. If labour is used to appropriate resources violently, higher wages may lower conflict by reducing labour supplied to appropriation (Opportunity cost effect). Alternatively, a rise in contestable income may increase violence by raising gains from appropriation (Rapacity effect) (Dube and Vargas 2013).

My research primarily builds on the issues explored in two articles; "Commodity price shocks and civil conflict: Evidence from Colombia" by Dube and Vargas (2013) and "Bases, Bullets and Ballots: the Effect of U.S. Military Aid on Political Conflict in Colombia" by Dube and Naidu (2015). The former paper has examined the effects of exogenous price shocks on armed conflict. A rich data set on civil war in Colombia is used to assess, how different income shocks affect conflict? Changes in the price of agricultural goods (which are labour intensive) as well as natural resources (which are not) were examined. The paper focused on Colombia's two largest exports, coffee and oil. They find out that a sharp fall in coffee prices during the 1990s lowered wages and increased violence differentially in municipalities cultivating more coffee. This is consistent with the coffee shock inducing an opportunity cost effect. In contrast, a rise in oil prices increases both municipal revenue and violence differentially in the oil region. This is consistent with the oil shock inducing a rapacity effect. It is also shown that this pattern holds in six other agricultural and natural resource sectors, providing evidence that price shocks affect conflict in different directions, depending on the type of the commodity sector.

Another dimension of conflict is military aid, which is explored by the second paper using almost similar data. Throughout 1990s, Colombia remained third largest recipient of US military aid after Israel and Egypt. This aid has influenced the armed conflict enormously and affected the society in number of ways. Dube and Naidu (2015) probe the question, whether foreign military assistance strengthens or further weaken fragile states facing internal conflict? The question is addressed by estimating how U.S. military aid affects violence and electoral participation in Colombia. The allocation of U.S. military aid to Colombian military bases is exploited, and compared with its effects on municipalities with and without bases.

Using detailed political violence data, they find out that U.S. military aid leads to differential increases in attacks by paramilitaries (who collude with the military), but has no effect on guerrilla attacks. On the implications for Colombian politics, the paper finds that there are differential paramilitary killings in election periods, with largest effects emerging in competitive municipalities. These results point to a political cycle of paramilitary violence that is exacerbated by U.S. military aid. The findings also suggest that foreign military assistance may strengthen armed non-state actors, undermining domestic political institutions (Acemoglu, Robinson, and Santos 2013). They also find that military aid also has a negative impact on anti-coca cultivation enforcement.

Keeping both these papers as a reference and earlier other work with in this realm, this thesis studies the effect of violent conflict on the price and value (revenue) of commodity production (especially coffee). My empirical results are consistent with the hypothesis that foreign military aid directly affects and exacerbates the conflict due to diversion of military aid to illicit paramilitary groups, which in turns drive down the price as well as revenue generated from coffee production. So my research will not only reconfirm the existence of direct relation between military aid and paramilitary violence as shown by Dube and Naidu (2015) but will go a step further in trying to explain the effect and likely cause of decrease in the revenue generation in an important sector (coffee production) due to conflict, which is employing approximately 30 % of the rural population. The relationship I uncover through my results is interesting but still some steps away from a causal one.

I do not have the ideal price data, which would vary locally (at the municipal level). The available price data are national aggregates, which vary over the years but not at municipality level. Since, none of the explanatory variables in my case can change the non-price part of the coffee revenue measure (not having time variation), hence my analysis rely only on variation in the price data. To address this I create the variable "coffee revenue", which is the interaction of log of annual national price of coffee and a measure of coffee intensity (varying by municipality) which is fixed over time. In this case, the coffee revenue is to be interpreted as a crude measure of the value of coffee production in a municipality at a given point in time. Clearly, the best strategy would have been "municipality level coffee price x time varying municipality level of coffee production". Since I lack these data hence, the constructed measure "coffee revenue" should be seen as a rough proxy of the real object.

In essence, my research will link up both the earlier works with another angle. This will help us to see not only the effects of military aid on the violence but also its wider effects on the society. This upsurge in violence increases the demand for manpower by the paramilitary groups in the coffee producing districts. This increase in demand complemented with higher wages due to military aid, drains out available human resource pool from coffee picking sector. This drives down the coffee production and subsequently revenue generation for the society.

In a way, my focus is similar to Lind, Moene and Willumsen (2014). They explore the other direction of causality between drugs and conflict. Earlier studies explored the rise in conflict

due to opium production whereas; they show that opium production follows in the wake of conflict events in Afghanistan. Similarly, my work tries to show the decrease in coffee revenue follows in the wake of conflict events in Colombia. Moreover, my thesis somehow tries to see the work of Dube and Vargas (2013) from opposite direction. They try to show the effect of external price shock on the conflict and my thesis tries to find the effect of conflict on the internal price and revenue generation.

1.2 Core Concepts

In this thesis several concepts are used which require some elucidation. The most important concepts used in the thesis are "Rapacity effect", "Opportunity cost effect" and "the Military aid diffusion channel".

1.2.1 Rapacity Effect

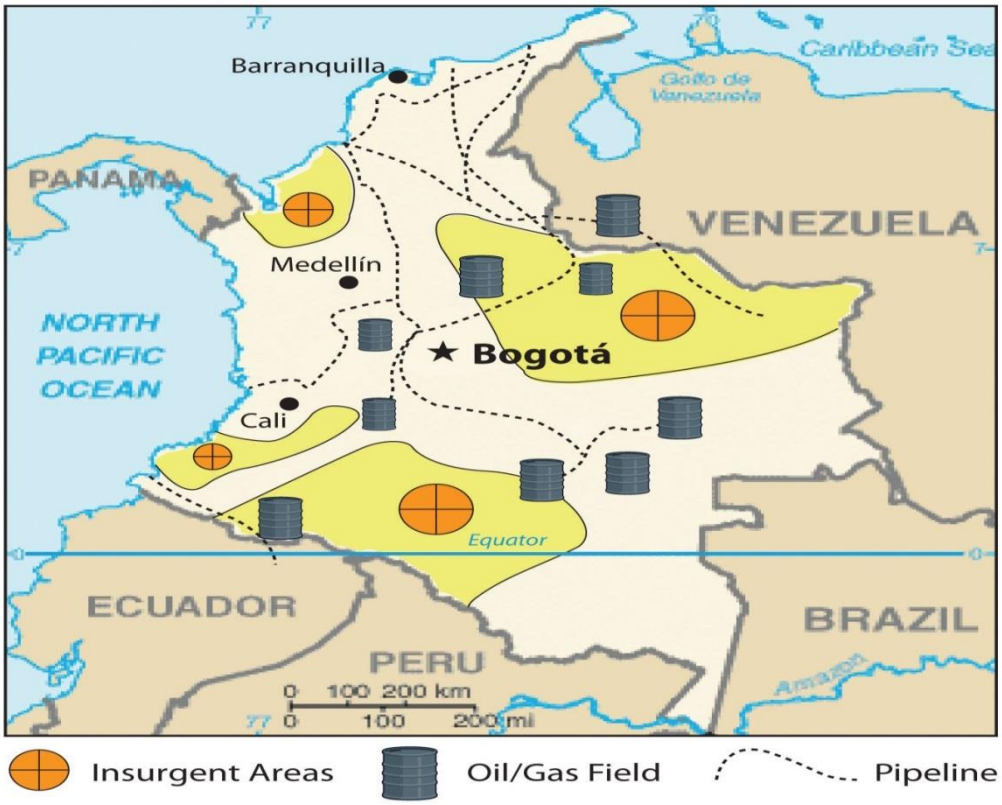

Figure 1: Oil Fields and Areas of Insurgent Influence
(Courtesy:http://2012books.lardbucket.org/books/regional-geography-of-the-world-globalization-people-and-places/s09-02-urban-north-and-andean-west.html)

Civil conflicts are generally fought over the valuable economics resources. Dalbo and Dalbo (2011), show that not all favourable shocks to an economy reduce conflict, even when they could make society richer. Rather, positive shocks to labour intensive industries raise wages and diminish social conflict, while positive shocks to capital intensive industries do just the

opposite. The key requirement is that the appropriation activity be more labour intensive than the average of the productive industries. Their model also tries to explain the perverse effects of aid to war ridden societies. Hence, the desire to appropriate resources increases the conflict.

Rapacity effect refers to the willingness to engage in conflict to control the production of commodities, such as oil or minerals, which do not require massive amount of labour, are highly valuable, are not perishable, and are not easily controlled. These resources are generally traded in the international markets and are subject to large swing in its prices. This affects both its value and the willingness to fight over them.

Workers normally choose to work in the sector where the rate of return is better. Be it the production sector or criminal sector. If the rate of return increases in the criminal activities as compared to production sector the workers will switch from the production sector to the criminal sector and vice versa. Grossman (1999, 1992) formalize the concept of civil war arising from theft. Hence, as shown by Dube and Vargas (2013), we can apply this concept of rapacity to armed conflicts as well.

1.2.2 Opportunity cost effect

As in Becker (1968), an individual's real income can be seen as his opportunity cost of engaging in a rebellious activity. For example as in my case of Colombia, a fall in the price of key export such as coffee can reduce employment in that sector, thus reducing the income that the workers in that sector must lose by engaging in conflict. Alternatively, if the prices of coffee increase, this will increase the employment in that sector and consequently the household income. This reduces their willingness to participate in the conflict. This mechanism is known as the Opportunity cost effect (Dube and Vargas 2013).

This mechanism does not imply that this switch is done free of compulsion. A member, who joins the conflict after his /her livelihood is destroyed and his family begins to starve, is likely motivated by the opportunity cost mechanism. But he/she may perceive a little choice in the matter. We should also note that this shock in the income can leave someone's family out of social net and into poverty trap which encourages violence due to frustration and increase motivation for engaging in conflict (Calì 2015). In essence an individual does not do it out of free will.

1.2.3 Military aid diffusion channel

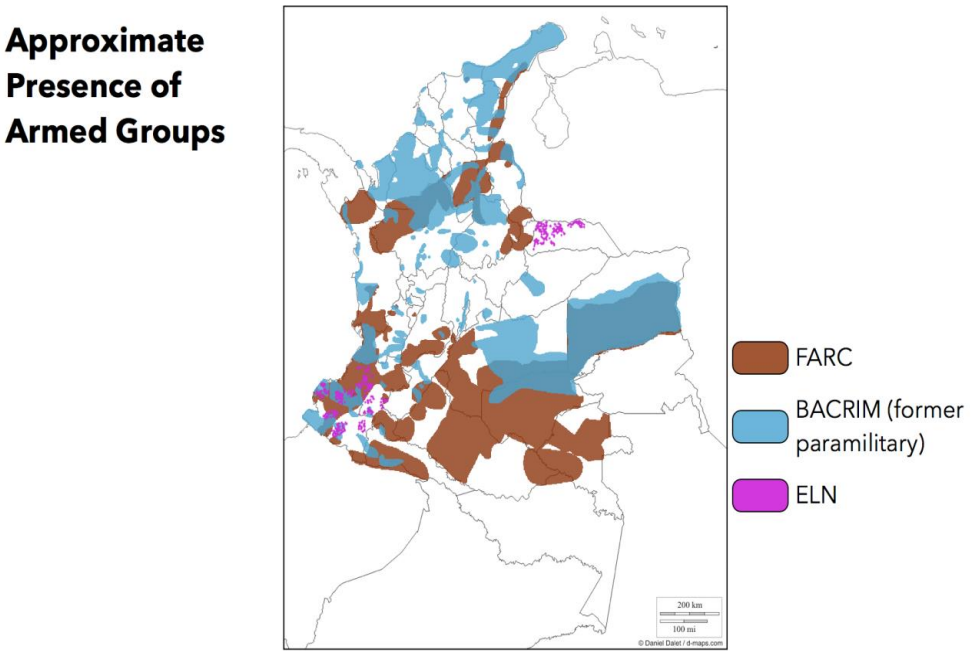

Figure 2: Geographical presence of Colombian Armed Groups
(Courtesy: www.wola.org)

Colombia is one of the largest recipients of the American military aid. The aid is given both for anti-insurgency as well as anti-narcotics operations. The important characteristic of the American military aid is that it is distributed to a particular military brigade operating out of specific military base. There are three potential channels through which the military aid can reach the paramilitary groups and strengthen them. First is the channel of resource-sharing. Colombian Military brigades may share their resources with regional paramilitary groups in terms of arms and ammunition, training and intelligence information. This resource-sharing could be both direct and indirect. Human right organizations have reported numerous events showing the active resource sharing between the military and para military organizations, resulting in human right violations. This has caused American government to link the aid with human right records of the Colombian military brigades. The second channel could be via complementarity tactics. If the paramilitaries specialize in a form of fighting efforts that helps government military efforts, then aid may lead to greater paramilitary violence in locations, where more military aid is received (Dube and Naidu 2015).

The last potential channel could be successful guerrilla repression. If aid could strengthen military in such a way that guerrilla forces are put on back foot in certain area then that could also increase paramilitary attacks in that region. In essence, if there is a resource sharing mechanism in place. Increase in military aid will increase violence in those regions where military brigades are stationed (Dube and Naidu 2015). If the complementary channel is in place then increase in aid will not lead to greater paramilitary attacks in the regions, where military brigades are stationed, if control is done for the government attacks. As for the

guerrilla repression channel, an increase in military aid will lead to decrease in the guerrilla violence in the regions with military brigades. From Dube and Naidu (2015), I know that the most likely channel is through resource-sharing.

1.3 Literature Review

Here, I will present some relevant literature on the income shocks and the subsequent generation of armed conflict due to these income shocks. Moreover, I will also try to cite the role of military aid on the evolution of violence. In the end, I will talk about the literature on the linkages between these two channels.

1.3.1 Income Shocks and armed conflicts

Instances of civil wars are now far more common than the international conflicts. Lacina and Gleditsch (2005) suggest that civil wars affected more than one-third of the world's developing nations. It is therefore important to understand the potential reasons for civil conflict. Collier and Hoeffler (2004) show that counter to the popular perception that grievances are the main causes of rebellion, those factors which determine the financial and military viability of a rebellion are more important. In order to create and maintain a rebel organization the rebels have to be paid and military equipment has to be purchased.

Fearon and Laitin (2003, 2005, 2008) state that the growing instances of civil wars since 1945 are mostly cause by poverty, political instability and difficult terrain. They give three main arguments in their favour. First, they argue that the present numbers of civil wars are due to the gradual accumulation in number of conflicts rather than a dramatic upswing, since the end of Cold war. Secondly, they say that a great degree of ethnic or religious diversity does not by itself make a country more prone to war. Lastly, strong ethnic or political grievances are not good predictors of the onset of civil conflict. Instead, the authors argue that when conditions favour insurgency the onset of civil conflict is more likely. They suggest that states that are weak organizationally, financially, and politically are more likely to experience insurgencies, while insurgents are aided by rough terrain, local knowledge, and large populations. They explicitly show that the lower per capita GDP is significantly associated with the onset of civil war.

In their paper Miguel et al (2004) state that estimating the impact of economic conditions on the likelihood of civil conflict is difficult because of endogeneity and omitted variable bias. They however, try to solve this problem by using instrumental variable approach (using rainfall variation as an instrument). They find growth strongly and negatively related to civil conflict. They also state that the impact of growth shocks on conflict is not significantly different in richer, more democratic, or more ethnically diverse countries. Their research is also important from a public policy perspective. They mention that, if a short-term drop in the opportunity cost of being a rebel (or government) soldier significantly increases the incidence of civil conflict, it may be possible to reduce the incidence of conflict through the design of

better income insurance for unemployed young men during hard economic times. Similarly, Oswald (1997) measure the impact of positive income shocks on the happiness and perceived wellbeing. He finds a positive link between both.

Miguel (2005) studies the link between poverty and witch killing in rural Tanzania. He finds that negative income shocks can result in declaring and killing of elderly women as witches. He also finds evidence suggesting lower survival chances of young girls and children due to negative income shocks, as they are perceived as burden during hard economic times. Lind, Moene et al (2014) explain the rise in Afghan opium production due to conflict. They explore how rising conflicts change the incentives of farmers. Conflicts make illegal opportunities more profitable as they increase the perceived lawlessness and destroy infrastructure crucial to alternative crops.

Do et al (2010) in their empirical analysis about geographic, economic and social factors that contributed to the spread of civil war in Nepal find out that poor districts are likely to be drawn into insurgency earlier. Moreover, they also state that in contrast to some cross-country analyses, ethnic and caste polarization, land inequality and political participation are not significantly associated with violence.

Dalbo and Dalbo (2011) incorporate appropriation activities (social conflict) into recognized models of trade and analyse how economic shocks and policies affect the intensity of conflict. They show that not all shocks that could make society richer reduce conflict. They further say that positive shocks to labour intensive industries diminish conflict, while positive shocks to capital intensive industries increase it. The basic requirement is that conflict activities be more labour intensive than the economy as this determines how shocks affect the return and cost of conflict.

Based on the previous literature such as of Becker's (1968) seminal work on the economics of crime, Dube and Vargas (2013) state that income shocks affect armed conflicts in two opposite directions, as suggested by theory. If labour is used to appropriate resources violently, higher wages may lower conflict by reducing labour supplied to appropriation. This is the opportunity cost effect. Alternatively, a rise in contestable income may increase violence by raising gains from appropriation. This is the rapacity effect. They use rich data on civil war in Colombia and try to gauge the effect of exogenous price shock on the labour intensive sector (coffee sector) and capital intensive sector (natural resources) and subsequently their effect on the armed conflict. They show that high prices in the coffee sector leads to lower conflict, whereas high prices in the oil sector intensify conflict. Similarly, negative price shocks effects armed conflict in the opposite direction (Dube and Vargas 2013). They also show that this pattern hold for other agriculture and natural resource sectors as well.

So different researchers have over the period of time significantly contributed to our understanding that how the economic outlook of individuals and states determine the course of any conflict.

1.3.2 Military aid and armed conflicts

Aid also called as international assistance or foreign assistance, in international relations is a kind of voluntary transfer form one government to another. It is given in different shapes for purposes. Military aid from advanced nations exceeds all other forms of aid. Every year billions of dollars are given by the powerful nations to weak countries to help them shore up civil conflicts and insurgencies raging within their boundaries. Still much more incidents of civil wars as compared to the international ones can be seen.

There is also issue of human rights violation attached to aid. In Colombian case, the American military aid has further strengthened the domestic economic elites, who have been a source of support for militarist solutions and political repression (Aviles 2006). This creates a bad situation for the propagation of human rights. Several studies have explored broadly the role of US military aid on democratic institutions. Schmitter and Philippe (1973) find insignificant relationship, whereas Muller and N. (1985) finds evidence of institutional deterioration. Finkel et al. (2007) also talk about insignificant relationship between the two. These mixed results could be due to differing samples as well as reliance on endogenous cross-country variations. Calì (2015) in his paper talk about the importance of trade in determining the instance of conflict. He show the evidence that trade and trade policy have a large impact on the risk and intensity of conflict.

Collier and Hoeffler (2004) conducted first quantitative study on the effects of aid on the likelihood of armed conflict. They argue from rent seeking perspective that aid helps the repressive capacity of the states. They state that main motive of rebels are access to natural resources rather than capturing the state. However, they could not find any direct evidence of effect of aid on the risk of war. Instead, they argue indirect effect on lower level of conflict through growth of economy and sound economic policies. They never tested their proposition empirically but arrived on their conclusion indirectly through separate analysis of variable of interest. Regan (2002) find that third party military interventions have showed to lengthen the conflict.

Collier and Hoeffler (2004), while modelling military expenditure state that there are regional arms races, which are fuelled by aid. Potentially, aid is encouraging a 'regional public bad'. They say that there may be an offsetting public good effect, if military spending deters rebellions. However, they find no deterrence effect of spending on the risk of civil war. Hence, there appears to be no regional public good effect offsetting the public bad arising from a neighbourhood arms race. So for them the military aid has a negative effect on the outcome of the civil wars. Djankov, Montalvo, and Reynal-Querol (2008) talk about the curse of aid and how it lowers the chances of democracy in a country.

(Ree, Joppe, and Nillesen. 2009) study the direct effect of aid on both the beginning and duration of armed conflict. They find no direct effect of aid on armed conflict. Some studies have moved away from aggregate aid flow to a particular type of aid such as Savun and

Tirone (2011) find that democracy assistance reduces the chances of armed conflict. Nunn and Qian (2014) show in their study that food aid increases the risk of armed conflicts.

Besley, Tomothy, and Persson (2010) state that the basic aspect of aid is that it is generally given from the strong to weak states. Weak states are those which don't have state capacities to raise revenue and to support markets. These weak states have a tendency of having power clusters instead of a central power command which leads to sharing of the aids given to them. This sharing or diversion of aid can intensify the conflict. Yet, little attention has been devoted to how military aid can exacerbate conflict when diverted to non-state armed actors.

Researchers have generally paid attention primarily on the behaviour of sovereign states (e.g., (Cingranelli and Pasquarello 1985, Carleton and Stohl 1987, McCormick, Mitchell, and Mitchell 1988, Poe and C. 1995, Abrams and Lewis 1993, Apodaca et al. 1999, Meernik et al. 1998). Pearlman, Wendy Cunningham, and Gallagher (2012) highlight the drawback in this strategy. They say that the most prominent form of violent conflict in the world today occurs within states rather than between them. Over 75 percent of militarized disputes have been civil conflicts since the Second World War. They define a non-state actor as an organized political actor not directly connected to the state but pursing aims that affect vital state interests. Indeed, these very actors may be strengthened, if they acquire enough resources and play a significant part in the conflict.

Dube and Naidu (2015) state that to complement existing work, the role of armed, non-state actors should be considered in evaluating how military aid affects political violence. They also state that aid may strengthen the state by bolstering its repressive capacity vis-à-vis armed non-state actors, or weaken it if resources are diverted to these very groups.

The links between state armies and these non-states actors (generally paramilitary forces) has been explored by many researchers. In his book "Walking Ghosts: Murder and Guerrilla Politics in Colombia (2004)" Steven Dudley writes extensively and passionately about suffering of people and the nexus between the military brigades and paramilitary forces.

Overall, there has been limited empirical work identifying the causal link between foreign military aid and violence related to civil war and only recently researchers have paid attention to address this problem (Dube and Naidu 2005). A handful of quantitative analyses have addressed the relationship between aid and the outbreak of armed conflict. Neither of the studies find any evidence of a direct relationship between aggregate levels of aid and the likelihood of civil war.

In sum, previous research on aid and armed conflict is scarce and the empirical research that does exist is inconclusive, especially in regard to whether, and how, aid levels may contribute to conflict. Moreover, generally there has been limited empirical work identifying the causal link between foreign military aid and civil war violence. Dube and Naidu (2015) in their study try to advance this link. They use in Colombian context within-country variation covering more than 900 municipalities and isolate exogenous variation in aid disbursement, which

facilitate cleaner identification of the political consequences of military aid. Moreover, they also talk about the potential channels through which this aid reaches to paramilitary forces, who are also participating in the conflict. The main difference between their research and others is that they highlight resource sharing channel between the different actor rather than the normal strategic interaction.

1.4 Contribution of this thesis

Figure 3: Map of Colombian Coffee Regions
(Courtesy: https://www.pinterest.com/mvcoffee/colombian-coffee-infographics/)

My study primarily focuses on the effect of increase in violence on the value of commodities produced in the agriculture sector. I take the case of production of coffee, which traditionally directly employs more than 30 % of the rural population of Colombia. Colombia is one of the largest exporters of coffee and any change in value of coffee could have enormous effects on the livelihood of the rural population and subsequently on the dynamics of conflict. Both guerrilla and paramilitary groups recruit from the ranks of rural workers, as the insurgency in Colombia is concentrated largely in the rural areas. So better understanding of this channel is very important for any public policy to dampen the conflict.

Dube and Vargas (2013) state that increase in the external prices of coffee decreases the conflict due to opportunity cost effect. In my thesis, I probe the question from another direction by examining the effect of increase in conflict on the value of coffee. This approach is similar to one used by Lind, Moene, and Willumsen (2014). They probe the effect of increase in the violence on the production of opium. Before them, several researchers tried to find the effect of production of opium on the occurrence of conflict.

During my analysis, I find some evidence of significant effect of conflict on the internal prices of coffee, which is generally negative. When I look at the effect of conflict on the coffee revenue (also termed as coffee value, which is the interaction term of coffee intensity and the log of internal price of coffee) the effect is significant and even more negative. All the conflict variables including the paramilitary attacks, guerrilla attacks, government attacks, clashes and casualties show varying degree of significance and effect on coffee revenue.

Dube and Naidu (2015) show that the military aid increases the instances of paramilitary attacks. They point out the aid diffusion is the most likely channel for this effect. In my research, I am able to reconfirm their findings regarding the direct relationship between the conflict and military aid. The most probable reason for decrease in value of coffee due to increase in conflict is based on labour demand channel. Since military aid is diffused to paramilitary groups, this led to increase in violence perpetuated by them. This increase in violence creates demand for further recruits. So this increase in demand by paramilitary groups affects the human resource available for coffee production, which may results in lower cultivation and hence lowers revenues.

I use the military aid as an instrument to check the effect of increase in violence on the internal prices of coffee and revenue generation by the coffee sector. I believe that the instrument military and narcotic aid is both relevant and exogenous. Relevant in a way that military and narcotic aid to Colombia is correlated with conflict. Since relevance of the instrumental variable can be checked, I show through my results that military and narcotic aid to Colombia is a relevant instrument. This means that increase in military aid increases the instances of conflict and decrease in military aid decreases the conflict even after controlling for the effect through other included regressors. Within conflict variables, I will use Paramilitary attacks as my endogenous variable, since it is relevant. This is also in line with Dube and Naidu (2015). The first stage regression shows a clear, significant and positive effect of military and narcotic aid to Colombia on the paramilitary attacks. The F-statistics are reasonably large enough and exceeds the minimum requirement of 10. The second stage coefficient of paramilitary attacks on the coffee price and revenue is significant and negative. This is also in line with the OLS fixed effect estimates.

On the other hand, I believe that the instrument military and narcotic aid to Colombia also full fills the exogeneity condition in a way that it is uncorrelated with the error term and is correlated with the endogenous regressor. Which in our case are paramilitary attacks. There is no evidence to suggest possibility of Military and narcotic aid affecting the dependent variables, internal coffee prices and its revenue measure directly. It only affects the dependent variables through conflict. In my case, I have an exactly identified model hence; I cannot test the hypothesis that the exclusion restriction is a valid one, because the condition involves the unobservable residual. My claim for exclusion restriction is based on believes that the instrument "military and narcotic aid to Colombia" is uncorrelated with error term and operates only through paramilitary attacks. Moreover, there is no known reverse effect of coffee revenue or internal prices on the instrument. By using military and narcotic aid to

Colombia as an instrument, I try to mitigate any endogeneity concerns which may arise and try to move closer to a causal interpretation.

My study try to shows that the paramilitary attacks decrease the value of coffee and also have significant effect on the internal prices of coffee. This is robust even after inclusion of other explanatory variables. Moreover, in my analysis, I find some evidence that the military aid is a valid instrument to determine the effect of the paramilitary attacks on the price and value of coffee.

Chapter 2

Background, data and Methodology

2.1 Background of Colombian civil war

Figure 4: Map of Colombia showing various departments

(Courtesy: http://www.ezilon.com/maps/south-america/columbia-maps.html)

The Colombian conflict is a contest of low intensity and long duration for political power. Various analysts have pinned down the land distribution as the main cause of Colombian Conflict over the centuries and yet there are others who see it as an extension of drug trade and break down of traditional power structures. Various economic and social indicators have shown serious inequality in distribution of wealth and other resources. 1 % of the population of Colombia controls 45 % of the wealth. In rural areas, 86 % of the population is poor. Nevertheless, the most notable indicators of this inequality relate directly to the distribution of land. 3 % of landowners own more than 70 % of the arable land and 30 percent of property owners control about 95 % of the best land. (Roberto Mignone, Atlanta International University)[1]

[1] Roberto Mignone wrote an excellent piece on Colombian history. Unfortunately the year of origin could not be traced. Website address of his article at Atlanta International University web page is given in bibliography.

The current phase of the Colombian conflict started around 1964 and is an ongoing low intensity civil war. In last 40 years, Colombia has been experiencing countless human rights violations and war crimes. Officially, it is a three sided conflict involving government (military), communist insurgents, and right-wing paramilitary groups, though typically, the government and the paramilitary groups have been allied against the guerrilla. Violence carried out by these actors has led to the death and displacement of tens of thousands of people. More than 3 million have fled the violence, making Colombia home to the second largest internally displaced population in the world (Amnesty International, World Report 2009: Colombia). Though the current conflict in Colombia is only four decades old but its roots could be traced in the events of past few centuries.

2.1.1 From Colonial time to present Conflict

Before the arrival of the Spanish Conquistadors all the indigenous groups in the territory, which is now Colombia had a collective community ownership of the land. In the colonial period (1492 – 1810), the main use of the land was not for agriculture but for extracting minerals but still it was seen as a source of power. Over the period of time, King of Spain use to grant immense tracts of lands as political favours to the ruling elites (Roberto Mignone, Atlanta International University).

As of the sixteenth century, marginalized groups such as escaped Afro-Colombian slaves and other poor farmers without land began the migration towards remote areas, where land was still available. In these regions, the State was absent and basic infrastructure was unheard of. This settlement process often occurred at the expense of the local indigenous groups, which raised frictions. After independence from Spain (obtained in 1810) the unequal land distribution increased as vast extensions of public land were assigned by the new government to militaries, who had fought the independence war. This further polarized the society (Roberto Mignone, Atlanta International University).

At the beginning of the twentieth century, the high concentration of land in few hands and extreme poverty of most peasants led to the creation of organized movements of protest. As a result, the first agrarian trade union was founded in 1913. Then in the 1920s more political movements were created or consolidated to give voice to the landless peasants, who called for land redistribution. Some of these movements were socialist in nature, which later turned in to the Communist Party of Colombia. Other such elements formed the Liberal Party. Liberal Party-run administrations made various unsuccessful attempts for land reforms in 1930s and 1940s. They tried to formally allocate land to peasants, who were already living on it and cultivating it. This move infuriated the landowners. The landowners with the backing of the Conservative Party forcefully reacted by expulsion of many peasants. These evicted landless peasants were again forced to colonize unclaimed land in remote regions, which further complicated the tenuous relations with the local indigenous groups.

2.1.2 Present Conflict

In 1948, the famous liberal party candidate for president was assassinated, which triggered the decade of violence, famously known as "LA Violencia" in which more than 200,000 people got killed. In 1953, military for the first and only time in the history of Colombia took power in a coup. Subsequent military crackdown forced many peasants and liberals towards remote areas of the country. They unsuccessfully tried to form independent republics and joined together to form FARC (Colombia's Revolutionary Armed Forces) in 1964. Other guerrillas groups, such the ELN (National Liberation Army), of Cuban inspiration, and the EPL (Popular Liberation Army), of Maoist tendencies also emerged in the mid-sixties (Roberto Mignone, Atlanta International University).

These groups are still active today and are among the main actors of the four decade - long civil conflict in Colombia. The other main actor of the current conflict emerged as a reaction to the advances of the FARC: the paramilitary groups, also known as Self Defence Groups (AUC). It is the fastest growing illegal armed actor in Colombia, since the early nineties. Among the main promoters and financiers of these paramilitary groups are rich landowners, who traditionally feel threatened by FARC.

The conflict remained low intensity throughout the 1980s, when it effectively served as a Cold war proxy, but escalated sharply during the 1990s for a number of different reasons, including guerrilla defeat of the narco-traffickers and the emergence of paramilitary groups. Both the guerrillas and paramilitaries have sought territorial dominance via warfare and targeted political killings. They are financed by kidnapping, extortion, and predation on natural resource rents and rely heavily on the cocaine trade for financing purposes (Richani 1997). Thus the drug trade is inextricably linked to the internal conflict. Paramilitary entry corresponded to a sharp intensification in overall casualties, as these groups intentionally targeted civilians perceived to be allied with the guerrillas (J., M., and Vargas 2004). They viewed this approach as pursuing "anti-infrastructure" activity.

Though there have been some positive developments to end this mindless four decades long violence but how this effort eventually turns out is yet to be seen.

2.2 Data

2.2.1 Data on Coffee cultivation, prices and violence

For my thesis, I have used the Panel data on the Colombian armed conflict. The data is mostly from Conflict Analysis Resource Centre (CERAC), based in Colombia. CERAC was created in 2005 by a group of academics affiliated to various Colombian universities and universities and academic institutions in Great Britain, Switzerland and the United States, with the objective to create a research platform about armed violence, conflict analysis and

the impact of conflict on development. The data compiled by them on the Colombian conflict is comprehensive.

Data is event based, and includes more than 21,000 war related events from 990 Colombian municipalities from 1988 to 2005. The database has several desirable characteristics. It is a daily data and since groups not directly involved in the conflict collected the data, the potential biases are kept to a minimum. It account for all armed group actions. Data gathering is designed from the beginning to measure the impact of the conflict, i.e., the data set is not derived from other data, collected for other purposes. And last but not the least, the data set include only the verifiable political violence and exclude any criminal violent episodes (J., M., and Vargas 2004).

Data is basically based on the media reports of 20 newspapers of national and regional coverage and supplemented by reports of NGOs, local public ombudsman and particularly by Catholic priests, who were serving on ground in almost all the municipalities. These Priests are regarded as neutral and often play the role of negotiators between the warring sides. Hence, it minimizes the chance of any over reporting of conflict. The events are also cross verified with the data set of Colombian national police and reports by Amnesty International and Human Rights Watch.

The dataset codes each event by date, municipality location; groups involved and associated causalities of both group members and civilians. Hence I can aggregate the statistics of events to municipality and year level, and employ the annual number of guerrilla attacks, paramilitary attacks and clashes as the key dependent or independent variables. The data can distinguish between attacks versus clashes. A clash is defined as a direct encounter between two or more groups that results in armed combat. An attack on the other hand is a unilateral violent event carried out by a single group, in which there is no direct armed combat between two groups (J., M., and Vargas 2004).

Thousands of hector of cultivated land is used as a measure for coffee cultivation in a municipality in a given year. For example, a coffee census in 1997 records hectors of land used for growing coffee in each municipality. Colombia is a good case for comparing conflict dynamics in regions of varying coffee intensity, since cultivation is not isolated to any particular region. In fact, 536 municipalities or approximately 54 % of the municipal sample is classified as coffee producing. In 1997, the coffee sector accounted for 30 % of rural employment (Ministry of Agriculture, Colombia, 2007). Coffee is not a plantation crop and is grown largely by small holders of land in Colombia mostly employing casual agricultural labourers.

Coming to Coffee prices, the data comes from the National Federation of Coffee Growers (NFCG), a quasi-governmental institution overseeing the taxation of coffee exports and internal prices paid to coffee growers. The internal prices are lower than the international prices (due to tax and transportation cost) and do not vary across regions. The tax is used to generate a fund which helps in stabilizing the coffee prices against external price shocks.

During the period under review the NFCG was successful for enacting the floor on the coffee prices (Dube and Vargas 2013).

I do not have the ideal price data, which would vary locally (at the municipal level). Instead, the data I have is the annual data on internal coffee prices at national level (not municipal level). Hence, I create the variable "coffee revenue" to try to circumvent this problem. The variable coffee revenue is the interaction of log of annual national price of coffee and a measure of coffee intensity (varying by municipality) which is fixed over time. In this case, the coffee revenue is to be interpreted as a crude measure of the value of coffee production in a municipality at a given point in time. Clearly, the best strategy would have been "municipality level coffee price x time varying municipality level of coffee production". Since I lack these data hence, the constructed measure "coffee revenue" should be seen as a rough proxy of it.

Data on coca cultivation comes from two sources: Dirección Nacional de Estupefacientes (DNE) has a measure of land used for coca cultivation in each municipality in 1994; an equivalent measure is available over 1999-2005 from the United Nations Office of Drug Control (UNODC), which collects this data based on satellite imagery. Coca in my study presents direct evidence against the alternative mechanism that fall in coffee revenue is due to plantation of more coca. My results show that coca has no significant effect on the coffee revenues. In addition data on municipal population came from DANE, the Colombian statistical agency (Dube and Vargas 2013).

I also look at the effect of conflict on oil revenue to contrast it with the effect on coffee revenue. Oil is Colombia's largest export. There are 39 oil producing municipalities in Colombia. My main Oil measure is the average barrels of crude oil produced per day in each municipality in 1988, the beginning of my sample period. Oil is a capital intensive sector and employs less labour in comparison with the coffee sector. Since, oil is easy to appropriate, I expect either no or positive effect of conflict on the oil revenues. The data on oil prices comes from International Financial Statistics (IFS) (Dube and Vargas 2013). I use variable oil revenue which is interaction of log of international oil prices and production of oil in 1988.

2.2.2 Data on Military Aid

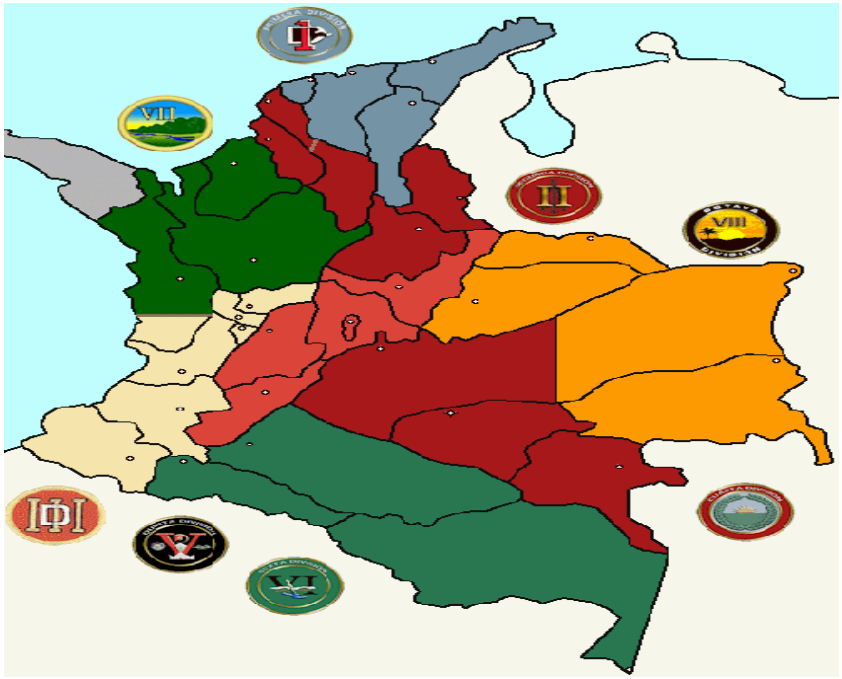

Figure 5: Location of Military Bases in Colombia

(Courtesy: www.globalsecurity.org)

The US military aid in Colombia is given directly to the military brigades stationed in bases in specific municipalities. The indicator for military base presence is constructed from two sources. First from globalsecurity.org, this gives a list of 37 municipalities with military bases. This information is crosschecked with the websites of Colombian Army, Navy and Air force to eliminate any newly constructed bases in my sample period. Three bases are found to be newly built and are deleted, since it is possible that these are built as an endogenous response to conflict (Dube and Naidu 2015). Out of the 34 left, 32 appear in the sample for which the conflict data is available.

Finally, data on U.S. military and narcotic aid is from the USAID Green book. Actual disbursements are used in the data, which are money and resources spent that year, rather than commitments of future aid. Since much of U.S. assistance to Colombia, including the provision of training and equipment, falls under the category of anti- narcotics assistance, I look at the combined categories of military and anti-narcotics assistance. The data on the military aid is region invariant. I am using the log values of military aid data for my analysis.

2.3 Methodology

The data I am using in my thesis is panel. This rich set of data documents more than 21,000 conflict related episodes for more than 900 Colombian municipalities from 1988 to 2005. In

my analyses none of the explanatory variables can change the non-price part of the coffee revenue measure; hence I rely only on the variation in the price data, which are national aggregates. I try to mitigate this concern by creation of variable on coffee revenue. The variable coffee revenue is the interaction of log of annual national price of coffee and a measure of coffee intensity (varying by municipality) which is fixed over time. In this case, the coffee revenue is to be interpreted as a crude measure of the value of coffee production in a municipality at a given point in time. Even this is not an ideal situation due to limitation of data as the most appropriate measure would have been the interaction of "municipality level coffee price x time-varying municipality level of coffee production".

Since I have the panel data for my analysis, the real choice I face is to decide between using the fixed effect and the random effect models.

2.3.1 Fixed effect Vs Random effect model

Panel data, longitudinal data or cross sectional time series data are repeated measurements at different points in time on the same individual unit, such as person, firm, state, or country. Regression can then capture both variation over units, similar to regression on cross-section data, and variation over time (Cameron & Trivedi. 2009). Panel data method are more complicated then cross-section. The standard errors of estimators need to be adjusted because of non-independence of data over multiple time periods. In my thesis, I will focus on short panel that means data on many individual units and few time periods. Moreover, I have a case of balanced data (absence of missing values) in my data set.

One of the threats to internal validity could be due to omitted variable bias (OVB). Panel Data offers a powerful way to tackle issues related to omitted variable bias. Specifically, panel data allow control for unobserved but fixed factors that drive participation and are related to potential outcomes. If that omitted variable is known, it can be included in the multiple linear regression model. If it is unknown, Panel data or instrumental variable approach is used.

One basic consideration in the panel data model is whether this omitted variable is correlated with the explanatory variable or not. If regressors are endogenous (provided they are correlated only with time invariant component of the error) fixed effect model is used. In case, if the omitted variable is uncorrelated with the explanatory variable random effect model is used.

In my case, I will use fixed effect model because I suspect that my explanatory variables are correlated with unobserved omitted variable. This is usually tested by a Durbin-Wu-Hausman test. To check my hypothesis, I use Hausman test and the resulting statistic I get is significantly different from zero. I report these results in table 2. This shows that the fixed effect estimator is a natural choice for my analysis.

2.4 Empirical Specification

I am interested in estimating the casual effect of increase in conflict on the price and revenue generation of coffee. As a first step, I am using the OLS fixed effect model to gauge the direct effect of conflict related variables, such as paramilitary attacks, guerrilla attacks government attacks, clashes and casualties on the coffee price and coffee revenue. In the next step, I will use military and narcotic aid to Colombia as an instrument to gauge the effect of paramilitary violence on the price and revenue generated by the coffee sector. I will use the Instrumental variable approach because there may still be a problem of omitted variable bias due to a variable, which varies both across municipalities and years. Instrumental variable approach will help me to mitigate any endogeneity concerns and move closer to a causal interpretation.

Due to data restriction I have only price variation in my analysis. To mitigate this, I create variable "coffee revenue" which is to be interpreted as a crude measure of the value of coffee production in a municipality at a given point in time.

2.4.1 OLS Fixed Effect Model

I will follow the difference-in-difference estimator by assessing the effect of various variables of conflict on the internal coffee prices and then on the coffee revenue. In this approach, time variation stems from movement in annual prices. My estimation equation is:

$$(Cofint_{jr}\ X\ CP_t)\rho = \alpha_j + \beta_t + \delta_{rt} + Conflict_{jrt}\tau + X_{rjt}\emptyset + Coca_{jr}t\sigma + \varepsilon_{jrt} \ldots\ldots\ldots (1)$$

Where $Cofint_{jr}$ is the municipality-level hectare of land devoted to coffee production in 1997. Data on hectares of land used for coffee cultivation comes from the 1997 Coffee Census, a nation-wide listing of coffee growers conducted by the National Federation of Coffee Growers (NFCG), over the period 1993-1997. I am using this time invariant measure of coffee production because in my sample period, data for only 1997 census is available. CP_t is the natural log of the internal coffee price in year t. j is one of the 972 municipalities, r is one of 4 regions in Colombia and t is one of 18 time periods. α_j are municipality fixed effects and β_t are year fixed effects. δ_{rt} are linear time trends in Colombia's four major regions (Andean, Caribbean, South-eastern and Pacific). These account for potential omitted variables, since commodities may be concentrated in particular regions, and violence may be trending upward in these locations based on other factors such as varying economic growth rates or geographic shifts in the presence of armed groups.

$Conflict_{jrt}$ captures the conflict related variables such as paramilitary attacks, guerrilla attacks, government attacks, clashes and casualties and X_{rjt} is basically the natural log of population, to account for the scale effect since the conflict variable is measured as the number of attacks.

$Coca_{jr}$ is an indicator that equals one if the municipality was cultivating coca in 1994, and $Coca_{jr}t$ are linear time trends in the coca and non-coca municipalities. These trends also mitigate potential omitted variable bias since coca presence may be correlated with commodity presence, and both coca planting and government eradication efforts increased dramatically during the 1990s, either of which may have caused violence to trend upwards in the coca area. This also examines the effect of coca cultivation on coffee revenue.

The standard errors in all regressions are clustered at the department level. This is done to control for potential serial correlation over time and across municipalities within a department. This is a fairly strict test since the cross-sectional variation in my key explanatory variables is at the municipal level. More than 900 municipalities in my sample are grouped into 32 departments. This is also in line with both Dube and Vargas (2013) and Dube and Naidu (2015).

2.4.2 2SLS approach: Military and Narcotic aid to Colombia as an instrument

OLS fixed effect model is still open to endogeneity concerns particularly due to omitted variable bias and reverse causation. To eliminate this concern, I need to instrument for "Conflict". I take Military and Narcotics aid to Colombia as an instrument for conflict. Colombia is one of the major recipients of American military aid. I find it a relevant instrument through first stage regression. Moreover, Military and Narcotics aid does not seem to affect coffee or oil prices or revenue directly. For the instrumental variable approach, I will again follow the difference-in-differences estimator by assessing whether changes in military aid affects the coffee prices. My specification can be represented in two stages. The second stage estimates the effect of conflict on price of coffee as well as the interaction of coffee intensity and prices, which is coffee revenue and is given by

$$(Cofint_{jr}\ X\ CP_t)\rho = \alpha_j + \delta_{rt} + Conflict_{jrt}\tau + X_{rjt}\emptyset + Coca_{jr}t\sigma + \varepsilon_{jrt} \quad \ldots\ldots\ldots\ldots (2)$$

In my specification, the first stage for effect of military aid on the conflict is as:

$$Conflict_{jrt} = \alpha_j + \delta_{rt} + X_{rjt}\emptyset + mil\_aid_t\theta + Coca_{jr}t\sigma + \in_{jrt} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where $Conflict_{jrt}$ depicts different conflict variables and is the main dependent variable in the municipality j, region r and time t. X_{rjt} includes all the explanatory variables including guerrilla attack, government attack, clashes, casualties and log of population. mil_aid_t captures the military and narcotic aid variation over the years. In military and narcotic aid there is no variation across the municipalities because the aid is given on an early basis to Colombia and major portion of it is distributed to military brigades directly stationed in specific military bases. Since I don't have the aid distribution data for the particular brigades; hence the data shows only yearly variation.

Since my main variable is the number of attacks in levels, and is not normalized by any parameters such as population or land area, I measure municipal exposure to price shocks analogously in levels, using the hectares of land used for cultivating coffee. I measure prices in logs, so that I can assess its effects in percent terms. The results are robust to specifying prices, as well as population, in levels. I use xtivreg2 command for estimating the IV regression in Stata. Time dummies are not included in the regressions due to concern of multicollinearity, where the variables are only changing over time, including the internal prices of coffee and military aid.

Chapter 3

3.1 Results

Here, I first present the main results from my analysis in every table. Next, I discuss the findings in some detail.

Table 1: Descriptive Statistics

VARIABLES	(1) Obs.	(2) Mean	(3) Std. dev	(4) Min	(5) Max
Panel level variables					
No. annual paramilitary attacks	17,820	0.0743	0.395	0	11
No. annual government attacks	17,820	0.0870	0.421	0	14
No. annual guerrilla attacks	17,820	0.488	1.502	0	41
No. annual clashes	17,820	0.469	1.342	0	25
No. annual casualties	17,820	1.867	6.825	0	292
Log of population, millions	17,820	-4.362	0.956	-8.832	-1.357
Oil revenue, millions of dollars	17,820	0.0137	0.225	0	7.829
Coffee revenue, millions of Pesos	17,478	0.536	1.078	0	10.43
Interaction of Coca indicator & year, 1994	17,820	100.8	437.2	0	2,005
Municipal-level variables					
Coffee intensity, thousands of hectors, 1997	17,478	0.835	1.544	0	10.59
Military bases, in a municipality	17,820	0.0162	0.126	0	1
Border Bases, municipalities bordering bases	17,820	0.171	0.388	0	1
Cultivated coca, indicator, 1994	17,820	0.0505	0.219	0	1
Coca intensity, thousands of hectares, 1994	17,820	0.0717	0.584	0	9.081

Annual level variables					
Log internal price of Coffee, thousands of 2006 pesos/lb	17,820	0.642	0.240	0.252	0.985
Military aid (millions of dollar)	17,820	0.213	0.242	0.0201	0.897
Log Military aid (millions of dollar)	17,820	-2.198	1.154	-3.907	-0.108

Table 1 shows the descriptive statistics of my variables. It shows the total number of observations, the mean value of each variable, its standard deviation and the range every variable takes. The variables are presented according to their types.

Panel level variables: This basically includes my several explanatory variables mostly related to different kinds of attacks by various parties, participating in conflict. These are expressed in number in a given year and municipality. I define an attack as a violent event in which there is no direct, armed combat between two groups. Still, on many occasions a clash is preceded or followed by an attack. This distinction is vital for internal conflicts due to the preponderance of non-clash situations over clashes. The variable number of annual paramilitary attacks show the attacks carried out by the paramilitary forces annually, within a given municipality. The maximum number of attacks carried out by paramilitary groups in any municipality during the period under review is 11. Variable "Number of annual Government attacks" show the attacks carried out by government during the period under review in a given municipality. Similarly, "Number of annual guerrilla attacks" show statistics about attacks perpetrated by guerrilla groups.

"Number of annual Clashes" present statistics about the clashes. Clash is defined as a direct encounter between two or more groups of armed individuals that results in armed combat. The variable "Number of annual casualties" measure the causalities suffered by both the groups as well as civilians with in a municipality in any given year. The casualties variable is measured with more noise relative to the other dependent variables, since there is generally more certainty about whether a violent event took place, than the number killed in the event, given that bodies are not always recovered and perpetrators may exaggerate deaths to appear stronger (Dube and Vargas. 2013).

The oil revenue is the interaction of oil production in the Colombian municipalities in 1988 in hundred thousand barrels per day and log of external prices of oil. The Coffee revenue is the interaction of coffee cultivation in the Colombian municipalities in 1997 in thousands of hectors and the internal price of coffee in thousands of 2006 peso per pound. Due to limitation of data, I don't have the ideal price data which would vary locally (at the municipal level). Hence I use the variable coffee revenue which is the crude measure of the value of coffee production in a municipality at a given point in time. The interaction term of coca indicator and year are linear time trends in the coca and non-coca municipalities.

The Coca indicator variable shows whether in any particular municipality, coca is cultivated or not.

Municipal level variables: The variable "Coffee intensity" describes the statistics of cultivation of coffee in thousands of hectors in a given municipality at the level of 1997. The variable "Military bases" present the statistics for those 16 military bases for which I have the data. Finally the variable "Border bases" present the data on municipalities, which either have the military bases or are immediate neighbour of those municipalities. This variable is used to capture the diffusion of military aid from military bases to not only in municipalities hosting military bases but also in their neighbouring municipalities.

In the Colombian context the military aid is directly given to individual military bases. Hence, there is a possibility of diffusion of military aid to paramilitary groups to neighbouring municipalities apart from original municipalities because of their small size. In this case, I have the data for 185 municipalities (based on the original 32 bases used by Dube and Naidu (2015) in their analysis), which are either hosting the military bases or are in their immediate neighbourhood. The coca intensity variable shows the coca cultivation at 1994 level.

Annual level variables: There are 18 years in my sample (1988-2005). The variables included under this category are log internal price of coffee in thousands of 2006 peso per pound. The variable "US military and narcotic aid to Colombia" is distributed annually and same is the case with their log values.

Table 2: Test to determine the most appropriate model

Here, I am conducting a test to select the appropriate model for my analysis. Since, I have Panel data the real choice is to select between the fixed effect and random effect model. I conduct the Hausman test to check the appropriate model. The null hypothesis is that there are no systematic difference between the estimates from fixed effects and those from random effect model. The hypothesis is significantly rejected. This step determines that for my analysis the fixed effect model is an appropriate choice.

The result is shown below:

	-Coefficients-			
	(b) Fixed	**(B) Random**	**(b-B) Difference**	**sqrt(diag(V_b-V_B)) S.E**
Paramilitary Attack	-.0474394	-.050082	.0026425	.
Guerrilla Attack	-.0089296	-.0081365	-.000793	.
Government Attack	-.0111467	-.0128189	.0016723	.
Clashes	-.0464416	-.0472166	.000775	.0002093
Casualties	-.0176564	-.0000892	-.0175672	.002884
Log of Population	.0041678	.1256226	-.1214548	.0231093
Coca	-.0177051	-.0000901	-.017615	.0028841

b = consistent under Ho and Ha; obtained from xtreg,
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic
chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 106.54
Prob>chi2 = 0.0000

Table 3: Effect of various conflict variables on internal coffee prices in OLS fixed effect model

VARIABLES	(1) Log of internal coffee prices	(2) Log of internal coffee prices	(3) Log of internal coffee prices	(4) Log of internal coffee prices	(5) Log of internal coffee prices	(6) Log of internal coffee prices	(7) Log of internal coffee prices
Paramilitary Attack	-0.048***	-0.041***	-0.038***	-0.031***	-0.035***	-0.027***	-0.025***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)
Guerrilla Attack		-0.015**	-0.012*	-0.003	-0.004	-0.003	-0.004
		(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Government Attack			-0.042***	-0.015**	-0.016**	-0.015**	-0.014*
			(0.008)	(0.007)	(0.007)	(0.007)	(0.008)
Clashes				-0.028***	-0.029***	-0.028***	-0.025***
				(0.006)	(0.006)	(0.005)	(0.005)
Casualties					0.001	0.000	0.000
					(0.000)	(0.001)	(0.000)
Log of population						-0.467***	-0.409***
						(0.135)	(0.134)
Coca indicator X Year							-0.025***
							(0.003)
Year dummies	No	No	No	No	No	No	No
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,820	17,820	17,820	17,820	17,820	17,820	17,820

Notes. Standard errors clustered at the department level are shown in parentheses. The dependent variable in all the columns is the log of internal coffee prices in thousands of 2006 peso per pound. Data from CERAC is used for conflict related variables. The data for a price of coffee comes from National Federation of Coffee Growers (NFCG). Data on Coca comes from Dirección Nacional de Estupefacientes (DNE) & United Nations office of Drug Control (UNODC). Variables not shown in all specifications include municipality fixed effects and year fixed effects. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

In table 3, I report some fixed effect OLS regressions to check the effect of paramilitary attack and other explanatory variables on log of internal coffee prices. In my analysis, the dependent variable log of internal coffee prices is a national aggregate of internal prices and varies across years and not municipalities. Due to variation of prices only across time, I drop the time dummies.

The regression in the first column shows the effect of paramilitary attack on the log of internal coffee prices without any other control variables. The coefficient is significant and negative at

1% level. With every additional paramilitary attack the price of coffee decrease by 4.1 %. In column 2 to column 7 additional control variables are included. The variables included are guerrilla attacks, government attacks, clashes, causalities, log of population and Coca indicator X year.

In the second regression I add guerrilla attack apart from paramilitary attack as an independent variable. Paramilitary attacks retain the negative sign and significance level of 1 %. Whereas, the guerrilla attack show a negative effect on log of internal price at 5 % level. With every additional guerrilla attack the internal coffee price will dip by 1.5 %.

In the third regression, I add government attack as well. With every additional government attack the price of coffee decrease by 4.2 %. This result is significant at 1 % level. Apart from it the paramilitary attack and guerrilla attack maintain varying levels of significance.

In the fourth regression, I add clashes, in addition to previous explanatory variables. Clashes also show negative sign and significance at 1% level. With every additional instance of clashes the coffee price dips by 4.2 %. However, the variable guerrilla attack lost its significance.

In the fifth regression, I add casualties but it does not show any significant effect on the coffee prices. In the sixth regression, I include another control variable log of population it also get significance level of 1 %. With every 1 % change in the population the coffee price decrease by 0.467%. Rest of variables retain the significance and sign as in previous regressions. In the last regression, I add interaction term of coca indicator and time and I again get the negative sign and significance level at 1 %.

Table 4: Effect of various conflict variables on coffee revenue in OLS fixed effect model

VARIABLES	(1) Coffee Revenue	(2) Coffee Revenue	(3) Coffee Revenue	(4) Coffee Revenue	(5) Coffee Revenue	(6) Coffee Revenue	(7) Coffee Revenue
Paramilitary Attack	-0.049**	-0.041**	-0.040**	-0.033**	-0.036*	-0.037*	-0.037*
	(0.018)	(0.016)	(0.016)	(0.015)	(0.020)	(0.020)	(0.019)
Guerrilla Attack		-0.017**	-0.015**	-0.008	-0.008	-0.008	-0.008
		(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Government Attack			-0.025	-0.003	-0.004	-0.003	-0.003
			(0.015)	(0.008)	(0.009)	(0.009)	(0.009)
Clashes				-0.024*	-0.025	-0.025	-0.024
				(0.014)	(0.016)	(0.016)	(0.015)
Casualties					0.001	0.001	0.001
					(0.001)	(0.001)	(0.001)
Log of Population						0.184	0.188
						(0.202)	(0.202)
Coca indicator X year							-0.005
							(0.010)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,478	17,478	17,478	17,478	17,478	17,478	17,478

Notes: Standard errors clustered at the department level are shown in parentheses. The dependent variable in all the columns is the coffee revenue, which is the interaction term of log of internal coffee prices in in thousands of 2006 peso per pound and coffee intensity at 1997 level. Data from Conflict Analysis Resource Center (CERAC) is used for conflict related variables. For coffee prices and its intensity the data comes from National Federation of Coffee Growers (NFCG). Data on Coca comes from Dirección Nacional de Estupefacientes (DNE) & United Nations office of Drug Control (UNODC). Variables not shown in all specifications include municipality fixed effects and year fixed effects. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

I repeat the same exercise but taking coffee revenue as the dependant variable. Since none of the explanatory variables can change the non-price part of the coffee revenue measure, hence all my analyses rely on the variation in the price data, which are national aggregates. Coffee revenue is the interaction term of log of internal coffee prices in in thousands of 2006 peso per pound and coffee intensity at 1997 level. Some results are stated in Table 4. In the first regression, I measure the effect of paramilitary attacks on the generation of coffee revenue. I

get significant and negative coefficient. With every additional paramilitary attack in a year within the municipality the coffee revenue decrease by 0.049. The coefficient is significant at 5 % level.

In the second regression the effect of paramilitary attack along with the guerrilla attack is examined on the coffee revenue. The coefficient slightly dropped but remained significant at 5% level. Apart from the paramilitary attack, I also get the significant effect of the guerrilla attack on coffee revenue. Coffee revenue drops by 0.017 with every additional guerrilla attack.

In third regression, I include government attack apart from paramilitary and guerrilla attack to examine their effect on the revenue. I again get significant and negative coefficient for the paramilitary and guerrilla attack, whereas the coefficient on the government attack is not significant. With every additional paramilitary attack the coffee revenue declines by 0.040 and with every additional guerrilla attack the coffee revenue declines by 0.015 both at 5 % significance level.

In fourth regression, I include clashes along with paramilitary, guerrilla and government attacks as an independent variable. I only get significant and negative effect for the variables, paramilitary attacks and clashes. Paramilitary attack is significant at 5 % level, whereas, the variable clashes is significant at 10 % level. With every additional paramilitary attack the coffee revenue drops by 0.033 and with every additional guerrilla attack the revenue drops by 0.024.

In fifth regression, causalities are added as an explanatory variable apart from other variables. This time, I get only negative and significant effect of paramilitary attack on coffee revenue. With every additional paramilitary attack the revenue drops by 0.036 at 10 % significance level.

In the sixth regression, I add log of population as additional control and again I get negative and significant effect of paramilitary attack on the coffee revenue at 10 % significance level. Rest of the explanatory variables do not show any significant effect on the coffee revenue. These regressions show a consistent and negative effect of paramilitary attacks on the coffee revenue.

Finally in the last regression, I add the Coca variable which is the interaction of coca indicator and year. This is included to mitigate any omitted variable bias concern. The coefficient is negative and insignificant.

Table 5: First stage results of various conflict related variables in 2SLS, using log of military and narcotic aid to Colombia as an instrument

VARIABLES	(1) Paramilitary Attack	(2) Guerrilla Attack	(3) Government Attack
Log Military & Narcotics Aid	0.016***	0.024	0.002
	(0.004)	(0.018)	(0.003)
F-Statistics (1,31)	18.85	1.80	0.38
Prob>F	0.0001	0.1897	0.5398
Year Dummies	No	No	No
Region Dummies	Yes	Yes	Yes
Observations	17,478	17,478	17,478

Notes: Standard errors clustered at the department level are shown in parentheses. The dependent variables are various variables depicting conflict. All regressions include other explanatory variables of conflict. Data from Conflict Analysis Resource Center (CERAC) is used for the conflict. For military aid data is taken from USAID Green Book. Variables not shown in all specifications include municipality fixed effects. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

In table 5, I report results of 2SLS model, which I conduct to identify which conflict related variable has maximum effect on the coffee revenue. I use military and narcotic aid to Colombia as an instrument. I use one by one various conflict related variables as endogenous variables, to estimate their effect on the coffee revenue. Log of military and narcotic aid has positive and significant effect on paramilitary attack at 1% significance level. The F-statistic is above 10 only for Paramilitary attack. Hence, I will use paramilitary attack for my future analyses. This is also in line with Dube and Naidu (2015).

In my regressions using military and narcotic aid to Colombia, I cannot use the year dummies because of its multicollinearity with prices (and military aid), since it only has time variation. Moreover, I believe that the instrument military and narcotic aid is both relevant and exogenous. Relevant in a way that military and narcotic aid to Colombia is correlated with paramilitary attacks. The first stage regression shows a clear, significant and positive effect of military and narcotic aid to Colombia on the paramilitary attacks. The F-statistics are reasonably large enough and exceeds the minimum requirement of 10.

On the other hand, I also believe that the instrument military and narcotic aid to Colombia also full fills the exclusion restriction in a way that it is uncorrelated with the error term. There is no evidence to suggest possibility of Military and narcotic aid affecting the dependent variables, internal coffee prices and its revenue measure directly. It only affects the

dependent variables through paramilitary attacks. In my case, I have an exactly identified model hence; I cannot test the hypothesis that the exclusion restriction is a valid one, because the condition involves the unobservable residual. Moreover, there is no known reverse effect of coffee revenue or internal prices on the instrument.

Table 6: Use of log of military and narcotic aid as an instrument to calculate the effect of paramilitary attacks on coffee price in 2SLS model

VARIABLES	(1) Log of internal Coffee Price	(2) Log of internal Coffee Price	(3) Log of internal Coffee Price	(4) Log of internal Coffee Price	(5) Log of internal Coffee Price	(6) Log of internal Coffee Price	(7) Log of internal Coffee Price
Paramilitary Attack	-4.840***	-5.610***	-5.742***	-6.309***	-6.451***	-7.122***	-7.243***
	(1.111)	(1.208)	(1.242)	(1.426)	(1.410)	(1.529)	(1.671)
Guerrilla Attack		0.285***	0.272***	0.231***	0.107*	0.118*	0.120*
		(0.082)	(0.086)	(0.083)	(0.064)	(0.071)	(0.073)
Government Attack			0.252	0.063	-0.155	-0.171	-0.174
			(0.214)	(0.267)	(0.295)	(0.323)	(0.330)
Clashes				0.221**	-0.110	-0.119	-0.123
				(0.102)	(0.097)	(0.108)	(0.113)
Casualties					0.168***	0.185***	0.188***
					(0.044)	(0.048)	(0.052)
Log of Population						0.801***	0.784***
						(0.234)	(0.226)
Coca indicator X Year							0.017
							(0.037)
F- Statistic	18.39	21.03	20.86	19.11	20.54	22.60	19.54
Year Dummies	No	No	No	No	No	No	No
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,820	17,820	17,820	17,820	17,820	17,820	17,820

Notes: Standard errors clustered at the department level are shown in parentheses. The dependent variable in all the columns is the coffee revenue, which is the interaction of log of internal coffee prices in in thousands of 2006 peso per pound and coffee intensity at 1997 level. Data from Conflict Analysis Resource Center (CERAC) is used for the conflict. For military aid data is taken from USAID Green Book. For coffee prices and its intensity the data comes from National Federation of Coffee Growers (NFCG). Data on Coca comes from Dirección Nacional de Estupefacientes (DNE) & United Nations office of Drug Control (UNODC). Variables not shown in all specifications include municipality fixed effects. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

In table 6, I measure the effect of paramilitary attack variable on the price of coffee using military and narcotic aid as an instrument. Log of internal coffee price is in thousands of 2006 peso per pound. In my analysis, the dependent variable log of internal coffee prices is a national aggregate of internal prices varying only across time. In all my regressions, I am only relying on the price variation for my analysis. Moreover, due to only time variation in prices

(and military aid) I drop time dummies. First I check only the effect of paramilitary attack on the log of internal coffee price. Then I repeat the step several times including various conflict variables one by one as exogenous variables. Some results of second stage are stated in Table 6.

In the first regression, I measure the effect of paramilitary attacks on the log of internal coffee price. I get significant and negative coefficient. The coefficient is significant at 1 % level. The F-statistic I get in the first stage is 18.39.

In the second regression I use paramilitary attack as endogenous variable along with the guerrilla attack as exogenous to examine the effect on the coffee revenue. The coefficient on paramilitary attack further gets strengthened and remains significant at 1% level. I get the F-statistic of 21.03, showing ample relevance for the instrument. Apart from the paramilitary attack, I also get the significant effect of the guerrilla attack on coffee revenue.

In third regression, I include government attack apart from guerrilla attack as exogenous variable. I again use paramilitary attack as endogenous variable with military aid as an instrument. I get almost the same result as in second regression. The F-Statistic remains relevant at 20.86 and coefficient on paramilitary attack remains negative and significant at 1 % level. I also get positive and significant effect of guerrilla attack on internal coffee price at 1% level. The government attack do not show significant coefficient.

In fourth regression, I include clashes along with the variables used in third regression. I get negative and significant effect for paramilitary attack on internal coffee price at 1% level. The F-statistic again remains at more than 10. The guerrilla attack and conflict shows positive and significant effect on coffee price with 1 and 5 % respectively.

In fifth regression, causalities are also included in addition to other variables mentioned in fourth regression. I again get a negative and significant effect of paramilitary attack on the coffee price at 1 % level. The F-statistic also remains at more than 10. Apart from paramilitary attacks casualties also get significant but positive effect on coffee price at 1% level.

In the sixth regression, I add log of population as additional control and again I get negative and significant effect of paramilitary attack on the coffee price at 1 % significance level. The instrument continues to remain relevant as shown by F-statistic of 22.60. Casualties and log of population shows positive and significant effect on coffee prices at 1 % level.

Finally in the last regression, I add interaction of coca indicator and year as additional control. I get negative and significant coefficient for Paramilitary attacks. It is significant at 1% level. I get positive and significant coefficient for casualties and log of population at 1% level.

The 2SLS regression has shown that the military and narcotic aid to Colombia is a relevant instrument for explaining the effect of paramilitary attack on internal coffee price. This

paramilitary attack consistently display negative effect on coffee price even after addition of various controls.

Table 7: Use of log of military and narcotic aid as an instrument to calculate the effect of paramilitary attacks on coffee revenue in 2SLS model

VARIABLES	(1) Coffee Revenue	(2) Coffee Revenue	(3) Coffee Revenue	(4) Coffee Revenue	(5) Coffee Revenue	(6) Coffee Revenue	(7) Coffee Revenue
Paramilitary Attack	-4.003***	-4.554***	-4.645***	-5.056***	-5.242***	-6.165***	-6.307***
	(0.904)	(1.043)	(1.058)	(1.256)	(1.231)	(1.390)	(1.462)
Guerrilla Attack		0.224***	0.214***	0.182**	0.084	0.100	0.103
		(0.077)	(0.080)	(0.077)	(0.057)	(0.070)	(0.071)
Government Attack			0.203	0.068	-0.116	-0.134	-0.138
			(0.177)	(0.220)	(0.251)	(0.290)	(0.297)
Clashes				0.174*	-0.094	-0.102	-0.106
				(0.095)	(0.081)	(0.094)	(0.099)
Casualties					0.137***	0.161***	0.165***
					(0.039)	(0.043)	(0.046)
Log of Population						1.095***	1.076***
						(0.276)	(0.280)
Coca indicator X Year							0.020
							(0.029)
F- Statistic	18.01	20.49	20.40	18.39	19.88	21.79	18.85
Year Dummies	No	No	No	No	No	No	No
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,478	17,478	17,478	17,478	17,478	17,478	17,478

Notes: Standard errors clustered at the department level are shown in parentheses. The dependent variable in all the columns is the coffee revenue, which is the interaction of log of internal coffee prices in in thousands of 2006 peso per pound and coffee intensity at 1997 level. Data from Conflict Analysis Resource Center (CERAC) is used for the conflict. For military aid data is taken from USAID Green Book. For coffee prices and its intensity the data comes from National Federation of Coffee Growers (NFCG). Data on Coca comes from Dirección Nacional de Estupefacientes (DNE) & United Nations office of Drug Control (UNODC). Variables not shown in all specifications include municipality fixed effects. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

Next, I use log of military aid as an instrument to calculate the effect of paramilitary attacks on coffee revenue. Since, I don't have the ideal price data which would vary locally (at municipal level); hence I create the variable "coffee revenue". Though still not ideal but it is a crude measure of the value of coffee production in a municipality at a given point in time. Coffee revenue is the interaction term of log of internal coffee prices in in thousands of 2006

peso per pound and coffee intensity at 1997 level. First I check only the effect of paramilitary attack on the coffee revenue. Then I repeat the step several times including various conflict variables one by one. Some results of second stage are stated in Table 6.

In the first regression, I measure the effect of paramilitary attacks on the generation of coffee revenue. I get significant and negative coefficient. With every additional paramilitary attack in a year within the municipality the coffee revenue decrease by 4.003. The coefficient is significant at 1 % level. The F-statistic I get in the first stage is 18.01.

In the second regression I use paramilitary attack as endogenous variable along with the guerrilla attack as exogenous to examine the effect on the coffee revenue. The coefficient on paramilitary attack further gets strengthened and remains significant at 1% level. I get the F-statistic of 20.49, showing ample relevance for the instrument. Apart from the paramilitary attack, I also get the significant effect of the guerrilla attack on coffee revenue. Coffee revenue increases by 0.224 with every additional guerrilla attack.

In third regression, I include government attack apart from guerrilla attack as exogenous variable. I again use paramilitary attack as endogenous variable with military aid as an instrument. I get almost the same result as in second regression. The F-Statistic remains relevant at 20.40 and coefficient on paramilitary attack remains negative and significant at 1 % level. I also get positive and significant effect of guerrilla attack on coffee revenue at 1% level.

In fourth regression, I include clashes along with the variables used in third regression. I get negative and significant effect for paramilitary attack on the coffee revenue at 1% level. With every additional paramilitary attack the coffee revenue drops by 5.056. The F-statistic again remains at more than 10. The guerrilla attack and conflict shows positive and significant effect on coffee revenue with 5 and 10 % respectively.

In fifth regression, causalities are also included in addition to other variables mentioned in fourth regression. I again get a negative and significant effect of paramilitary attack on the coffee revenue at 1 % level. The F-statistic also remains at more than 10. Apart from paramilitary attacks casualties also get significant but positive effect on coffee revenue at 1% level.

In the sixth regression, I add log of population as additional control and again I get negative and significant effect of paramilitary attack on the coffee revenue at 1 % significance level. With every additional paramilitary attack the coffee revenue decrease by 6.165. The instrument continues to remain relevant as shown by F-statistic of 21.79. Casualties and log of population shows positive and significant effect on coffee prices at 1 % level.

Finally in the last regression, I add interaction of coca indicator and year as additional control. I get negative and significant coefficient for Paramilitary attacks. It is significant at 1% level. I get positive and significant coefficient for casualties and log of population at 1% level.

The 2SLS regression has shown that the military and narcotic aid to Colombia is a relevant instrument for explaining the effect of paramilitary attack on coffee revenue. This paramilitary attack consistently display negative effect on coffee revenue even after addition of various controls. In the abovementioned regression, year dummies are not used as they are prone to multicollinearity with military and narcotic aid to Colombia, since the military aid is given on the yearly basis and is same for all the municipalities.

Table 8: Estimating the effect of paramilitary attacks on the coffee revenue using border bases as an instrument.

VARIABLES	(1) Coffee Revenue	(2) Coffee Revenue	(3) Coffee Revenue	(4) Coffee Revenue	(5) Coffee Revenue	(6) Coffee Revenue	(7) Coffee Revenue
Paramilitary Attack	-3.138***	-3.287**	-3.325**	-3.400**	-2.988**	-4.034**	-4.075**
	(1.216)	(1.319)	(1.331)	(1.446)	(1.274)	(1.798)	(1.922)
Guerrilla Attack		0.153**	0.146**	0.119*	0.044	0.062	0.063
		(0.073)	(0.073)	(0.061)	(0.030)	(0.042)	(0.043)
Government Attack			0.129	0.042	-0.071	-0.092	-0.093
			(0.128)	(0.148)	(0.145)	(0.192)	(0.194)
Clashes				0.100	-0.075	-0.084	-0.085
				(0.075)	(0.057)	(0.074)	(0.078)
Casualties					0.078*	0.105*	0.106*
					(0.040)	(0.057)	(0.060)
Log of Population						0.701**	0.694**
						(0.343)	(0.334)
Coca indicator X Year							0.006
							(0.024)
F- Statistic	15.91	18.94	19.95	17.91	16.00	11.05	09.23
Year Dummies	No	No	No	No	No	No	No
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,478	17,478	17,478	17,478	17,478	17,478	17,478

Notes: Standard errors clustered at the department level are shown in parentheses. The dependent variable in all the columns is the coffee revenue, which is the interaction of log of internal coffee prices in in thousands of 2006 peso per pound and coffee intensity at 1997 level. Data from Conflict Analysis Resource Center (CERAC) is used for the conflict. For military aid data is taken from USAID Green Book. For coffee prices and its intensity the data comes from National Federation of Coffee Growers (NFCG). Data on Coca comes from Dirección Nacional de Estupefacientes (DNE) & United Nations office of Drug Control (UNODC). Variables not shown in all regressions include municipality fixed effects. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

In Colombia military aid is given to military brigades operating from bases, located in specific municipalities. Dube and Naidu (2015) used data on 32 such base municipalities for their analysis, since conflict data by CERAC is only available for 32 bases out of the 37 military bases, which they identified in Colombia. Out of these 32 municipalities, I can use data for only 16 municipalities. For rest of the 16 municipalities, I don't have data for internal

coffee prices. Hence, I cannot examine the specific effect of increase in violence due to diffusion of military aid due to drop out of half of municipalities hosting military bases.

To circumvent this problem, I also use the conflict data from municipalities bordering 32 municipalities, which are hosting military bases. Using this method, my data increases from 16 to 185 municipalities. Since the municipalities in Colombia are generally of smaller size, I expect the diffusion of military aid to paramilitary groups doesn't restrict only to municipalities hosting military bases. I name this variable as border bases. I interacted border bases with log of military aid and used it as an instrument to examine the effect of increase in paramilitary violence on the coffee revenue. Due to limitation of data I am using variable "coffee revenue" which is a crude measure of the value of coffee production in a municipality at a given point in time.

In the first regression, I measure the effect of paramilitary attacks on the generation of coffee revenue using military aid to border bases as an instrument. I get significant and negative coefficient. With every additional paramilitary attack in a year within the municipality the coffee revenue decrease by 3.138. The coefficient is significant at 1 % level. I get 15.91 F-statistic in the first stage.

In the second regression, I use guerrilla attack along with paramilitary attack in the regression to examine their effect on the coffee revenue. The coefficient on paramilitary attack further gets strengthened but significance level dropped to 5%. I get the F-statistic of 18.94, showing ample relevance for the instrument. Apart from the paramilitary attack, I also get the significant effect of the guerrilla attack on coffee revenue. Coffee revenue increases by 0.513 with every additional guerrilla attack.

In third regression, I include government attack apart from guerrilla attack as exogenous variable. I again use paramilitary attack as endogenous variable with military aid as an instrument. I get almost the same result as in second regression for paramilitary attack. The F-Statistic remains relevant at 19.95 and coefficient on paramilitary attack remains negative and significant at 5 % level. I also get positive and significant effect of guerrilla attack on coffee revenue at 5% level.

In fourth regression, I include clashes along with the variables used in third regression. I get negative and significant effect for paramilitary attack on the coffee revenue at 5% level. With every additional paramilitary attack the coffee revenue drops by 3.40. The F-statistic again remains more than 10. The guerrilla attack shows positive and significant effect on coffee revenue at 10 % level.

In fifth regression, numbers of causalities are included in addition to other variables mentioned in fourth regression. I again get a negative and significant effect of paramilitary attack on the coffee revenue at 5 % level. The F-statistic also remains at more than 10. Apart from paramilitary attacks casualties also get significant but positive effect on coffee revenue at 10% level.

In the sixth regression, I add log of population as additional control and again I get negative and significant effect of paramilitary attack on the coffee revenue at 5 % significance level. With every additional paramilitary attack the coffee revenue decrease by 4.034. The instrument continues to remain relevant as shown by F-statistic of 16.00. Casualties and log of population shows positive and significant effect on coffee prices at 10 % and 5 % level respectively.

In the last regression I add Coca and the result came almost similar to the fifth regression showing a clear pattern. This method has again shows that the paramilitary attacks contribute in decreasing the revenue earned from coffee. The effect I am getting is in line with the result, which I get for using only log of military and narcotic aid as instrument. However the instrumental relevance just fell below 10.

I have not used the year dummies in this regression similar to analysis in previous table due to concern of multicollinearity as price (and aid) only varies across years.

Table 9: Estimating the effect of conflict on oil revenue using OLS fixed effect model

Dube and Vargas (2013) have elucidated the concept of rapacity effect using the Colombian oil sector. They showed that with increase in the international prices of oil the conflict flares up as the competition to appropriate resources also intensifies. This pinned the chances of direction of conflict on the nature of production sector.

In my analysis, I am getting consistently drop in the revenue of the coffee due to increase in the paramilitary violence. Consistent with these results, I believe that increase in paramilitary violence will either have no effect or it will increase the value of oil since paramilitary groups will like to appropriate it as much as possible. When I check my hypothesis, I get the following results:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	**Oil Revenue**	**Oil Revenue**	**Oil Revenue**	**Oil Revenue**	**Oil Revenue**	**Oil Revenue**	**Oil Revenue**
Paramilitary Attack	0.002	0.002	0.002	0.002	0.003	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Guerrilla Attack		0.000	0.000	0.000	0.000	0.000	0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Government Attack			-0.000	-0.000	-0.000	-0.000	-0.000
			(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Clashes				-0.000	-0.000	-0.000	0.000
				(0.000)	(0.000)	(0.000)	(0.000)
Casualties					-0.000	-0.000	-0.000
					(0.000)	(0.000)	(0.000)
Log of Population						0.003*	0.004
						(0.002)	(0.002)
Coca Indicator X Year							-0.000
							(0.000)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,820	17,820	17,820	17,820	17,820	17,820	17,820

Notes: Standard errors clustered at the department level are shown in parentheses. The dependent variable in all the columns is the coffee revenue, which is the interaction of log of internal coffee prices in in thousands of 2006 peso per pound and coffee intensity at 1997 level. Data from CERAC is used for the regressions. Data on Coca

comes from Dirección Nacional de Estupefacientes (DNE) & United Nations office of Drug Control (UNODC). Data on oil is taken from International Financial Statistics (IFS). Variables not shown in all specifications include municipality fixed effects and year fixed effects. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

The OLS fixed effect regressions show no effect of conflict variables on the coffee revenue. This is robust with the inclusion of other control variables.

Table 10: Estimating the effect of increase in paramilitary violence on oil revenue using log of military aid as an instrument in 2SLS model

VARIABLES	(1) Oil Revenue	(2) Oil Revenue	(3) Oil Revenue	(4) Oil Revenue	(5) Oil Revenue	(6) Oil Revenue	(7) Oil Revenue
Paramilitary Attack	0.027*	0.031**	0.032**	0.035**	0.036**	0.037**	0.039**
	(0.014)	(0.015)	(0.015)	(0.016)	(0.017)	(0.017)	(0.018)
Guerrilla Attack		-0.001***	-0.001***	-0.001***	-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Government Attack			-0.002	-0.000	0.001	0.001	0.001
			(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Clashes				-0.001*	0.001	0.001	0.001
				(0.001)	(0.001)	(0.001)	(0.001)
Casualties					-0.001**	-0.001**	-0.001*
					(0.000)	(0.000)	(0.001)
Log of Population						-0.001	-0.001
						(0.001)	(0.001)
Coca indicator X Year							-0.000
							(0.000)
F- Statistic First Stage	18.39	21.03	20.86	19.11	20.54	22.60	19.54
Year Dummies	No	No	No	No	No	No	No
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,820	17,820	17,820	17,820	17,820	17,820	17,820

Notes: Standard errors clustered at the department level are shown in parentheses. The dependent variable in all the columns is the coffee revenue, which is the interaction of log of internal coffee prices in in thousands of 2006 peso per pound and coffee intensity at 1997 level. Data from Conflict Analysis Resource Center (CERAC) is used for the conflict. For military aid data is taken from USAID Green Book. For coffee prices and its intensity the data comes from National Federation of Coffee Growers (NFCG). Data on Coca comes from Dirección Nacional de Estupefacientes (DNE) & United Nations office of Drug Control (UNODC). Data on oil is taken from International Financial Statistics (IFS). Variables not shown in all specifications include municipality fixed effects. *** is significant at the 1% level, ** is significant at the 5% level, * is significant at the 10% level.

All the regressions show a positive and significant effect of increase in paramilitary violence on the value of Oil. The F-stat also shows a case of relevant instrument as all the values are above 10. In the final regression where all the other explanatory variables are included, show that with every additional paramilitary attack the value of Oil increase by 0.037. This is significant at 5 % level. In some of the regressions guerrilla attacks and casualties show negative and significant effect on coffee revenue.

Chapter 4

Conclusion

In this thesis, I have examined the problem presented by Dube and Vargas (2013) from the opposite direction. They show the effect of external coffee price shocks on the instance of conflict and I examine the effect of conflict on the internal price and revenue generated by coffee sector. I show that military aid to Colombia could be a good channel to explain the effect of conflict on the price and value of coffee. I find that the internal price and value of coffee decreases with increase in violence due to military aid. Moreover, I also try to explain the most probable reason for observing this pattern. This approach is similar to the Lind, Moene and Willumsen (2013). They explore the other direction of causality between drugs and conflict by examining the effect of increase in conflict on opium cultivation.

On military aid, I also come to conclusion that it is a relevant and strong instrument. I also reconfirm the results of Dube and Naidu (2015) that increase in military aid increases the paramilitary violence.

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