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Land Concentration and Conflict in Colombia 2000-2012

Author : Ronny Giovanni De Salvador Ortega

Thesis Director : Joseph Gomes

Thesis Reader : William Parienté

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Université catholique de Louvain - Economics School of Louvain - Place Montesquieu 3, 1348 Louvain-La-Neuve
Université de Namur – Economics School of Namur – Rempart de la Vierge 8, 5000 Namur

Abstract

We used the Acemoglu et al. (2005) theoretical framework and the instrumental variable of conflict suggested by Dube & Vargas (2013) to build a model that explains how the conflict affects land concentration in Colombia for the period 2000-2012. The instrumental variable uses the international price shocks of Colombia's commodities to describe episodes of greater or lesser violence (conflict) and as a dependent variable we use the Gini of lands and owners calculated for rural properties at the municipal level. The results show the positive effect of conflict on land concentration providing new empirical evidence on the connection between conflict and inequality.

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Keywords— Inequality, Land Inequality, Conflict, Colombia, Commodity Prices

Contents

1 Introduction

A result that repeatedly appears in the literature shows how conflict negatively affects economic growth through its devastating effects on physical and human capital accumulation. However, this is not the only effect that conflict has on a country's economy. It can also impact the distribution of resources and its impact on the economy in the long run through institutions, technology, and economic and political power. Unfortunately, there is still a lack of sufficient empirical evidence to identify the mechanisms that connect conflict to these drivers of long-run economic performance and inequality (Bircan et al., 2017; Blattman & Miguel, 2010). Our objectives and contributions to this paper are to answer whether the conflict has a positive impact on inequality and, to identify the mechanisms through which a conflict upsurge increases inequality, providing new empirical evidence on the connection between conflict and inequality. First, we have to establish a causal relationship between conflict and inequality, which is challenging because they have a bidirectional relationship. In our review of the literature, we found that many articles study the relationship between conflict and inequality in different countries using institutions (especially property rights and the state's presence) as a connecting element. Although the lack of generalization of the effects found in each country may be a significant drawback of this type of study, the advantage is that it allows for better identification of the mechanisms, directions, and nature of those effects.

Following this direction, we used the Acemoglu et al. (2005) theoretical framework to build a cyclical relationship between conflict and inequality (distribution of resources) through the inclusion of institutions and power, where first the allocation of resources determines the conflict and economic institutions, and these, in turn, determine the distribution of resources for the next period. With this cyclical relationship, it is easier to find the effect of conflict on inequality using an instrumental variable for conflict. Thus, we can eliminate (control) the impact of inequality and institutions on conflict. Next, to find empirical evidence of conflict to inequality, we run a regression of our inequality measure using the instrumental variable of conflict as an independent variable. In our case, we used information from the Colombian conflict of 2000-2012 because there was sufficient information at the municipal level about both the dependent variable we used to measure inequality (land ownership inequality or rural property concentration Gini) and the instrumental conflict variable.

In our model, we used the instrumental variable of conflict suggested by Dube & Vargas (2013), based on the conflict model of Dal Bó & Dal Bó (2011). This variable uses the international price shocks of Colombia's commodities to describe episodes of greater or lesser violence (conflict). In this context, the increase in conflict results from two mechanisms: the opportunity cost effect and the rapacity effect. In the opportunity cost effect, positive income shocks increase wages, which implies a higher opportunity cost of committing a crime that reduces the incentives to become involved in the conflict. In the rapacity effect, positive income shocks increase the potential benefits of fighting for control of resources linked to the rise in income, which increases the incentives to become involved in the conflict. In Dube & Vargas (2013) , a difference in difference strategy shows that a positive expected income shock from a rise in the international price of oil/coffee increases/decreases conflict in the municipalities where oil/coffee existed during 1988-2005 period.

In our inequality model, using a difference in difference strategy, we show that in municipalities where conflict increases as a result of an expected income shock, the degree of land concentration also increases. (variations in the prices of oil and coffee, which are our instrumental conflict variables).

One of the risks of directly implementing prices in the inequality model is that they may contain information other than conflict that can directly affect land concentration. To verify whether our results are a consequence of conflict, we separated our sample into two groups, municipalities that once had conflict and municipalities that never had conflict, and we checked whether prices explain the inequality. The results allow us to use prices as an instrument of conflict because, for non-conflict municipalities, prices did not play an essential role in determining land concentration.

Our empirical implementation is done in two stages due to a possible endogeneity in coffee prices since Colombia is among the world's leading coffee exporters. The first stage consists of constructing the instrumental variable for the intensity of coffee, and the second stage takes both the variations in the intensity of coffee (international coffee price x cultivated hectares) and the variations in the intensity of oil (international oil price x oil production in 1988) in the municipalities to establish differences in the concentration of land. Among the results of this study, the positive effect of conflict on land concentration was obtained; that is, a part of the land concentration does not necessarily come from the productive processes that maximize the use of resources (Fergusson mechanism). Unlike (Dube & Vargas, 2013), it was found that oil prices negatively impact the level of conflict, so there is no rapacity effect, and on the contrary, in this sector, the opportunity cost mechanism could be operating. Unfortunately, it was not possible to include forced displacement in the model. However, it was possible to prove that conflict and weak property rights negatively influence those who do not migrate, making them more vulnerable to elites and illegal armed groups' power and control, which also concentrates land ownership.

The next chapter provides an overview of the literature relevant to this dissertation. Chapter 3 presents a summary of land inequality and the conflict in Colombia for the period 2000-2012. Chapter 4 describes the information, the methodology employed, including the theoretical model and the empirical strategy, and Chapter 5 presents the results and evidence of robustness for both the conflict model and the land concentration model. This work's contributions to the literature of inequality and conflict are the combination of theoretical and empirical elements presented in these sections to study the effect of conflict on land concentration. Chapter 6 concludes.

2 Literature Review

2.1 Inequality,Growth and Conflict

The complexity of the relationship between inequality and conflict is evident in the literature, where causality has been hard to establish. Instead, depending on the phenomenon analyzed and the databases used, different effects may exist simultaneously between the two variables that may counteract or enhance their aggregate magnitude and direction. In the neoclassical literature on economic growth, explanations have been sought for the lack of convergence in growth rates between rich and developing countries.Benhabib & Rustichini (1996) study how the level of wealth and the degree of inequality determines the conflict that affects growth. Deininger & Squire (1998) show how land inequality has a significant impact on economic growth in low-income countries. Conflict can also interact with external shocks and institutions to make growth rates less persistent (Rodrik, 1999). On the other hand, Miguel et al. (2004), using an Instrumental Variables approach, estimates the impact of growth on the likelihood of civil conflict. Besides, poverty and underdevelopment are factors that initiate violence in civil conflict (Blattman & Miguel, 2010; Fearon & Laitin, 2003). Also, as the abundance of natural resources,

corruption, and rent-seeking behavior increase the level of conflict (Aslaksen & Torvik, 2006; Bannon & Collier, 2003).

2.2 The Effect of Inequality on Conflict

Previous studies have focused on the role of inequality in provoking violent conflict with mixed results, while Bircan et al. (2017); Collier (1999); Fearon & Laitin (2003) found that income inequality was inconclusive in generating conflict, Garfinkel & Skaperdas (2007); Hirshleifer (1991) using the opportunity cost mechanism show that wealthy individuals have fewer incentives to allocate their resources to fighting than productive activities. In contrast, poor individuals have opposite incentives, so that the decrease in inequality will reduce conflict (Paradox of Power). Lopez Cruz & Torrens (2019) show that in internal conflicts, the Paradox of Power applies but inequality in productivity can motivate the most productive groups to enter into external conflicts. Using data from Nepal's war Macours (2011) found increasing inequality between landowners and landless farmers allowed massive recruitment by armed groups. Esteban & Ray (2011) using a behavioral model of conflict, show that the equilibrium level of conflict is represented by a linear function of inequality, fractionalization, and polarization. Caruso (2007) shows that if the groups in conflict have an equal probability of winning the contest (similar availability of resources), the conflict will increase as the groups try to avoid the emergence of a stalemate and increase their military capabilities to increase their probability of winning.

2.3 The Effect of Conflict and Institutions on Inequality

Several authors identify not only the direct effect of the armed conflict on the increase in income inequality but also an indirect effect on structural variables of the economy that affect income distribution, such as the decumulation of the stock of physical and human capital in the long term equilibrium (Goodhand, 2001), high transaction costs resulting from limited access to markets and the emergence of subsistence economies (Deininger, 2003), contractual obligation worthless due to the lack of state capacity to exercise the monopoly of force (Endres, 2003), limited government social spending leading to a deterioration in the provision of public services (Iqbal, 2006), increased illegal activities such as drug trafficking and smuggling that benefit a minority (Pugh, 2002; Bircan et al., 2017). Collier (1999) shows that conflict generates an environment of uncertainty, which affects investment and savings in economic agents, leading to contractions in capital-intensive sectors. Bircan et al. (2017) found that distortions in production and markets and the disappearance of laws during the conflict affect tax revenues, limiting the government's budget for social spending and redistribution.

Another dimension that affects inequality is the quality of institutions, where the inability of the central state to provide public services induces elites with resources to provide them themselves. This creates an imbalance in political power that decreases the demand for public services and institutions that only guarantee local elites' interests (Fearon & Laitin, 2003). Suppose these local elites in the peripheral areas do not have sufficient power to exert pressure on the central government. In that case, the distribution of resources and institutions will be limited to their capacities and interests. Using a general equilibrium model of resource distribution between productive and appropriated activities Grossman & Kim (1995) first show that with weak property rights, property claims are negatively related to the capacities of appropriation and is positively associated with the destructiveness of predation. And second, if property rights are weak, the cost of ownership activities increases with more secure claims to the property. Acemoglu et al.

(2005); Levchenko (2007) use institutions as the unifying determinant of different economic and distributional outcomes. For example, in conflict theory, agents create and modify institutions through their political power.

Using the information at the municipal level in Colombia, Acemoglu et al. (2013) show a causal relationship between conflict and inequality using two effects: First, the direct effect that the paramilitary presence has and second, the indirect effect that corresponds to a decrease in the provision of public goods and other amenities as a consequence of the inability of citizens to punish or reward local government policies in paramilitary controlled municipalities, which encourages political parties to direct their efforts and policies to captivate voters in regions without paramilitary control (Electoral Competition with Paramilitaries). In municipalities where the threshold of votes between parties is narrow, the local government may prefer not to exercise a monopoly on violence if it gains electoral advantage from the presence of paramilitary groups. However, if the growing presence of illegal armed groups poses a risk to the national government, this would also imply a greater risk of remaining in power for the party with an electoral advantage obtained with such groups' help. Then, this symbiotic relationship between local government and illegal armed groups disappears, the more extraordinary exercise of the monopoly of violence would come into effect. As mentioned at the beginning, the literature on the bilateral relations between conflict and inequality is extensive. However, the endogeneity between these variables makes it difficult to isolate the effects of conflict on inequality. In several of these papers, part of the methodology consists of seeking the best way to control endogeneity.

3 Colombian Context

Acemoglu et al. (2012); Dell (2010); Engerman & Sokoloff (1994) show that colonial extractive institutions' location can explain the pattern of regional inequality in Colombia. First, colonial institutions emerged in response to a demand for institutional infrastructure to optimize extraction and exploitation activities. In this sense, the colonial authorities used the most densely populated areas close to the Magdalena River to locate their institutions, facilitating logistical operations and access to Spain. Secondly, as these colonial settlements grew, so did the demand for public services, which led to the appearance of the first hospitals, education centers, registration centers and notaries, financial institutions that increased the gap between the center and the periphery over the years. After Colombia's independence from Spain, the change to a new regime did not necessarily imply a political order due to the constant struggles between liberals and conservatives. This continuous fight generated a republican state with an endemic weakness that did not allow it to limit the revolt and monopolize the means of violence, which resulted in poor collection, insufficient provision of public goods, and almost no protection of property rights (Kalmanovitz, 2008). This situation reversed in the territories that actively participated in international trade with tobacco or coffee products. Still, a good portion of the national territory remained unlucky with international trade until well into the twentieth century, so the lack of state presence and non-extractive economic institutions persisted. As we can see, the international trade on agricultural commodities conditioned the most remote municipalities to underdevelopment and a low presence of institutions, which continues today. For example,Fergusson et al. (2017)found that the municipalities lagging in development and with high poverty rates currently have in common a dependence on extractive economic institutions, a weak state presence, worse public policy, and weak property rights.

Different segments of society mobilize in 1991 to have the constitution amended to allow for a decentralization of the Colombian state to address the lack of institutional and state presence

in the regions. These modifications included the election by vote of mayors at the municipal level and governors at the departmental level, greater control of the local budget, etc. Later, the promulgation of new laws, such as articles 170 and 173 of Law 136 of 1994, followed this decentralization dynamic for the Colombian state's control agencies (personeria municipal). However, Acemoglu et al. (2013) established that this decentralization process also enabled regional elites, large landowners, drug traffickers, guerrillas, and paramilitaries to influence political power and control over state revenues in the regions. Parallel to this scenario of regional inequality, there is also a persistently high concentration of land. In reviewing land concentration evolution, CEDE [1] and the IGAC [2] found that it went from 0.86 to 0.88 from 1960 to 1996. For this period, they also identified appropriation factors such as drug trafficking, accumulation of institutional income, land valuation vs. low taxation, dispossession of small and medium peasants due to the armed conflict, etc. For the period 2000-2009, they found a decrease in the share of the medium-sized property in favor of large properties as well as an increase in the number of owners, diminishing the average number of hectares available per owner (from 15.69 to 15.39 hectares). They concluded that former owners' purchase of new land focusing on lower quality land was the land ownership concentration mechanism. Finally, there may be positive differences at the departmental level of land gini and landowners gini if there is more than one plot for a few owners, or negative due to a few large properties (Ibañez et al., 2012).

Concerning the armed conflict during these 50 years, there is empirical evidence that displacement is associated with mass expropriation of land, which indicates the deterioration of property rights in Colombia (Reyes Posada & Duica Amaya, 2009; Histórica, 2013). The conflict has also exacerbated chronic problems such as poverty and inequality, especially in regions with little state presence. Weak property rights have unprotected small and medium peasants and benefited large landowners and illegal armed groups (Arias et al., 2019) The GMH (Grupo de Memoria Histórica) identifies the 2000-2012 period as the fourth stage of the Colombian armed conflict after the period of La Violencia (the armed struggle between members of the Liberal and Conservative parties that began after the events of the Bogotazo and the death of Liberal leader Jorge Eliecer Gaitan in 1948). This period characterized a continuous expansion of the guerrilla (following the Demilitarized zone of Caguan and the peace agreements of the Pastrana government) and the paramilitary groups and the military strengthening of the Colombian state forces (Plan Colombia). In the middle of that decade, the state achieved the military weakening of the guerillas (FARC and ELN) and the surrender of several paramilitary groups with the law of justice and peace (Law 975 of 2005). However, from a union between former paramilitaries who did not surrender to the government and drug traffickers arises new illegal armed groups known as BACRIM (Urabenos, Rastrojos, Envigado Office) that take over the territories previously left by paramilitary or guerrilla groups. Besides, there are alliances between paramilitary groups and the Colombian government's armed forces to combat the guerrillas. Moreover, within the armed forces, there are human rights violations against the civilian population in response to a perverse strategy of rewards for casualties in combat (false positives).

[1] Center for Economic Development Studies. Andes University (Colombia)
[2] Agustin Codazzi Geographic Institute (Colombia)

4 Data and methodology

4.1 Data

For the Gini of landowners and land, we used the database of Sustainable Development Goals Indicators -ODS of IGAC and CEDE. This dataset includes information for the years 2000-2012 at the municipality level. Both Ginis were calculated by CEDE and are constructed using the cadastral census carried out by the Instituto Agustin Codazzi (IGAC), which registers and measures each of the properties that constitute the municipal cadastres. For the calculation of the Gini of lands, each cadastral record corresponds to a property whose information includes the land area and its valuation. The calculation is at a municipal level using the information on the properties' size and weighting it by the number of owners per property, Concerning the Gini of owners; the owners and each of the properties registered in the cadastre were identified using a unique identifier for each of the individuals. The land area held by each of the owners is then calculated, weighted by the number of properties. If there are several owners of a property, the property's total area is divided between the owners, ensuring that the area after aggregation by owners is equal to the property area. Our model uses information from the conflict module of the CEDE Municipal Panel of the Universidad de los Andes. Our analysis's violence variables have as their source the National Police who have information for the period 1993-2010. To measure the intensity of coca cultivation in the municipality, we use the number of hectares cultivated with coca calculated by the Colombian Drug Observatory (ODC), which has information for 1999-2018. The Single Registry of Victims (RUV) conflict database from 1993-2018 is used to measure forced displacement and perform the robustness tests. The Conflict Analysis Resource Centre (CERAC) database, which categorizes the country's municipalities according to the conflict's duration and intensity between 2000 and 2012, is also used to carry out robustness tests. To study collusion between municipal governments and illegal armed groups, we use the percentage of participation achieved by presidential candidate Alvaro Uribe in the elections in 2002. Only rural areas were considered for the observations because groups such as the FARC concentrate their efforts in these areas.

The internal coffee price comes from the National Federation of Coffee Growers (NFCG), while the export volume of the top 3 other leading coffee exporting nations comes from the International Coffee Organization. We used the World Bank database for the other international commodity prices from 2000-2012 (oil, sugar, bananas, African palm oil, coal, gold, silver, and platinum). The information on intensities (production or area cultivated) in agricultural products and natural resources is compiled by (Dube Vargas, 2013), which in turn used different sources described below: - Information on intensity (area cultivated in hectares) of coffee comes from the 1997 Coffee Census conducted by the National Federation of Coffee Growers (NFCG), while the intensity of sugar, banana, and African palm from 2005 comes from the Ministry of Agriculture. - Measures of municipal coal and gold production in 2004 come from the Colombian Institute of Geology and Mining (Ingeominas) and the carbon reserves in 1978 come from the U.S. Geological Surveyís Coal Quality Inventory in Colombia. On the other hand, the reserves of precious metals (gold, silver, and platinum) come from the number of mining license applications submitted to the Ministry of Mines and Energy in 1978. For the other variables, there is a description of the sample size and sources in the Data Appendix Table A10: Sample Size and Sources description.

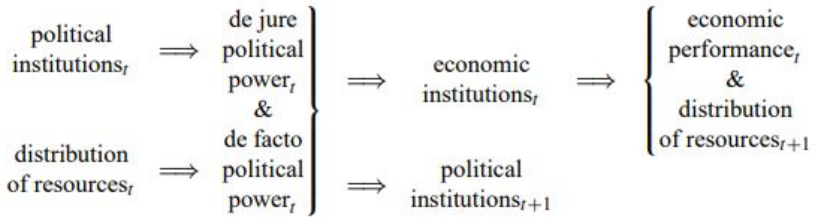

Figure 1: Institutions, Conflict and Distribution Framework
Source:Acemoglu et al. (2005)

4.2 Methodology

4.2.1 Theoretical Framework

Acemoglu et al. (2005) introduce their theory of economic institutions to explain the relationship between social conflict, economic performance and the distribution of resources by assuming that economic institutions are endogenous. It argues that it is the differences in political institutions and the distribution of political power that explain the variations in economic institutions and the resources distribution. Therefore, economic (and political) institutions may not be chosen by the whole society but by groups with political power that may not benefit the whole society and may not be socially efficient (maximize total surplus, wealth, or income). The outline of the conceptual framework is in Figure 1.

Political power at the moment t explains which economic institutions are chosen at moment t and which political institutions will be functioning in period t+1. Acemoglu et al. (2005) suggests that economic institutions are chosen by the elites who hold political power if they obtain net benefits in distributing resources. In this case, he presents three economic institutions that may change due to political power: labor market regulation/feudalism, the rules governing financial market development, and agricultural price regulation. Political power is divided into two: de jure political power (formal institutions) and de facto political power (groups that are not part of the de jure political power but have a way to influence or make decisions through their economic power and their capacity to coerce). In the case of de jure political power, this depends on the political institutions at moment t. In contrast, de facto political power comes from how the resources of society are distributed since more resources can generate greater power through more significant influence (economic power) or a greater capacity to impose themselves through the monopoly of the legitimate/illegitimate use of physical force within a given region (Acemoglu et al., 2005, 2013). The study of the relationship between the distribution of resources and the de facto political in the literature ranges from showing correlations between economic conditions and violence (Barron et al., 2004; Deininger, 2003; Do & Iyer, 2010) to identifying a relationship between economic conditions and war (Chassang & Miquel, 2010; Dube & Vargas, 2013; Grossman & Kim, 1995; Hirshleifer, 1991; Acemoglu et al., 2005). Finally, in its conceptual framework, Acemoglu et al. (2005) describes a cyclical structure where political institutions (e.g., government) in t and distribution of resources (legal and illegal elites) in t choose the political institutions that will benefit them most in the future. They will also choose the economic institutions that will give them access to a favorable distribution of resources in the t+1 period that will allow them to maintain their political power.

In order to find a good quality IV, this article uses the Dal Bó & Dal Bó (2011) theory. This theory considers a 2x2 international economics model with two productive sectors, one more

labor-intensive than the other. In addition to the productive sectors, an appropriation sector only uses labor to take over the productive sectors' output. The central assumption is that the appropriation sector increases with the labor used for this activity. Based on this framework, the level of conflict results from two opposing forces, the opportunity cost of carrying out appropriation activities (opportunity cost effect) and the gain obtained from appropriating the resources (rapacity effect). For example, an increase in the international price of the labor-intensive sector expands while the capital-intensive sector contracts. This expansion demands more labor units per unit of capital than the local supply can offer, so wages increase and with them the opportunity cost of ownership activity. If this increase in the opportunity cost is not compensated for by an increase in the profits obtained from the expropriation activity, the conflict level decreases. On the contrary, if the price shock positively affects the capital-intensive sector's income, wages decrease, which, together with profits that at least do not decrease in the appropriation sector, generate pressure for more people to join armed groups and increase the level of conflict. Our model of land ownership inequality is adapted from the framework of Dal Bó & Dal Bó (2011) and its empirical application for the Colombian conflict by Dube & Vargas (2013). The central assumption about the appropriation sector is that the increase in conflict is a consequence of the decrease in the relative position of wages in the productive sectors to those in the appropriation sector, the decrease of wages in relative terms to capital rents in the productive sectors, and an increase in rents in the appropriation activity. Also, in the long term, the persistence of wage gaps between the appropriation sector and the productive sectors will cause the size of the illegal armed groups and the conflict level to increase. Previous literature Ross (2004); Snyder & Bhavnani (2005) examines the mechanism of rapacity channel whereby benefits in the appropriation sector come from its capacity to take over income or profits from productive activities using violence and struggle. Therefore, the appropriation sector is always looking for new income sources for expropriation, which determines the positive relationship between positive income shocks and the level of violence or conflict used to control those shocks' resources and sectors. One of the factors that play an essential role for this channel to have a more significant influence on the propensity of conflict is the economy's dependence on natural mineral resources (more capital than labor-intensive) and lower-income and state capacity (Besley & Persson, 2010). A modification of this mechanism is studied by PulgarÃn et al. (2020) using the palm crop (capital-land intensive), which has increased returns to scale. In this case, positive income shocks increase palm owners' incentives to expand their crops. This situation, together with weak institutions and the possibility of taking over new land (forced displacement) or buying it at low prices (below the market price) by force, increases the level of conflict in palm oil-producing regions. This modified rapacity effect on new lands prevails over the increase in salaries in the oil palm sector, so the net effect increases conflict. Similarly, this modified mechanism applies to illicit crops where drug traffickers or illegal armed groups exert pressure to increase and expand their crops in remote areas with little or no state presence. Ibáñez & Querubín (2004)) explains how illicit crops are related to displacement and how this appropriation of land is not only used to increase production but also to launder illicit money, which subsequently generates a land speculation process that ends up increasing prices and benefiting the final owners of the land (front men for drug traffickers and armed groups).

Another mechanism is the substitution of legal rents for illegal rents, which differs from the other mechanisms mentioned above in that individuals also make decisions on the amount, type of resources, and labor allocated to their own companies or land. For example, a large drop in the price of agricultural products or an increase in their volatility can lead farmers to plant illegal crops on their farms to compensate for the loss of income, which in turn can generate more violence as a result of state repression or the struggle between illegal armed groups for control of these new illegal rents. In the Colombian case Dube & Vargas (2013) found no

evidence that falls in coffee prices have led farmers to plant more coca. Political and Economic Institutions: The effect of the State Presence, Property Rights and Conflict on land concentration Political institutions' influence on the intense concentration of land in Colombia can be seen from colonial times and throughout Republican history with policies that benefit elites and large landowners. One example is the colonization of vacant land during the first half of the 20th century, which exacerbated the conflict between small landowners and landowners by giving the latter advantages in terms of quality and quantity of land, and which ended in an armed confrontation during the period of the violence (Fajardo, 2002). Furthermore, the absence of the Colombian state in several regions of the country increases the potential gains from appropriation activity and increases the probability of possible collisions between the different armed groups and between them and the government. Our model of land concentration indirectly controls state and institutional presence using the presence of coca crops in 1994. The reason to consider it is its correlation with a weak monopoly of the state's force, low collection of taxes and revenues, and low offer of public services. Concerning economic institutions, the lack of property rights benefits the illegal armed actors in two ways, firstly the low costs they incur to appropriate property, and secondly, by using their monopoly of force, they can maintain extensive land holdings with minimal maintenance, exploitation, and production costs in addition to not paying taxes. These low exploitation and production costs result from farmers' unfavorable conditions when negotiating wages and land leases with landowners amid conflict. Simultaneously, low tax collection in municipalities with illegal armed groups results in limited redistributive efforts by municipal governments. Thus, the lack of property rights creates incentives to violently appropriate production factors given the expected growth in potential rents and profits from appropriation activities. Ibáñez & Querubín (2004) have also identified the expansion of the territorial domain for drug trafficking as another reason for the violent appropriation of land using forced displacement.

The level of property rights modifies the behavior of the state and the illegal armed groups. Fergusson (2013) states that landowners prefer to have less strong, private property rights if they receive more significant benefits from a more impoverished economy (lower peasant salaries and lower peasant migration risk) due to their greater share in the municipality's total production, which compensates for that decline in economic performance. Conversely, if economic performance is large enough for landowners to make a profit, they will prefer to reinforce private property rights even if they lose their share in the municipality's total production to the point where this loss of share does not compromise their power and control in the municipality. Also, when there is a permanent presence of illegal armed groups and few property rights, peasants will choose activities with short-term yields and lower profitability and investment, and if violence intensifies, they will opt for subsistence activities (Arias et al., 2019) . This situation ends in the impoverishment of peasants, which facilitates the subsequent appropriation of large tracts of land by illegal armed groups, not only through coercion but also through their influence on traditional elites and the state to achieve distortions in their favor (Ibáñez & Querubín, 2004). Peasants located in municipalities with better land distribution will have a higher opportunity cost for abandoning their land (Engel & Ibáñez, 2007), which may increase violence from illegal armed groups when rents or appropriation gains increase in these municipalities. In the case of Colombia, the armed conflict affects the quality of political institutions and the quality of economic institutions, making it easier for elites to capture the state and armed groups to control the territory, thereby affecting economic growth and resource distribution. (Cortés & Vargas, 2012). In turn, the Colombian conflict results from the interaction between de jure political power and de facto political power in the different regions and the particular conditions in each municipality (economic, geographical, etc.).

4.2.2 Estimation Strategy

The main empirical challenge following the conceptual framework is to make causal inference of any conflict variable (e.g., paramilitary attacks) on our outcome variable (land Gini coefficient), using a regression approach since the estimated effect of the conflict variable on the Gini coefficient could be biased. As observed in the Figure 1, political institutions and the distribution of resources interact simultaneously in determining both political power and the conflict level. The classical approach to address this endogeneity is based on instrumental variables (IV)(Wooldridge, 2010), which in our case, correlate with the conflict variables but not with the unobserved determinants of the Gini coefficient (that are part of the error term). According to this, the IVs must meet two requirements Angrist & Pischke (2008): First, the IVs must have a strong relationship with the endogenous regressors. Second, the IV must be unrelated to the error term in the regression equation.

We hypothesize that the armed conflict affects land distribution in two ways: first, by maintaining weak property rights and institutions that affect the behavior of illegal armed groups, elites, and peasants; and second, through the forced appropriation of land (forced displacement of peasants) by armed groups. To test these hypotheses, we first followed the methodology used in previous literature (Dube & Vargas, 2013) to estimate conflict in which changes in coffee and oil prices affect the level of violence in a more significant proportion in municipalities that produce more of these two products, using the opportunity cost mechanism and the mechanism of rapacity simultaneously.

Second, we use changes in coffee and oil prices as our instrumental conflict variables to explain land concentration. The reason for directly employing prices is to expose the mechanisms of rapacity and opportunity cost in explaining land concentration [3]. In this case, we did several checks, so the instrumental variable meets the two requirements mentioned above (Angrist & Pischke, 2008). Among these are that the direction and significance of the price coefficients found in the conflict model are maintained. Also, for municipalities that have not had a conflict, prices should not affect land concentration. By including coffee and oil price shocks as instrumental conflict variables in the regression to estimate land concentration, we connect our theoretical model with the empirical strategy of estimating land concentration while avoiding the endogeneity of conflict. This model evaluates whether changes in oil and coffee prices affect land concentration disproportionately in municipalities that produce more of these commodities and have ever been in conflict [4].

In the model, in order to determine the impact of the oil shock, we use the interaction between the oil production in the year 1988 that existed in municipality j in the region r (Oil_{jr}) and the natural log of the international price of oil in year t (OP_t), which guarantees that this variable is exogenous to the Colombian conflict during the period of analysis. On the other hand, Colombia is among the largest coffee exporters in the world. Therefore, it can influence the international price of coffee during the analysis period and bias the estimates if the international price is used directly, since the conflict can change Colombian coffee production, altering the international price. To control this endogeneity problem, we create an instrumental variable for the coffee price faced by Colombian farmers using the coffee export volume of the three other leading coffee exporters (FE_t). Also, coffee production can have problems of endogeneity, so we instrument

[3] The land concentration model was also estimated using 2 SLS estimation. The first stage used coffee and oil intensities to estimate violence and the second stage estimated land concentration using the violence estimated in the first stage. However, placing the coffee and oil intensities together made it challenging to interpret the price shocks later

[4] In non-conflict municipalities, there were no significant price effects.

coffee production with rainfall (R_{jr}) and temperature (T_{jr}) since this captures the capacity to produce coffee of each municipality j in region r. Due to the coffee's endogeneity, our specification is represented in two stages and uses 2SLS estimation.

In the first stage, we estimate the impact of the coffee shock of municipality j in the r region or the interaction between Cof_{jr} (number of hectares of land devoted to coffee production in 1997 in the municipality) and CP_t (the natural log of the price of coffee in year t faced by farmers in each municipality) using the following equation:

First stage

$$Cof_{jr} * CP_t = \alpha_j + \beta_t + \delta_r t + Coca_{jr} t\gamma + \sum_{m=0}^{1}\sum_{n=0}^{1}(R_{jr}^m * T_{jr}^n * FE_t)\theta_{mn} + X_{jrt}\rho + \mu_{jrt} \quad (1)$$

where α_j are municipality fixed effects; β_t are year fixed effects;$\delta_r t$ are linear time trends in Colombia's four major regions (Andean, Caribbean, Southeastern and Pacific) that control for possible missing variables that arise from differences specific to these regions in time; $Coca_{jr}t$ are linear time trends in the coca and non-coca municipalities that also control for possible missing variables since coca presence may be correlated with commodity presence (climatic conditions of coffee are also favorable for coca cultivation); the powers m and n allows include in the regression all possible combinations of interactions between rainfall (R_{jr}^m is the average annual rainfall of municipality j of region r raised to the power m), temperature (T_{jr}^n is the average annual temperature of municipality j raised to the power n) and the coffee export volume of the three other leading coffee exporting countries (FE_t is the natural logarithm of coffee export volume of the top 3 coffee producers different to Colombia) but not including the unique effect of each of these variables ($\theta_{00} = 0$) which is why they are raised to the power m and n to activate or deactivate each variable in the interaction;X_{jrt} are time-varying controls at municipal level that include the logarithm of the population size.

In our second stage, we estimate the effect of commodity shocks on land concentration and is given by

Second stage

$$Gini_{jrt} = \alpha_j + \beta_t + \delta_r t + Coca_{jr} t\gamma + (Oil_{jr} * OP_t)\lambda + (\widehat{Cof_{jr} * CP_t})\rho + X_{jrt}\phi + \mu_{jrt} \quad (2)$$

Where $Gini_{jrt}$ is the Gini coefficient (owners and lands) in municipality j, region r and year t in the land concentration model[5]; α_j are municipality fixed effects; β_t are year fixed effects; and X_{jrt} are time-varying controls at municipal level. Oil_{jr} is the oil production level in municipality j and region r during 1988; OP_t is the natural log of the international price of oil in year t; Cof_{jr} is the municipality level hectares of land devoted to coffee production in 1997; and CP_t is the natural log of the internal coffee price in year t; $(\widehat{Cof_{jr} * CP_t})$ is the estimated value of the impact of the coffee shock in the municipality j of the region r given by the first stage. The coefficients λ and ρ capture the differential effect of oil and coffee prices respectively on the Gini coefficient in municipalities that produce more oil or grow more coffee. $\delta_r t$ are linear time trends in Colombia's four major regions and $Coca_{jr}t$ are linear time trends in the coca and non-coca municipalities.

In other specifications considered here, endogeneity is controlled in other agricultural commodities' intensity by the number of hectares dedicated to those commodities at the beginning of the

[5]In the conflict model, the Gini is replaced by any of the violence outcomes(guerrilla attacks, paramilitary attacks, clashes or casualties)

period as a proxy for other years. To control potential endogeneities in the natural resources, we used the reserves estimated in previous years to the analysis period. Also, in all model specifications, standard errors are clustered at the department level to control potential serial correlations in time and across municipalities within a department. The conflict model for the period 1988-2005 estimated by Dube & Vargas (2013), using data from Colombia at the municipality level, found that income shocks through the variation of international commodity prices have two opposite effects on the armed conflict. The opportunity cost effect is when illegal armed groups depend on Labor to violently appropriate resources. In this case, higher wages could reduce the armed conflict by decreasing the amount of labor available for appropriation. The Rapacity effect instead explains how an increase in contestable income can increase the potential gains from violent appropriation. The fall in coffee prices in the 1990s brought down wages and increased violence in the coffee-growing municipalities in Colombia. In contrast, in the oil-producing municipalities, an increase in oil prices increased both the tax revenues and the illegal armed groups' level of violence. In summary, the price of agricultural commodities (which are labor-intensive) is negatively related to the conflict, while the price of natural resources (more capital intensive) is positively related to the conflict. In our case, with a period that only considers information for 2000-2012, it is necessary to re-run the conflict model to confirm whether mechanisms persist or change in each of the commodities. On the other hand, the land concentration model must show a behavior of the coefficients similar to the one found in the conflict model to initially consider conflict as a factor behind the Gini coefficient's behavior. The model was also run considering as instruments the interaction between rain, temperature, the coffee export volume of the top 3 exporters, and the interaction between oil and oil price, confirming a positive relationship between this instrument and the Gini coefficient. To be able to compare the effect of changes in prices between municipalities with and without conflict, we need to look for the non-existence of price effects in the municipalities of the control group(non-treated). In the results section, we compare the level for treated (with conflict) and non-treated (without conflict) municipalities and show that the latter group prices do not affect the Gini coefficient in any way. In this manner, we can return to the main specification that enriches the analysis by observing the mechanisms of opportunity costs and rapacity effect in the Gini. In the main specification, we use municipality fixed effects to control time-invariant municipal characteristics that may correlate with economic performance results, resource distribution, and violence.

5 Results

We use regression analysis to assess conflict on land concentration using international coffee and oil price shocks as a conflict level tool. Our empirical strategy uses a difference-in-difference estimator to assess whether there is a disproportionate change in land concentration due to increased conflict violence. Since the violence or intensity of the armed conflict and land concentration can be simultaneously related (endogeneity), the intensities of coffee and oil in the municipalities are used as instrumental variables in the search for causality. Equations (1) and (2) are estimated via 2SLS. The results show land concentration and violence models for 2000-2012 using the international price shocks of coffee and oil. We will now present an analysis of the relationship between armed conflict and coffee and oil shocks for the period 2000-2012; the results will provide context for our model of land concentration and price shocks.

5.1 Armed Conflict 2000-2012, The Opportunity cost and Rapacity Channels

The period that (Dube Vargas, 2013) consider for their study includes strengthening and expanding the guerrillas, the military weakening of the Colombian state, and the emergence of the paramilitary groups (1988-2005). In our case, the availability of information on the Gini of lands and owners defines our analysis period (2000-2012), so new dynamics of the conflict may emerge in our database. For example, by 2002, negotiations with the FARC fail, and the Caguan demilitarised zone disappears while Plan Colombia (United States financial and military aid, aimed at solving the problem of drug trafficking and internal conflict in Colombia) enters a new phase of expansion with greater support in equipment and training for the Colombian armed forces. Furthermore, this period also includes the two mandates of Alvaro Uribe Velez, a right-wing politician who desists from negotiating with the guerrillas and launches a military campaign against these insurgent groups for territorial control while seeking negotiation and submission to the justice of the paramilitary groups. In Table A.1 of the Appendix, there is a summary with the descriptive statistics of each of the variables used in the model's different specifications. Table A.2 of the Appendix shows the correlations between the different variables of the model. It should be noted that the intensities of coffee and oil are positively correlated with both the Gini and the violence outcomes. In terms of violence outcomes, only paramilitary attacks are positively correlated with Ginis, which would coincide with several studies of the Colombian armed conflict in which the anti-guerrilla approach of the armed forces may have facilitated the criminal actions of the paramilitaries, including the appropriation of large areas of land.

Table 1: The Effect of the Coffee and Oil Shocks on Violence

	2 Stage				1 Stage
VARIABLES	(1) Guerrilla attacks	(2) Paramilitary attack	(3) Clashes	(4) Casualties	(5) Coffee int. x log coffee price
Coffee int. x log coffee price	-1.331	-0.446	-2.488	-0.303	
	(1.200)	(0.310)	(1.730)	(0.477)	
Oil production x log oil price	-16.128***	-1.236	-21.709***	-11.438***	0.020
	(1.576)	(2.393)	(3.937)	(3.569)	(0.042)
Log(population)	0.467	-0.642	0.828	0.074	-0.152
	(0.839)	(0.409)	(1.040)	(1.282)	(0.246)
Cultivated coca, indicator x year	0.000	0.045	-0.231	-0.245	0.007
	(0.139)	(0.061)	(0.202)	(0.162)	(0.010)
Rain x log(Top3 coffee prod.)					0.001***
					(0.000)
Temp. x log(Top3 coffee prod.)					0.084***
					(0.015)
Rain x Temp. x log(Top3 coffee prod.)					-0.000***
					(0.000)
Observations	10,758	10,758	10,758	10,758	10,758
R-squared	0.004	-0.004	-0.002	0.007	0.029
Number of origmun	978	978	978	978	978
Municipality FE	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Fp					0.000161

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In Table 1, indicators of violence increase only when there are decreases in oil prices. The Kleibergen-Paap F-statistic associated with this table is 12,157, which according to the Staiger-Stock rule of thumb (ia 5 percentage test that the worst-case relative bias is approximately 10 percentage or less) exceeds the Stock Yogo critical value. In addition, the null hypothesis that our instruments are valid is rejected (the overidentifying restrictions statistic is 7.876 and its p-value is of 0.0195) so IV is relevant but may be related to the error term in the regression equation .

This result goes against the rapacity channel mechanism, so we examine this channel by analyzing the price shocks in the local government budgets, which are a resource alternative that may be targeted for predation (According to law 141 The government places 80 percent of the oil royalties in the oil stabilization fund and the remaining 20 percent is distributed among the central government 32 percent, the departmental government 47.5 percent and 12.5 percent goes to the municipality). In Table 2, column (1) shows that an increase in oil price is not enough to increase the municipality's capital revenues. Furthermore, in columns (3) and (4), it can be seen that the increase in prices is not related to the increase in criminal activities; in this case, only the decrease in the price of oil generates an increase in kidnappings and political murders.

Table 2: The rapacity Mechanism

VARIABLES	(1) Log(Capital Rev.)	(2) Guerrilla Politcal Crimes	(3) Paramilitary Politcal Crimes
Coffee int. x log coffee price	-0.066	-0.071	-0.007
	(0.061)	(0.144)	(0.009)
Oil production x log oil price	-0.328	-0.504***	-0.089
	(0.226)	(0.074)	(0.140)
Log(population)	0.658***	0.036	0.014
	(0.120)	(0.072)	(0.020)
Cultivated coca, indicator x year	0.009	-0.001	0.004*
	(0.009)	(0.006)	(0.002)
Observations	12,254	10,758	10,758
R-squared	0.008	-0.000	0.000
Number of origmun	962	978	978
Municipality FE	YES	YES	YES
Region FE	YES	YES	YES
Year FE	YES	YES	YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The central government distributes the resources from oil exploitation to the municipalities under certain conditions of efficiency in spending, presentation of projects, and total population. Law 756 of 2002 modifies how royalties were distributed in the country, seeking to revert regional disparity that arose with the previous royalty regime (Botero-Ospina et al., 2015). In this way, municipalities that were not oil producers could benefit from the rise in international prices that occurred during 2000-2010. These two situations together could limit the effect of oil prices in all municipalities. For example, in Table 2 column (1), the total population is positive and significant in determining capital income.

This may be limiting access to the expected profits from the appropriation of state resources by illegal armed groups. Also, social investment sponsored by the municipality's capital income on the municipality's population may be sustaining the local economy.

5.1.1 Alternative Accounts and Robustness Tests

In this section, we analyze alternative accounts that may affect the effects of price shocks on conflict. First, we examine whether there is greater military activity by the government as it has more resources available due to positive variations in oil prices. Second, we check whether there is government support for paramilitary groups in places where the government cannot have a military presence. Also, we check if there is collusion between municipal public officials and the paramilitaries (or other illegal groups). Finally, we consider the alternative effects of coca on prices on the conflict

To assess whether positive shocks in oil prices can increase the military's resources, we estimate equation (2) with government attacks. These results, shown in column (1) of Table A3 Panel A, indicates that government attacks increase in the oil towns when oil prices fall, which coincides with the increase in the conflict and a growing need for more military enforcement rather than an increase in attacks because the government increased monetary resources.

On the other hand, we also analyzed the government's need to provide security in areas where it does not have a strong presence and, in response, seek the collaboration of illegal armed groups. In Columns (2) and (3) of Table A3 Panel A, we did not find that oil or coffee shocks had induced more massacres by either of these groups in response to the other rival's aggressions groups. It is therefore not possible to conclude that paramilitary groups have served as protectors of the population. Possible collusion between the government and the paramilitaries is also analyzed, where the government finances paramilitary violence. In this case, there must be a positive interaction between the clashes in oil prices and the municipalities where the presidential candidate Alvaro Uribe won since these municipalities would have greater ideological proximity to the right and a more significant influence of the paramilitary groups.

The three-way interaction term in Table A3 Panel B shows if municipalities, where the candidate Uribe Velez won, have differential decreases in guerrilla attacks when prices increase; this shows the development of the national government's political-military strategy by increasing security in municipalities that are both favorable to elections and strategic in production in order to reduce guerrilla attacks. This contrasts markedly with the paramilitary groups where the proximity of the population to the right-wing government does not seem to affect the paramilitaries' level of violence. On the other hand, despite the paramilitaries' political influence during this period, it is not possible to confirm the collaboration between right-wing municipal governments with the paramilitaries using the national police database.

We check if there is no alternative mechanism by which violence increases due to the struggle for control of the new rents from the coca expansion that results when farmers substitute coffee for coca crops to respond to a fall in coffee prices. The results in table A4 Panel A column (1) show that neither oil shocks nor coffee shocks are significant for the increase in coca cultivation, so there is no substitution toward coca planting in response to coffee and oil price shocks.

In columns (2) - (5), we re-estimated the conflict measures for a subsample of years and municipalities that have information on coca cultivation. The pattern of effects observed in table 1 is maintained for most except for oil shocks in guerrilla attacks where it is no longer significant. Also, the oil shocks for casualties are no longer significant for this reduced sample due to the large decrease in observations. The fight against drug trafficking can affect the level of violence in the municipalities where coca is grown through eradication or increasing the government military presence in the area. Concerning eradication, if it is successful, there are fewer expected gains from coca activity, so it cannot be compensated by the costs of exercising more violence, which

decreases the level of armed conflict in the municipalities where this policy is implemented. On the other hand, if the fight against drug trafficking involves greater use of force, this can increase violence by increasing attacks by the public forces against illegal armed groups. These policies can bias the results if there is a correlation between coca intensity and coffee or oil production. Although in the original model, this effect is partially controlled with the linear trends of municipalities with or without coca crops, the control of coca is also done first by using the interaction between year dummy variables and the intensity variable in 1994 of coca crops (table A4 Panel B). Second, remove all municipalities that have ever grown coca (table A4 Panel C) to see if the patterns observed in table 1 are similar.

In both Panel B and Panel C of table A4, the patterns are similar in direction; however, when controlling for coca, coffee's effect becomes significant for guerrilla attacks, clashes, and casualties. This may indicate that farmers do not have the option to choose between coffee and coca in the coca municipalities, due to the monopoly of violence of an illegal armed group, or due to the low intensity of coffee cultivation in the coca municipalities, which does not allow for any opportunity cost effect. In contrast, the results in Table 1 are robust to oil shocks with their negative effect on levels of violence.

Table A5 shows the possibility that a drop in coffee prices will lead to an increase in the recruitment of farmers by illegal armed groups to take advantage of oil revenues, resulting in increased violence in the oil-producing municipalities. This indirect or spillover effect of coffee shocks on the level of violence in the oil region increases when the location of coffee and oil production are close to each other. In our case, the spillover effect is isolated by controlling the sample in three ways, first by excluding municipalities that produce both oil and coffee, second by eliminating oil municipalities adjacent to coffee municipalities, and third by eliminating coffee municipalities that are neighbors of other coffee municipalities.

The results are robust in cases where municipalities that produce coffee and oil are excluded, and also when coffee-growing municipalities that are close to oil-producing municipalities are excluded. When we exclude oil-producing municipalities that are neighbors of coffee-producing municipalities, the effect of shocks on coffee prices becomes significant for paramilitary attacks and confrontations, suggesting spillover from oil price shocks affecting coffee-producing municipalities that are neighbors of oil-producing municipalities. One possible reason for this is that the municipal economy can receive benefits and income from its neighbors, and if they produce oil, the local economy will be less dependent on coffee, including workers' wages. All these exercises seem to suggest that negative oil price shocks directly affect increasing the level of conflict. However, channels such as greater military enforcement, the right-wing ideological orientation of local government, coca crops, and spillover from neighboring oil-producing municipalities can make the opportunity cost effect disappear when there are coffee price shocks. Moreover, intensify the negative effect on the level of conflict when there are positive oil price shocks. On the other hand, it is striking in the case of paramilitary attacks that only when controlled by proximity with the municipal government political orientation or excluding oil municipalities that are neighbors of coffee municipalities, the shocks of the coffee price and the corresponding opportunity cost of farmers when they abandon coffee cultivation become significant.

This may suggest that the national government's political-military strategy was successful against the guerrillas but had no impact on reducing paramilitary violence. Also, the paramilitaries, who took control of the oil areas, were able to employ other resource appropriation methods that would not be considered in this article, such as threats, extortion, collusion with state contractors, etc. This can affect the significance of price shocks in the conflict.

5.2 Land Concentration 2000-2012, The Opportunity cost and Rapacity Channels

As mentioned in the section describing the information, the Agustin Codazzi Institute calculates both the Gini of land and the Gini of owners and uses them in a complementary way to follow the evolution of land concentration in Colombia, so both indicators are used as dependent variables in our model. The coefficients in Table 3 columns (1)-(8) show the isolated effect of coffee and oil shocks on the Gini, while columns (9)-(12) show the effect of coffee and oil shocks when both variables are included. Column (13) is the first stage of the Instrumental Variable Land Concentration Model in Column (12). For all models where the coffee shock is significant, its effect on the Gini is positive, while the oil shock is negative and significant for most models except for the non-fixed effect owner Gini models where it is positive. Fixed effect models have smaller r squares, and among the fixed effect models, those that include oil intensity are the best performers.

These results align with the new dynamics of the Colombian armed conflict for the period 2000-2012 studied in the previous section, and they are opposite to those found by Vargas and Dubei in their paper. In table A6 the effect of conflict on Gini is evaluated by running a 2SLS estimation where the shocks in oil and coffee prices (using the IV of coffee intensity indirectly) are used to estimate the conflict in the first stage. In column (2), the conflict's effect on the Gini of land is positive and significant. Unfortunately, the R-square and the F-statistic discard this specification.

Table 3, our fixed effect model in columns (11) and (12) shows that for both Gini, the coffee price shocks are not significant, and the oil price shocks are significant but with the opposite sign of the rapacity effect. Consider, a fall in oil prices for the average oil municipality (average oil production is 0.08 hundred thousand barrels/day). The coefficients imply that a fall of oil prices equivalent to its minimum during 2000-2012 (74.03 USD/Barrel or a fall of 63 percent from its mean) will induce a 0.005 percent increase in the Owner Gini coefficient and a 0.007 percent increase in the Land Gini coefficient. The Kleibergen-Paap F statistic for the land gini is 11.562, which according to the Staiger-Stock rule of thumb (5percent test that the worst-case relative bias is approximately 10 percent or less) exceeds the Stock Yogo critical value (weak identification test). This indicates that our instrument has the information to be a good predictor of coffee intensity. Furthermore, the null hypothesis that our instruments are valid is not rejected (the overidentifying restrictions statistic is 3.569, and its p-value is 0.3119).

Table 3: The Effect of the Coffee and Oil Shocks on Land Concentration

VARIABLES	(1) Gini Owner	(2) Gini Land	(3) Gini Owner	(4) Gini Land	(5) Gini Owner	(6) Gini Land	(7) Gini Owner	(8) Gini Land	(9) Gini Owner	(10) Gini Land	2 Stage (11) Gini Owner	2 Stage (12) Gini Land	1 Stage (13) Coffee int. x log coffee price
Coffee int. x log coffee price	0.005***	0.005**			0.004	0.001			0.005***	0.005**	0.004	0.001	
	(0.001)	(0.002)			(0.008)	(0.007)			(0.001)	(0.002)	(0.008)	(0.007)	
Oil production x log oil price			0.004	-0.005*			-0.031**	-0.043***	0.011***	0.000	-0.025*	-0.032***	0.036
			(0.003)	(0.003)			(0.013)	(0.014)	(0.004)	(0.003)	(0.015)	(0.012)	(0.054)
Log(population)	0.022***	0.023***	0.034***	0.033***	0.011	0.026***	0.015	0.029***	0.022***	0.023***	0.011	0.026***	-0.004
	(0.005)	(0.005)	(0.005)	(0.007)	(0.015)	(0.010)	(0.016)	(0.010)	(0.005)	(0.005)	(0.015)	(0.010)	(0.286)
Cultivated coca, indicator x year	-0.000***	-0.000***	-0.000***	-0.000***	-0.000	0.000	-0.001	-0.000	-0.000***	-0.000***	-0.000	0.000	0.013
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.016)
Rain x log(Top3 coffee prod.)													0.002***
													(0.001)
Temp. x log(Top3 coffee prod.)													0.128***
													(0.025)
Rain x Temp. x log(Top3 coffee prod.)													-0.000***
													(0.000)
Observations	10,858	11,455	11,112	11,709	10,858	11,454	11,112	11,708	10,858	11,455	10,858	11,454	11,454
R-squared	0.0655	0.0398	0.106	0.0753	-0.000	0.002	0.001	0.003	0.0658	0.0399	-0.000	0.003	0.046
Number of origmun	842	963	862	983	842	962	862	982	842	963	842	962	962
Municipality FE					YES	YES	YES	YES			YES	YES	YES
Region FE					YES	YES	YES	YES			YES	YES	YES
Year FE					YES	YES	YES	YES			YES	YES	YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

5.2.1 Robustness checks and Alternative Specification

First, we will analyze whether there are effects other than conflict where price shocks can change land concentration. To start the analysis, municipalities that did not suffer from any manifestation of the armed conflict during the study period are excluded. Table 4 columns (1)-(6) use the Conflict Analysis Resource Center's (CERAC) classification of municipalities by the level of conflict severity to exclude conflict municipalities while columns (7)-(12) identify and exclude conflict municipalities using the national police database.

In table 4 in columns (1)-(2) and (7)-(8), when municipalities are excluded using CERAC and National police information, it is shown that for non-conflict municipalities, coffee and oil price shocks do not have any significant effect on both the owner Gini and the land Gini. This allows us first to verify that our methodology identifies and separates the effects of both the treatment (conflict) and control groups. Second, the non-significant coefficients suggest that the current coffee and oil price shocks do not include other effects such as economic growth or increased income that may affect income and land inequality in the municipalities. On the other hand, we also check if it is possible to run our model using the price variables with lags (previous year); Table 4 in columns (3) and (10) shows that the model is not able to differentiate between municipalities with and without conflict when one or more price variables with lags are used.

Next, we also examine what types of violence resulting from conflict can be included in the land concentration model. Migration and forced displacement are the channels that have been considered in the literature to explain land concentration. For migration, no database was found that would allow us the inclusion of additional information to that collected by Dubei and Vargas in their paper, where they conclude that coffee and oil prices do not affect migration. Forced displacement is caused by more than one type of violence and this, of course, adds other dynamics and mechanisms that could explain land concentration through conflict. In our case, we include this violent phenomenon in our group of dependent variables to detect any effect of coffee and oil price shocks using the information on forced displacement found in the Registro Unico de Victimas (RUV) database.

Table 5 shows us in Panel A Column (3) that current coffee and oil shocks are not significant in explaining Forced displacement, but if we use last year's prices, the oil shocks become significant (see Panel B Column (3)). We can assess two ways to include forced displacement in the land concentration model; the first option is to use the land concentration model with last year's prices to find that forced displacement depends on the previous year's oil and coffee prices. The second option is to identify other commodities that could explain forced displacement with their current prices to use the land concentration model with coffee and oil at current prices.

Table 4: Other Factors Affecting Land Concentration besides the Conflict

	Excluding municipalities ever had conflict CERAC						Excluding municipalities that ever had conflict National Police					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Gini Owner	Gini Land	Gini Owner	Gini Land	Gini Owner	Gini Land	Gini Owner	Gini Land	Gini Owner	Gini Land	Gini Owner	Gini Land
Coffee int. x log coffee price t	-0.010	0.004					-0.013	-0.015				
	(0.024)	(0.036)					(0.013)	(0.015)				
Oil production x log oil price t	-1.327	-1.559			-1.474	-1.709	0.452	0.355			0.473*	0.422*
	(1.838)	(1.725)			(1.820)	(1.695)	(0.309)	(0.296)			(0.258)	(0.232)
Coffee int. x log coffee price t-1			-0.031**	0.003	-0.031**	0.003			-0.015	0.006	-0.015	0.006
			(0.015)	(0.027)	(0.015)	(0.027)			(0.016)	(0.014)	(0.016)	(0.014)
Oil production x log oil price t-1			-1.649	-1.823					0.024	0.181**		
			(1.846)	(1.722)					(0.102)	(0.085)		
Observations	2,141	2,162	1,978	1,999	1,978	1,999	4,194	4,454	4,188	4,448	4,188	4,448
R-squared	0.013	0.015	0.016	0.020	0.013	0.017	-0.011	-0.011	-0.010	0.000	-0.009	0.000
Number of origmun	167	171	167	171	167	171	756	831	756	831	756	831
Municipality FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Feasibility of the model with forced displacement and previous year's prices. PulgarÃn et al. (2020) showed that the shock in expected income due to a change in the price of palm oil from the previous period could affect rates of forced internal displacement (FID) in regions with weak institutions and large territories available for agricultural activities. According to this finding, we check the possibility of using the land concentration model with the previous year's prices instead of the current year's prices. Table 5 Panel B and C in Column (3) shows that forced displacement increases when the previous year's oil price falls, and this effect is significant. Also, column (1) y (2) shows that oil shocks share the same pattern in direction and significance in the land concentration model when the models with the variables in t-1 are considered. However, table 4 shows that it is not possible to use the land concentration model for these types of variables. Unfortunately, the feasibility of the model with forced displacement and previous year's prices is not possible.

Feasibility of the model with forced displacement and including other commodities. The other option is to include new commodities in the land concentration model. Table 6 Panel A includes carbon, gold, silver, and platinum without presenting economically and statistically significant coefficients for these other resources. In table 6, Panel B, the same exercise was carried out but including, in addition to coffee, other agricultural products with information available for the period 2005-2012. Table A7 shows that the effects of price shocks on land concentration using new commodities remain after removing the municipalities that have not had a conflict, indicating problems with the land concentration model to differentiate between the control and treatment groups (municipalities with conflict) using other commodities. These checks show that in our model is not possible to incorporate forced displacement. However, with a database that includes other commodities and more years, its viability could be reviewed again.

The intuition behind the concentration of land without forced displacement could include other types of mechanisms where farmers are forced to hand over land to illegal armed groups but with the option of remaining in the municipality. For example, it is possible that conflict could indirectly affect land concentration through weak property rights in the municipalities. Fergusson (2013), using property rights, presents a mechanism by which land concentration can be increased without forced displacement. This mechanism is that if urban wages are high and the threat of migration is high, then elites, powerful landowners, or other powerful groups will choose weak property rights if they depend on peasants' labor to cultivate their large land plots. Weak property rights force peasants to stay in the rural sector to protect their land and also force them to work for large landowners because the conflict decreases the productivity of their land, making them dependent on landowners to maintain their livelihood levels (Arias et al., 2019; Calderón Ibáñez, 2016). Thus, peasants' choice to work for the landowners depends on their land size; if the land is large enough to maintain subsistence levels, peasants would have no incentive to work for the large landowners or, in our case, the illegal armed groups. The mechanism shows us that the elites and illegal armed groups must choose the level of violence in such a way that it allows them to increase their profits by decreasing the land available for the farmers on the one hand, and on the other hand, avoid being left without a workforce because of the risk of farmers migrating to the city in search of better wages.

Table 5: Feasibility of the model with forced displacement and previous year's prices.

VARIABLES	(1) Gini Owner	(2) Gini Land	(3) Forced Displacement
	Panel A Using only current prices		
Coffee int. x log coffee price t	0.004	0.001	-12.209
	(0.008)	(0.007)	(230.372)
Oil production x log oil price t	-0.025*	-0.032***	-715.396
	(0.015)	(0.012)	(634.784)
log(population)	0.011	0.026***	1,061.317***
	(0.015)	(0.010)	(378.414)
Cultivated coca, indicator x year	-0.000	0.000	-3.096
	(0.001)	(0.001)	(46.738)
Observations	10,858	11,454	11,129
R-squared	-0.000	0.003	0.006
Number of origmun	842	962	950
Municipality FE	YES	YES	YES
Region FE	YES	YES	YES
Year FE	YES	YES	YES
	Panel B Using only prices with lags		
Coffee int. x log coffee price t-1	0.004	0.004	-235.094
	(0.007)	(0.005)	(176.839)
Oil production x log oil price t-1	-0.027**	-0.017	-923.353*
	(0.013)	(0.012)	(478.767)
log(population)	0.015	0.032***	983.290***
	(0.017)	(0.010)	(332.094)
Cultivated coca, indicator x year	0.001	0.001	-11.938
	(0.002)	(0.001)	(49.800)
Observations	10,031	10,627	10,283
R-squared	0.000	0.001	0.007
Number of origmun	842	962	948
Municipality FE	YES	YES	YES
Region FE	YES	YES	YES
Year FE	YES	YES	YES
	Panel B Using only coffee prices with lag		
Coffee int. x log coffee price t-1	0.004	0.004	-234.985
	(0.007)	(0.005)	(176.820)
Oil production x log oil price t	-0.027**	-0.017	-814.120
	(0.013)	(0.011)	(596.999)
log(population)	0.015	0.032***	982.157***
	(0.017)	(0.010)	(331.863)
Cultivated coca, indicator x year	0.001	0.001	-11.818
	(0.002)	(0.001)	(49.791)
Observations	10,031	10,627	10,283
R-squared	0.000	0.001	0.007
Number of origmun	842	962	948
Municipality FE	YES	YES	YES
Region FE	YES	YES	YES
Year FE	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Feasibility of the model with forced displacement and including other commodities

VARIABLES	(1) Gini Owner	(2) Gini Land	(3) Guerrilla attacks	(4) Paramilitary attacks	(5) Clashes	(6) Casualties	(7) Forced Displacement
Panel A: Including other natural resources commodities							
Coal production x log coal price	0.003	-0.002	0.058	-0.048	-0.031	-0.004	16.525
	(0.006)	(0.002)	(0.131)	(0.089)	(0.179)	(0.159)	(51.833)
Gold production x log gold price	-0.048*	-0.005	-0.432	-0.054	-1.102**	0.113	-29.556
	(0.025)	(0.009)	(0.458)	(0.040)	(0.511)	(0.135)	(65.075)
log(population)	0.030*	0.037***	0.888	-0.397	2.534**	0.103	1,061.159***
	(0.018)	(0.011)	(0.968)	(0.397)	(1.287)	(1.117)	(378.674)
Cultivated coca, indicator x year	-0.001	-0.000	0.025	0.045	-0.143	-0.231	-0.954
	(0.001)	(0.001)	(0.151)	(0.059)	(0.210)	(0.166)	(46.734)
Oil production x log oil price	-0.032**	-0.046***	-16.017***	-1.437	-21.592***	-11.045***	-733.094
	(0.015)	(0.016)	(1.721)	(2.442)	(3.822)	(3.511)	(644.342)
Silver Platinun Res x log silver price	0.000	-0.000***	0.000	-0.000	0.000**	-0.000	0.018
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)
Silver Platinun Res x log Platinum price	0.000	0.000*	0.000	0.000	0.000	0.000*	-0.031***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)
Observations	11,112	11,708	10,978	10,978	10,978	10,978	11,370
R-squared	-0.647	-0.037	-0.010	-0.023	-0.015	0.005	-0.001
Number of origmun	862	982	998	998	998	998	969
Panel B: Including other agricultural commodities							
Coffee int. x log coffee price	0.007	-0.000	-5.653***	-0.239*	-9.170***	0.046	-126.380
	(0.008)	(0.007)	(1.781)	(0.125)	(2.595)	(0.059)	(150.722)
log(population)	0.004	0.031***	-3.273	-0.224	-6.253	-0.003	287.295*
	(0.019)	(0.011)	(2.048)	(0.286)	(4.553)	(0.031)	(174.189)
Cultivated coca, indicator x year	0.002	0.003	-0.483	0.006	-0.916	-0.015*	-3.515
	(0.003)	(0.003)	(0.410)	(0.056)	(0.724)	(0.009)	(52.880)
Sugar production05 x log sugar price	-0.003	-0.001	-0.004	-0.009	-0.162	-0.003	-18.638
	(0.002)	(0.001)	(0.292)	(0.019)	(0.327)	(0.003)	(24.346)
Banana production05 x log banana price	2.043***	0.050**	1.936***	0.744***	3.913***	0.003	100.671***
	(0.023)	(0.024)	(0.423)	(0.060)	(0.766)	(0.009)	(23.968)
Palm production05 x log Palm Oil price	-0.004***	-0.003*	-0.559*	-0.399	-0.547	-0.010	-126.252***
	(0.001)	(0.002)	(0.316)	(0.301)	(0.452)	(0.007)	(36.848)
Observations	6,708	7,280	5,868	5,868	5,868	5,868	6,762
R-squared	0.010	0.007	-0.095	0.004	-0.092	-0.012	0.006
Number of origmun	842	962	978	978	978	978	932

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Alternative Accounts With the model of land concentration, similar verifications are made to those made with the conflict variables. First, table A8, column (1) and (2) explores the possibility of collusion between the Colombian government and the paramilitaries that affects land concentration using an interaction between price shocks and the municipalities where presidential candidate Alvaro Uribe won due to the greater ideological closeness between the right-wing represented by Uribe and the paramilitary groups. As with the violence outcomes, it was not possible to confirm the proximity of municipal governments aligned to the right and the paramilitaries in land concentration. However, the three-way interaction term is no longer significant for both Ginis, so the effect of the national government's strategy against the guerrillas does not influence the concentration of land in the municipality. In table A8 column (3) and (4), shows that the shocks in oil prices are no longer significant when only municipalities with information on coca cultivation are used, indicating that the presence of coca in the municipality and the fight against drug trafficking do not have an impact on land concentration. However, in column (5) and (6) when controlling for coca using the interaction between year dummy variables and the intensity variable in 1994 of coca crops, and in column (7) and (8) when controlling by removing all municipalities that have ever grown coca, the results show that the shocks in oil prices are significant and negative, as it was also the case in the models with violence outcomes. This would indicate that in municipalities without coca cultivation, positive shocks in oil prices hurt both the conflict and land concentration, and this effect can be greater or lesser depending on the year. Table A9 shows that the land concentration model results are robust as they are maintained when the sample is controlled to identify spillovers from coffee price shocks that may affect the municipality's oil sector. As we saw in the section on violence, this happens when the variation in coffee prices is translated into a variation in the salaries of coffee growers who can modify their behavior to enter the illegal groups dedicated to appropriating the oil revenues municipality or neighboring municipalities. The conflict then increases as more labor is available to appropriate the oil revenues vilely. This violence could eventually affect land concentration by facilitating its violent appropriation without consequences due to weaker property rights. In other words, an increase or decrease in violence resulting from a decrease or increase in coffee prices does not affect the level of land concentration in neighboring municipalities and within the same municipality.

6 Conclusions

In summary, the instrumentalization of the conflict through coffee and oil shocks confirms that the Colombian armed conflict positively affects land concentration (see table 3). While in all specifications, the effect of coffee is positive, it is only significant when the fixed effects, including region and year, are not considered. On the contrary, the effect of oil is negative and significant for most of the specifications. These opposite outcomes of the coffee and oil shocks in the Gini and their asymmetric effects correspond to a higher level of armed conflict and violence. However, they differ from the findings of (Dube Vargas, 2013) in that the opportunity cost mechanism no longer operates through coffee shocks, and the possible gain from positive oil shocks does not increase conflict and violence in oil producing municipalities (Rapacity Channel). The different robustness tests showed similar patterns in coffee and oil price shocks on both conflict and land concentration. Furthermore, price shocks have no effect on the non-conflict population in the land concentration model, so our difference in difference strategy would be collecting the effect of conflict through coffee and oil price shocks on land concentration. In the model of violence, we saw that this negative effect on oil prices could be related to a greater military capacity of the Colombian Government, which implies more difficulties for the guerrilla groups to appropriate

oil resources, which generates less violence; in this way, it could also be affecting the violent appropriation of property and its effect on land concentration. On the other hand, the negative effect of oil price shocks on violence may come from a change in the type of violence or in the non-violent strategies employed by these groups to take over state revenues; however, if successful, such a strategy should positively affect land concentration (land used as an investment asset), which also does not occur during the period. There could also be an opportunity cost effect on oil, since in many municipalities in Colombia, both oil and non-oil producers, their fiscal resources and economy could be totally dependent on oil directly or indirectly (royalties and transfers); therefore, the salaries of peasants would be positively connected to oil prices, which would raise the recruitment costs of the guerrilla groups. This greater social investment could affect the salaries of the population and expand the quantity and quality of political and economic institutions in the municipalities, increasing the costs of the appropriation sector (Acemoglu et al., 2005). However, the lack of significant effects on coffee and oil prices from paramilitary attacks casts doubt on social investment and institutions' improvement in municipalities with paramilitary presence. Furthermore, concerning mechanisms, we cannot differentiate between the increase in the Government's military intervention or the cost opportunity in the negative effect of oil prices on the conflict. However, for the land concentration model, the increase in the conflict makes property rights weaker, which allows for more land concentration. The analyzed mechanisms included migration, forced displacement, and the mechanism of (Fergusson, 2013). With respect to migration, it was only possible to verify with the Dube Vargas database (2013) that the price effect did not affect land concentration between 2000 and 2005, so prices would only affect land concentration through forced displacement the Fergusson mechanism. Unfortunately, coffee and oil prices are not significant in explaining forced displacement, so price shocks would only be detecting the Fergusson mechanism in the land concentration model. The land concentration model shows that this mechanism exists, as the conflict is chosen to weaken property rights and increase land concentration. Among the model's limitations is that it is focused on the rural part and could not easily be applied to other sectors of the economy. Moreover, for developing countries with few exports, international commodity prices would not affect the conflict. Finally, the land concentration model controls for endogeneity by using coffee and oil price shocks as instrumental variables of conflict. However, if crime depends on lagging events such as in the case of forced displacement, the model could not be implemented if oil and coffee prices are from different periods because one may influence the other to explain land concentration.

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A Appendix

Table A1: Summary Statistics of Variables

	Obs.	Mean	Median	Sts.Dev.	Min.	Max.
Panel-level variables						
Gini Landowners	11112	0.71	0.72	0.1	0	0.98
Gini Land	11709	0.69	0.7	0.11	0	0.99
No. annual guerrilla attacks	10979	1.61	0	4.81	0	95
No. annual paramilitary attacks	10979	0.28	0	1.36	0	48
No. annual clashes	10979	2.5	0	7.49	0	163
No. annual casualties	10979	0.71	0	3.84	0	204
No. annual government attacks	10994	1.03	0	3.2	0	83
No. annual paramilitary massacres	10004	0.01	0	0.23	0	10
No. annual guerilla massacres	10004	0.04	0	0.69	0	43
No. annual guerrilla political homicides & kidnappings	10995	0.03	0	0.29	0	20
No. annual paramilitary political homicides & kidnappings	10995	0	0	0.05	0	2
Log real municipal capital revenue, millions of 2006 pesos	12507	8.44	8.3	0.82	3.23	12.24
Coca intensity, thousands of hectares, 1994 and 1999-2012	12823	0.08	0	0.52	0	16.52
Log population, millions	12974	-4.33	-4.36	1	-8.49	-1.31
No. annual Forced Displacement	3,994	4.79	2	11.35	1	311
CERAC Conflict typology by municipalities, 2000-2012	12,870	4.65	4	1.42	1	7
Municipal-level variables						
Coffee intensity, thousands of hectares, 1997	978	0.83	0.05	1.54	0	10.59
Oil production, hundred thousand barrels/day, 1988	998	0	0	0.05	0	1.63
Coal production, thousands of tons, 2004	998	1.87	0	12.75	0	155.52
Coal reserves, indicator, 1978	998	0.32	0	0.47	0	1
Gold production, hundred thousand grams, 2004	998	0.37	0	2.66	0	34.11
Precious metal mining, hectares, 1978	998	583.28	0	3865.8	0	100000
Cultivated coca, indicator, 1994	998	0.05	0	0.22	0	1
Coca intensity, thousands of hectares, 1994	998	0.07	0	0.58	0	9.08
Ever cultivated coca, indicator, 1994 and 1999-2012	998	0.27	0	0.44	0	1
Rainfall, cm3	998	1888.33	1685	1003.75	160	9200
Temperature, celsius	998	21.39	21.8	4.97	3.9	28.9
Percentage of votes for Uribe in the 2002 presidential race	975	44.98	44.58	19.52	3.44	87.18
Sugar intensity, thousands of hectares, 2005	998	0.69	0	2.49	0	19.4
African Palm intensity, thousands of hectares, 2005	998	0.08	0	0.69	0	8.85
Banana Palm intensity, thousands of hectares, 2005	998	0.02	0	0.22	0	5.17
Annual-level variables						
Log internal coffee price, thousands of 2006 pesos/lb	13	0.54	0.53	0.23	0.26	1.05
Log int'l price of oil, thousands of 2006 pesos/barrel	13	4.76	4.83	0.27	4.3	5.13
Log int'l coal price, thousands of 2006 pesos/ton	13	-2.1	-2.08	0.3	-2.54	-1.53
Log int'l gold price, millions of 2006 pesos/ounce	13	0.31	0.32	0.35	-0.19	0.85
Log int'l silver price, millions of 2006 pesos/ounce	13	-3.76	-3.65	0.43	-4.32	-2.95
Log int'l platinum price, millions of 2006 pesos/ounce	13	0.8	0.84	0.19	0.48	1.01
Log coffee exports of top 3 coffee exporters, millions 60 kg bags	13	3.85	3.92	0.22	3.53	4.19
Log coal exports of top 3 coal exporters, thousands of short tons	13	13.13	13.08	0.34	12.7	13.71
Log int'l sugar price, thousands of 2006 pesos/lb	13	5.58	5.5	0.22	5.29	5.96
Log int'l palm price, thousands of 2006 pesos/lb	13	6.41	6.48	0.23	5.98	6.71
Log int'l banana price, thousands of 2006 pesos/lb	13	6.7	6.72	0.13	6.49	6.88

Note: All panel-level and annual-level variables are defined for the 2000-2012 period

Table A2: Correlation Matrix

	Gini Owner	Gini Land	Guerrilla attacks	Paramilitary attack	Clashes	Casualties	Coffee int. x log coffee price	Oil production x log oil price	Cultivated coca, indicator x year
Gini Owner	1.00	0.81	-0.02	0.05	-0.04	0.00	0.14	0.03	-0.18
Gini Land	0.81	1.00	0.00	0.03	-0.03	0.01	0.09	0.02	-0.19
Guerrilla attacks	-0.02	0.00	1.00	0.26	0.87	0.43	0.09	0.13	0.12
Paramilitary attack	0.05	0.03	0.26	1.00	0.32	0.43	0.01	0.09	0.02
Clashes	-0.04	-0.03	0.87	0.32	1.00	0.34	0.06	0.11	0.15
Casualties	0.00	0.01	0.43	0.43	0.34	1.00	0.06	0.05	0.05
Coffee int. x log coffee price	0.14	0.09	0.09	0.01	0.06	0.06	1.00	-0.02	-0.01
Oil production x log oil price	0.03	0.02	0.13	0.09	0.11	0.05	-0.02	1.00	0.00
Cultivated coca, indicator x year	-0.18	-0.19	0.12	0.02	0.15	0.05	-0.01	0.00	1.00

Table A3: Enforcement, Paramilitary protection and Political Collusion

VARIABLES	(1) Government attacks	(2) Paramilitary massacres	(3) Guerrilla massacres	(4)
	Panel A: Enforcement and paramilitary protection			
Coffee int. x log coffee price	-1.075	0.004	-0.092	
	(0.655)	(0.014)	(0.085)	
Oil production x log oil price	-2.318**	0.001	0.091	
	(1.068)	(0.045)	(0.664)	
log(population)	0.362	0.161	0.027	
	(0.413)	(0.129)	(0.164)	
Cultivated coca, indicator x year	-0.087	0.010	0.017	
	(0.059)	(0.007)	(0.015)	
Observations	10,772	9,801	9,801	
	Panel B: Political Collusion			
VARIABLES	Guerrilla attacks	Paramilitary attacks	Clashes	Casualties
Coffee int. x log coffee price	-2.234**	-0.646**	-4.335***	-0.536
	(1.089)	(0.255)	(1.617)	(0.596)
Oil production x log oil price	40.345**	-80.484*	-51.211	-8.467
	(17.293)	(48.804)	(62.118)	(18.333)
log(population)	-1.109	-1.132*	-1.556	0.242
	(1.220)	(0.586)	(1.906)	(1.994)
Cultivated coca, indicator x year	-0.098	0.047	-0.532*	-0.467
	(0.189)	(0.060)	(0.320)	(0.321)
Share vote for A.U. x Oil production x log oil price	-0.857***	1.233	0.504	-0.023
	(0.273)	(0.769)	(0.994)	(0.304)
Share vote for A.U. x log oil price	0.005	-0.002	0.015	0.019
	(0.013)	(0.004)	(0.023)	(0.012)
Observations	8,622	8,622	8,622	8,622

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4: Coca indirect effect on Conflict

VARIABLES	(1) Coca	(2) Guerrilla attacks	(3) Paramilitary attacks	(4) Clashes	(5) Casualties
		Panel A: Testing the coca substitution hypothesis			
Coffee int. x log coffee price	-0.018	-1.599	-0.153	-1.846	-2.281
	(0.029)	(2.313)	(0.558)	(4.213)	(2.468)
Oil production x log oil price	-0.025	47.033	-7.743	-121.123**	-66.747
	(0.581)	(31.578)	(8.179)	(57.202)	(73.601)
log(population)	0.005	6.548*	0.332	8.603*	4.342
	(0.067)	(3.457)	(1.267)	(4.925)	(6.354)
Cultivated coca, indicator x year		0.049	0.022	-0.104	-0.235
		(0.254)	(0.042)	(0.488)	(0.185)
Observations	12,563	1,592	1,592	1,592	1,592
		Panel B: Controlling for coca intensity interacted with year effects			
Coffee int. x log coffee price		-1.412	-0.469	-2.573	-0.273
		(1.191)	(0.308)	(1.729)	(0.491)
Oil production x log oil price		-16.249***	-1.246	-21.692***	-11.123***
		(1.269)	(2.418)	(4.052)	(3.560)
log(population)		0.458	-0.622	0.707	-0.031
		(0.820)	(0.395)	(1.061)	(1.248)
Observations		10,758	10,758	10,758	10,758
		Panel C: Removing every coca municipality			
Coffee int. x log coffee price		-1.312**	-0.433	-2.745***	-0.751*
		(0.610)	(0.276)	(1.014)	(0.419)
Oil production x log oil price		-16.222***	1.235	-17.443***	-8.390***
		(0.669)	(0.789)	(1.341)	(0.473)
log(population)		-0.417	-0.370	0.694	0.378
		(0.706)	(0.404)	(0.943)	(0.800)
Observations		7,898	7,898	7,898	7,898

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A5: Spillovers effects Across Municipalities

VARIABLES	(1) Guerrilla attacks	(2) Paramilitary attacks	(3) Clashes	(4) Casualties
	Panel A: Excluding municipalities with coffee and oil			
Coffee int. x log coffee price	-1.359	-0.465	-2.517	-0.365
	(1.178)	(0.322)	(1.701)	(0.438)
Oil production x log oil price	-16.623***	-1.248	-22.480***	-10.435***
	(1.340)	(2.463)	(4.611)	(2.577)
log(population)	0.558	-0.605	1.015	0.169
	(0.871)	(0.406)	(1.038)	(1.265)
Cultivated coca, indicator x year	-0.002	0.045	-0.233	-0.246
	(0.139)	(0.061)	(0.202)	(0.163)
Observations	10,604	10,604	10,604	10,604
	Panel B: Excluding oil municipalities that neighbor coffee			
Coffee int. x log coffee price	-1.476	-0.591**	-2.952*	-0.397
	(1.164)	(0.277)	(1.616)	(0.441)
log(population)	0.630	-0.487	0.879	0.243
	(0.831)	(0.359)	(0.915)	(1.281)
Cultivated coca, indicator x year	-0.049	0.030	-0.303**	-0.262
	(0.135)	(0.053)	(0.147)	(0.169)
Observations	10,406	10,406	10,406	10,406
	Panel C: Excluding coffee municipalities that neighbor oil			
Oil production x log oil price	-16.469***	-1.202	-22.115***	-10.274***
	(1.341)	(2.467)	(4.544)	(2.695)
log(population)	0.238	-0.429	1.063	-0.343
	(1.001)	(0.455)	(1.279)	(0.914)
Cultivated coca, indicator x year	0.103	0.100	-0.062	-0.010
	(0.121)	(0.064)	(0.218)	(0.091)
Observations	8,800	8,800	8,800	8,800

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A6: The Effect of the Coffee and Oil Shocks on GINI using IV for Violence

	2 stage	1 stage	2 stage	1 stage
	(1)	(2)	(3)	(4)
VARIABLES	Gini Owner	Violence	Gini Land	Violence
Violence	0.000		0.001**	
	(0.000)		(0.000)	
Log(population)	0.023	-7.613	0.042**	-7.559
	(0.022)	(5.875)	(0.018)	(5.705)
Cultivated coca, indicator x year	0.000	-0.792	0.000	-0.880
	(0.002)	(1.093)	(0.003)	(1.050)
Oil production x log oil price		-47.269***		-47.289***
		(14.959)		(14.753)
Rain x log(Top3 coffee prod.)		-0.001		-0.003
		(0.004)		(0.004)
Temp. x log(Top3 coffee prod.)		-0.508**		-0.580***
		(0.193)		(0.196)
Rain x Temp. x log(Top3 coffee prod.)		0.000		0.000
		(0.000)		(0.000)
Observations	6,867	6,867	7,463	7,463
R-squared	-0.014	0.008	-0.039	0.008
Number of origmun	859	859	979	979
Municipality FE	YES	YES	YES	YES
Region FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A7: The effects of Price Shocks on Land Concentration using New Commodities

VARIABLES	(1) Gini Owner	(2) Gini Land	(3) Gini Owner	(4) Gini Land	(5) Gini Owner	(6) Gini Land	(7) Gini Owner	(8) Gini Land
Coffee int. x log coffee price	-0.015	-0.019	-0.015	-0.018	-0.031	-0.023	-0.033	-0.024
	(0.010)	(0.012)	(0.010)	(0.013)	(0.031)	(0.028)	(0.031)	(0.028)
log(population)	0.000	0.018	0.000	0.018	-0.055	-0.068	-0.054	-0.068
	(0.029)	(0.021)	(0.029)	(0.021)	(0.045)	(0.055)	(0.044)	(0.055)
Cultivated coca, indicator x year	0.018	0.017*	0.018	0.017*	0.013	0.007	0.013	0.007
	(0.011)	(0.010)	(0.011)	(0.010)	(0.013)	(0.009)	(0.013)	(0.009)
Sugar production05 x log sugar price	-0.002	-0.002	-0.002	-0.002	-0.010	-0.001	-0.010	-0.001
	(0.004)	(0.002)	(0.004)	(0.002)	(0.008)	(0.005)	(0.008)	(0.005)
Banana production05 x log banana price	2.945***	0.376	2.945***	0.376	2.433***	2.938***	2.430***	2.937***
	(0.018)	(0.479)	(0.018)	(0.479)	(0.056)	(0.077)	(0.056)	(0.076)
palm05xlpalmp	0.009**	0.001	0.009**	0.001				
	(0.004)	(0.004)	(0.004)	(0.004)				
Oil production x log oil price			0.150	0.149			-0.017	0.046
			(0.262)	(0.221)			(0.175)	(0.144)
Observations	3,442	3,696	3,442	3,696	1,325	1,345	1,325	1,345
R-squared	0.045	-0.000	0.045	0.001	0.068	0.088	0.067	0.088
Number of origmun	755	830	755	830	167	171	167	171

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A8: Alternative Accounts With the Model of Land Concentration

VARIABLES	(1) Gini Owner	(2) Gini Land	(3) Gini Owner	(4) Gini Land	(5) Gini Owner	(6) Gini Land	(7) Gini Owner	(8) Gini Land
Coffee int. x log coffee price	0.003	-0.001	0.022	0.011	0.004	0.001	-0.003	-0.005
	(0.007)	(0.006)	(0.018)	(0.009)	(0.008)	(0.007)	(0.007)	(0.006)
log(population)	0.017	0.035***	0.057	0.024	0.011	0.026***	0.007	0.028*
	(0.017)	(0.011)	(0.058)	(0.029)	(0.015)	(0.010)	(0.022)	(0.015)
coca94indxyear	0.001	0.001	-0.001	-0.001				
	(0.002)	(0.002)	(0.002)	(0.002)				
Oil production x log oil price	-0.120	-0.100	-0.146	-0.197	-0.024	-0.033***	-0.013	-0.029***
	(0.163)	(0.133)	(0.340)	(0.192)	(0.015)	(0.012)	(0.015)	(0.011)
Share vote for A.U. x Oil production x log oil price	0.001	0.001						
	(0.003)	(0.002)						
Share vote for A.U. x log oil price	0.000*	-0.000						
	(0.000)	(0.000)						
1994 coca, thsds. Hectares X year					YES	YES		
Observations	9,047	9,634	1,386	1,510	10,858	11,454	8,370	8,716

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A9: Spillovers Across Coffee and Oil Municipalities

Excluding Municipalities	with coffee and oil		oil municipalities that neighbor coffee		coffee municipalities that neighbor oil	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Gini Owner	Gini Land	Gini Owner	Gini Land	Gini Owner	Gini Land
Coffee int. x log coffee price	0.004	0.001	0.003	0.001		
	(0.008)	(0.007)	(0.008)	(0.007)		
log(population)	0.011	0.026***	0.010	0.025**	0.017	0.030**
	(0.015)	(0.010)	(0.016)	(0.010)	(0.022)	(0.013)
coca94indxyear	-0.000	0.000	0.000	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Oil production x log oil price	-0.029*	-0.032***			-0.027*	-0.031**
	(0.015)	(0.012)			(0.015)	(0.012)
Observations	10,702	11,293	10,496	11,077	8,921	9,378

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A10: Sample Size and Sources description

Variable	Source	Sample period
Gini Landowners	IGAC , CEDE	2000-2012
Gini Land	IGAC , CEDE	2000-2012
No. annual guerrilla attacks	National Police, CEDE	1993-2010
No. annual paramilitary attacks	National Police, CEDE	1993-2010
No. annual clashes	National Police, CEDE	1993-2010
No. annual casualties	National Police, CEDE	1993-2010
No. annual government attacks	National Police, CEDE	1993-2010
No. annual paramilitary massacres	National Police, CEDE	1993-2010
No. annual guerilla massacres	National Police, CEDE	1993-2010
No. annual guerrilla political homicides & kidnappings	National Police, CEDE	1993-2010
No. annual paramilitary political homicides & kidnappings	National Police, CEDE	1993-2010
Log real municipal capital revenue, millions of 2006 pesos	DNP, CEDE	2000-2012
Coca intensity, thousands of hectares, 1994 and 1999-2012	ODC, CEDE	2000-2012
Log population, millions	DANE	2000-2012
No. annual Forced Displacement	RUV, CEDE	2000-2012
CERAC Conflict typology by municipalities, 2000-2012	CERAC	2000-2012
Coffee intensity, thousands of hectares, 1997	NFGC, Dube and Vargas(2013)	1997
Oil production, hundred thousand barrels/day, 1988	MME, Dube and Vargas(2013)	1988
Coal production, thousands of tons, 2004	Ingeominas, Dube and Vargas(2013)	2004
Coal reserves, indicator, 1978	USGS, Dube and Vargas(2013)	1978
Gold production, hundred thousand grams, 2004	Ingeominas, Dube and Vargas(2013)	2004
Precious metal mining, hectares, 1978	Jacome(1978), Dube and Vargas(2013)	1978
Cultivated coca, indicator, 1994	ODC, CEDE	1994
Coca intensity, thousands of hectares, 1994	ODC, CEDE	1994
Ever cultivated coca, indicator, 1994 and 1999-2012	ODC, CEDE	any year of 1994, 1999-2012
Rainfall, cm3	CEDE	1995
Temperature, celsius	CEDE	1995
Percentage of votes for Uribe in the 2002 presidential race	Acemoglu et al., (2013)	2002
Sugar intensity, thousands of hectares, 2005	Ag. Ministry, Dube and Vargas(2013)	2005
African Palm intensity, thousands of hectares, 2005	Ag. Ministry, Dube and Vargas(2013)	2005
Banana Palm intensity, thousands of hectares, 2005	Ag. Ministry, Dube and Vargas(2013)	2005
Log internal coffee price, thousands of 2006 pesos/lb	NFCG	2000-2012
Log int'l price of oil, thousands of 2006 pesos/barrel	World Bank	2000-2012
Log int'l coal price, thousands of 2006 pesos/ton	World Bank	2000-2012
Log int'l gold price, millions of 2006 pesos/ounce	World Bank	2000-2012
Log int'l silver price, millions of 2006 pesos/ounce	World Bank	2000-2012
Log int'l platinum price, millions of 2006 pesos/ounce	World Bank	2000-2012
Log coffee exports of top 3 coffee exporters, millions 60 kg bags	ICO	2000-2012
Log coal exports of top 3 coal exporters, thousands of short tons	US EIA	2000-2012
Log int'l sugar price, thousands of 2006 pesos/lb	World Bank	2000-2012
Log int'l palm price, thousands of 2006 pesos/lb	World Bank	2000-2012
Log int'l banana price, thousands of 2006 pesos/lb	World Bank	2000-2012