Land Tenure, Price Shocks and Insurgency: Evidence from Peru*

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Abstract

Does land tenure fuel armed conflict? If so, which types of property arrangements lead to greater violence? I revisit this longstanding question by exploiting exogenous variation in the agricultural incomes of Peruvian coffee producers to compare how they affect violent outcomes in districts under different property arrangements. Using detailed data on district level land tenure and violent attacks by the Peruvian guerrilla and government army between 1980 and 2000, I find that negative price shocks leads to an overall increase in violence, particularly from guerrillas. Yet, such spike in violence is larger in districts with a prevalence of individual ownership but smaller for districts under communal arrangements. These results suggest that forms of shared ownership may better attenuates income shocks from international markets. A close examination of the mechanisms at work shows that negative price shocks led to a higher rate of unemployment in ownership areas than in communal land tenure districts. Consistent with this interpretation, coffee price shocks only have an effect on violence at times when there is no coffee harvesting or unemployment is larger. The paper provides the first micro-estimations of the role of different property arrangements on violence intensity in Peru.

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1 Introduction

How does land tenure fuel armed conflict? During the last century, land tenure has been frequently referred to as a major factor driving peasant rebellion and insurrection. From Che Guevara to Mao itself "the question of the land" has been considered paramount to explain the rise of guerrilla movements and political violence, particularly in Latin America. Despite the importance of land tenure arrangements and exhaustive sociological research on this topic,[1] little micro-level evidence exists about its effect on armed conflict and the mechanisms which may explain such effect. The reasons for such gap are twofolded: First, there is an inherent difficulty in disentangling the effects of land-tenure and overall economic conditions associated with violence (e.g. poverty). Second, a slow-changing factor such as land tenure arrangements is considered unsuitable to explain conflict onset and intensity. In this paper I address both concerns by showing how land tenure arrangements affect the intensity of armed conflict in the presence of exogenous changes in the opportunity cost of joining armed organizations.

The paper uses a unique district level dataset on land tenure arrangements[2] and violent episodes during the period of the Peruvian civil war (1980 to 2000) to show how different property arrangements impact armed conflict, depending on the extent they changed the opportunity cost of violence. Although the idea has been long put forward by sociologists highlighting the different insurance mechanisms peasants use to face market risks,[3] this paper provides the first empirical micro-estimates of such mechanisms. To do so, I exploit the exogenous variation in the international prices of coffee to show how income shocks of coffee producers affect conflict intensity differentially according to the prevaling land tenure arrangements. The paper finds that, consistent with an opportunity cost argument (Collier and Hoeffler 1998 and 2004; Fearon and Laitin, 2003; Miguel et. al. 2004; Dube and Vargas 2012), a drop in the price of coffee increases violence intensity from Shining Path's guerrilla in Peru. Yet, such increase in violence due to negative price shocks is much smaller in districts with shared property arrangements such as sharecropping and communal land in which peasants cultivate the land but do not own it individually.

These results provide evidence that shared property rights (e.g. communities and sharecroppers) might reduce violence intensity by mitigating the effect of income shocks driven by international market conditions. Since losses from coffee production are to be shared among others, community safety nets and crop switching strategies can reduce the incentives to engage in violence. In contrast, individuals left to face the volatility of the international markets have greater incentives to engage in violence when there is a drop in the value of coffee production. In theory, small landowners would find it easier

[1] Among prominent studies: Scott (1977), Paige (1978), Popkin (1979), Wolf (1969), Wickham-Crowley (1992) among others.

[2] By "land tenure arrangements" I am not referring to the presence or not of secure property rights in the form of titling, but rather, in the form of production of this land such as tenancy arrangements, single land holders, or communal land arrangements.

[3] For example, Scott's *Moral Economy of the Peasant* (1977)

to switch to alternative crops or use land in some other ways to offset reduced profits, for instance, use it as a collateral during bad times. In practice, this does not seem to be the case given the higher prevalence or unemployment in districts with individual ownership than during times of drops in coffee prices. These findings show that while strong and well defined property rights may be crucial for economic development (North and Thomas, 1973; De Long and Shleifer, 1993; Johnson et. al. 2002) and investment (Demsetz 1967; Alchian and Demsetz, 1973), it is unclear whether property rights in the form of individual ownership is better than communal ownership to insure against income shocks that lead to violence, at least in the Peruvian case.

Interestingly, income shocks show a weaker effect on the levels of government violence, contingent on the type of land tenure arrangements prevailing. One explanation for this result is that violent attacks by the army do not follow economic conditions. Rather, income shocks bolsters guerrilla support and violence rather than army attacks. As an unexpected result, there is no robust effect of income shock among sugar producers or cotton producers. This result could be due to either a lack of sufficient variation in sugar and cotton prices or the small participation of Peru in the international sugar and cotton market. Finally, I document the relative increase in unemployment for individual ownership areas due to income shocks, compared to communal and tenant districts, thus mirroring their corresponding increase in violence. Consistent with this interpretation, there is no price shock at times of the coffee agricultural cycle in which there is harvesting (and therefore employment is at its peak). These results show that price shocks reduce violence by reducing unemployment in districts with a prevalence of shared ownership.

The paper contributes to the current literature in the following ways: First, it is a well-established fact that negative economic shocks affect conflict (Collier and Hoeffler 1998; Fearon and Laitin 2003; Miguel et. al. 2004; Fearon 2005), however, the channels through which price shocks affect conflict appear to vary enormously and may not have been exhausted (for an example see Dube and Vargas 2012). This paper proposes an alternative channel through which price shocks can affect conflict based on the property arrangements of agricultural workers. While more secure property rights in the form of titling and enforcement can reduce conflicts over land, it remains to be established whether individual ownership versus communal or shared property arrangements can better insure peasants from risks in the international markets. According to strong advocates of individual ownership, these should be better insured against market risk than those which live under unclear property arrangements (e.g. shared) given they are unable to use land as a collateral (Feder et. al. 1988), or because they will have lower agricultural productivity to begin with (Banerjee et. al. 2002; Libecap and Lueck 2008). Results found here calls for a re-examination of the role of different types of property arrangements on the extent they can insure against risk and reduce the appeal of joining armed organizations at times of poor economic performance.

Second, the paper contributes to the on-going debate of the role of international commodity markets on the Peruvian Civil War. On the one hand, some accounts of the Peruvian case argue for a limited influence of the export crop industry on the up-rise

and success of the guerrilla movement (McClintock 1984). On the other, sociological accounts posit that instances of peasant unrest cannot be detached from the agrarian export industry. For instance, Scott (1977) argues that the introduction of market relations in the countryside, particularly international markets, exposed peasants to greater risk thus providing incentives for revolutionary action. More specifically, Paige (1978) and Wickham-Crowley (1992) argue that it is agricultural workers, sharecroppers and migrant state laborers working for wages in the export crop industry who are more vulnerable to market shocks and likely to rebel or radicalize demands. Some evidence of this relationship is provided by Hofheinz (1977) who finds some tenancy and sharecropper support for the Chinese communist guerrillas. My findings for the case of Peru suggest that the export crop sector did play an important role in the intensity of Shining Path's violence. However, contrary to the sociological literature, price shocks led to greater violence in places where there is a prevalence of individual land ownership rather than in districts dominated by wage laborers. That is, in times of low returns to coffee production, the ranks of Shining Path would swell with individual owners rather than with individuals working in communal or tenant types of arrangements due to changes in the opportunity cost of violence.

The third contribution of the paper is to examine a specific channel through which price shocks can fuel conflict. Using district level data from the 1993 and 1981 population census, I test whether communal members and sharecroppers actually face higher opportunity costs of fighting given their ability to switch from productive to fighting activities. I show that the fall in coffee prices caused unemployment to decrease differentially in export-crop areas, and among these, in districts where communal lands and sharecropping is more prevalent. Therefore, the negative price shock on coffee prices led to a decrease in the returns for coffee cultivation and laying off of coffee producers which provided incentives to switch to join armed groups *outside* sharecropping and communal districts. These results demonstrate how price shocks affect violence through depending on their land organization, crop production and participation in international markets. Consistent with this interpretation I measure the timing of violent events and show that the increase in violence in coffee districts occurred mostly at times outside the harvesting season, that is, when there is less demand for labor.

Fourth, according to some qualitative studies Shining Path did not benefit from the revenues obtained through coca trade. Rather, these "coca taxes" remained in the region where they were mostly generated (Huallaga) and did not help finance Shining Path's violent actions elsewhere (McClinctock 1998). However, other studies seem unable to rule out or confirm the financing means of the guerrilla through coca trade (Weinstein 2007: 93). Using agricultural data on district coca cultivation I explore the alternative explanation that increases of violence in coffee areas was due to the expansion of illicit crops (Angrist and Kugler 2008). I find that after excluding the main production regions from the sample, and interacting the levels of coca production with export crop prices, price shocks still have a negative effect on violence. Moreover, the effect of higher coffee prices *increased* violence in coca producing areas, which seem counter intuitive consid-

ering coca production should be more attractive at times of *lower* coffee production not when prices are high. Future research will investigate the precise mechanisms through which this occurs.

The paper is organized as follows: Section 2 describes the main features of the Peruvian Civil War as well as Peru's recent developments in the export sector and land reforms. Section 3 describes the data and the construction of the variables included in the paper. Section 4 describes the identification strategy and estimation procedure. Section 5 presents and discusses the results. Section 6 concludes and considers extensions and venues for future research.

2 Shining Path and MRTA - Peruvian Civil War

From 1980 until 2000, two guerrilla movements caused the most intense period of violence in recent Peruvian history. The rebel group P*artido Comunista del Perú - Sendero Luminoso* (PCP-SL or Shining Path) and the *Movimiento Revolucionario Tupac Amaru* (MRTA) were in constant fights with both the army and paramilitary groups and sometimes even among themselves. According to the Peruvian Truth and Reconciliation Commission (CVR, for its acronym in Spanish), this conflict caused the death of about 69,290 people (CVR, 2004) thus making the Peruvian civil war one of the bloodiest political conflicts in Latin America.

The PCP-SL, also known as Shining Path, declared a "war" on the Peruvian State in May 1980 which would continue until its full dismantling in 2000. Alone, Shining Path is responsible for the death of 31,331 people or 54% of total casualties (CVR 2004). The rebel group, initially founded with 17 members in 1970 reached its peak in 1990 with 2,700 core militants without counting other sympathizers or occasional collaborators (CVR 2004). Shining Path's first violent action was to symbolically boycott national elections by burning ballot boxes and the voter registry on the eve of the elections in the district of Chuschi, in Ayacucho state (Weinstein 2007:81). At the onset, the state of Ayacucho was the center of Shining Path's political activity, however, inspired by the Chinese revolution it attempted to advance from the rural areas to the cities. As put elsewhere, Shining Path's leader "envisioned a rural movement led by the peasantry that would 'encircle the cities from the countryside'" (Weinstein 2007: 84).

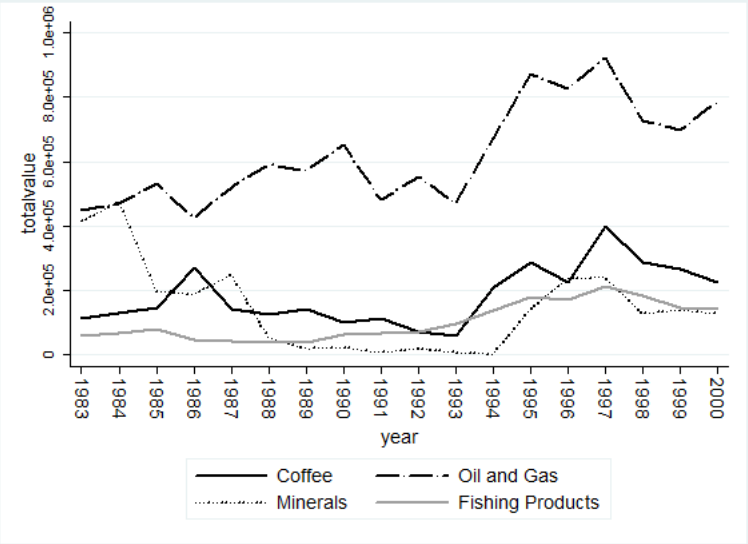
Shining Path was not a centralized organization. Rather, it was formed by a large number of groups each of which contained a small number of trained cadres which would agitate, mobilize, and start the process of "population education" of peasants and exert "popular" justice. The main targets of Shining Path were visible figures of "the system": government representatives, police force, peasant leaders, and local officials as well as public infrastructure. In financial terms, Shining Path was also a decentralized organization whereby each regional committee was financed with resources locally extracted from peasants as in the case of coca producers from the Upper Huallaga Valley.

2.1 Peruvian Economy and Export Sector: 1980-2000.

Parallel to the conflict, worsening economic conditions between 1970 and 1992 were particularly felt by peasants in the rural highlands (Weinstein 2007). For instance, McClintock (1984:64) argues that by 1980 the terms of trade between the coast and the highlands have turned against the latter. The crisis started during the mid 80's when Peru was finally transitioning to democracy after years of military dictatorship. Soon after the transition, during the first presidential period (1986-1990) of Alan Garcia, the country underwent one of its worst macroeconomic economic crises with a sharp decrease in its gross domestic product and hyperinflation episodes. Macroeconomic indicators, such as consumer price indexes and exchange rates skyrocketed. Moreover, starting 1980, a trade policy oriented towards liberalization and tariff reduction on food imports made Peruvian peasants face external competition, lower food prices and greater price volatility. The only peasant villages that remained unaffected by the market economy were the most backwards, isolated and reliant on subsistence agriculture. Such economic instability may have contributed to the onset and appeal of Shining Path in the countryside.

Despite the crises of the 1980's, and after years of structural adjustment and market oriented reforms, the agricultural export sector experienced a notable expansion during the 1990's (MINAG 2011). According to the Peruvian Ministry of Agriculture, the expansion of the agricultural export sector occurred both in traditional agricultural Peruvian exports (coffee, cotton and sugar) as well as in an incipient "non-traditional" agricultural exports (asparagus, cacao, grapes, bananas, and beans). These changes were driven largely by previous structural adjustment policies, that is, drastic liberalization by reduction of tariff levels in agricultural sectors (Boloña and Illescas 1997; Fairlie and Torres Zorrilla 2002). As shown in Figure 1 below, coffee exports largely benefited from liberalization, as the value of total exports increased sharply after 1993. Moreover, coffee is also one of the main Peruvian exports only exceeded by the proceeds obtained from oil and natural gas and even more important than that of minerals and fishing products. The value of the exports of other agricultural goods was quite small, include those of sugar, corn, beans and cotton.

Figure 1: Value of Peruvian Exports: 1983-2000



[Source: ECLAC. Export value of other agricultural goods was too small to be included].

2.2 Peruvian Land Reforms

The variable of interest in this paper is land tenure, which before 1970 was characterized by the prevalence of large landholders (approximately 90% of Peruvian land was held by 5% of total owners) often established since colonial times. Even by Latin American standards, land distribution in Peru was one of the most unequal in the world (McClintock 1984: 4). Therefore, in 1969, the governing military junta launched a land reform of populist cut ordering the redistribution of large landholders, generally haciendas, into collective or individual ownership which in turn could not be sold in the private markets. The military junta also explicitly promoted associative or collective forms of production such that vast territories would be given in property to associations, towns or *pueblos*, mostly indigenous. In numbers, the reform meant that between 1969 and 1979 9,066 thousands of hectares were expropriated and distributed among 368,817 peasants. The land distributed were those of former *haciendas* or single-owned large extensions of land, which would be collectivized and to be run under cooperatives ("cooperativas"). In practical terms the reform ordered the transfer of ownership of *haciendas* to the peasants already working there with the limitation of not being able to sell it. A similar arrangement was that of "communal" land tenure which was land distributed to members of an indigenous peasant community[4] with the same restriction of not being able to be sold,

[4]By peasant communities it is generally referred as those of strong indigenous and traditional roots located in the Andean highlands.

privatized or divided. This effort was partially dismantled with the Constitution of 1979 which allowed for collective forms of land to be divided and small property or "minifundos" to exist. Later, in 1991, the decree of 1969 was completely abolished thus allowing land to be sold and to register individually the land distributed during the 1970s.

2.3 Land Tenure and Crop Cultivation

The main agricultural export of Peru, coffee, is mostly grown in the highland areas of Peru and part of the tropical jungle. In particular, coffee grows in middle altitudes with plenty of precipitation. Coffee also has the advantage of being able to grow jointly with other food crops to guarantee a minimum provision of subsistence even in cases of bad harvesting (Paige 1978).The organization of coffee production in different land tenure arrangements responds to historical events as well as to the agricultural characteristics of the crop.

In Table 1 I created a dichotomous variable indicating coffee presence to assess the distribution of different land tenure arrangements. As shown, the type of land tenure prevalent in coffee areas is that of individual ownership, who often sell their coffee produce to major distributors. In second place, coffee areas also exhibit commercial manors with tenants or sharecroppers who grow coffee in exchange for a wage. In third place, and especially in the Andean highlands, communal land tenure is also present in coffee producing districts. Specifically, around 60% of coffee areas are under individual ownership arrangements while those under tenant and communal arrangements comprise around 5% and 2% of coffee districts, respectively. Although the presence of tenant and communal land tenure appear to be a small fraction of all coffee producing districts, once we look at the distribution of these conditional on the presence of coffee such distribution does not look very different from each other, as shown in the 2 x 2 tables in the Appendix. Specifically, districts with above or below 50% ownership are evenly split between districts cultivating coffee or not. More importantly, looking at those districts with above or below 50% of sharecropping or communal land, there is no sizeable imbalances that may be driving the results. In other words, a similar number of communal and tenant arrangements cultivate coffee or not, even though these property arrangements may represent a small fraction of all agricultural land in Peru. Finally, it should be noted that the dichotomous measure of coffee captures the presence of cultivation but it does not reveal the specific intensity with which it is cultivated, which will be closely analyzed in section IV.

In sum, we observe different ownership arrangements being present in both coffee and non-coffee areas which will be useful to contrast the effect of different tenure systems on conflict intensity. Moreover, the heterogeneity in land tenure arrangements will allow me to document whether there is an effect of income shocks on conflict. While this claim was initially put forward by Scott's (1977) landmark book and widely tested in the literature on economic shocks and violence, I use such finding to establish: First, whether individual versus communal arrangements better insures against income shocks to reduce violence intensity. Second, whether wage-laborers seem particularly susceptible

to radical appeals given their limited access to land and their larger vulnerability to price shocks which would leave them without means of subsistence (Wickham-Crowley 1992) than non-wage laborers.

3 Data

The dataset on violence was collected by the Peruvian Truth and Reconciliation Commission (CVR), which recorded individual level data on the number and type of human rights violations (illegal detentions, kidnapping, murder, extra judicial executions, torture, or rapes) as well as the perpetrator (government forces, guerrilla or paramilitary groups) over the twenty years of the Peruvian civil war. The Peruvian Truth and Reconciliation Commission collected around 19,000 testimonies from victims of the conflict or their relatives. To do so, the CVR held public hearings around the country to gather testimonies from victims, relatives, witnesses and survivors to report any violent act between 1980 and 2000. Testimonies were coded by the type of violent action, location, responsible group, time of occurrence and the victim's individual characteristics. Testimonies were also crosschecked with other NGO's to verify their accuracy. The location and timing of the crimes allows me to identify where and when the victim was attacked by either the army, guerrilla or paramilitary groups.

To measure land tenure, I collected district level measures of property arrangements from the agricultural census of 1972. I sought information *preceding* the conflict episode to minimize possible confounders. The agricultural census data identifies the type of land tenure, size of the land plot in hectares and type of crops cultivated. I measure crop intensity as the number of hectares per district to obtain the relative coffee intensity at the district level. This measure is commonly used by the Statistics Institute in Peru in their elaboration of their indicators as well as in other related papers using crop cultivation intensity (Dube and Vargas 2012). I measure land tenure according to the proportion of the district which is under one land tenure arrangement or another. The data distinguishes three main types of land tenure: full property, tenants (individuals who use others land in exchange for a fee) and communal land tenure. Although other types exist, their proportion from the total is negligible[5]. While full (individual) property is the most prevalent form, communal land tenure is common in places with historical strong indigenous community organization (departments of Apurimac, Cusco and Amazonas). Finally, tenant forms are present in areas in which peasants work in exchange for a wage for a landowner who does not personally cultivate the land, particularly in the departments of Lima (8%), Ancash (8%), and Cajamarca (9%).

As shown in Figure 2, none of these types of tenure are clustered regionally. Since the census data identifies the type of land tenure per district I therefore matched these

[5] According to the Ministry of Agriculture, the other associative forms created of land tenure created in 1969 are the "Cooperativas Agrarias de Production" (CAP), the "Sociedades Agricolas de Interes Social" (SAIS) and the "Empresas de Propiedad Social" (EPS). These forms only represent 0.28% of production units in 1994. Source: http://iinei.inei.gob.pe/iinei/cenagro1994/

measures with the conflict data, to obtain the levels of violence per year and district as well as the types of land tenure, crop production and district size. This allows me to exploit variation over time within a district (there are about 1800 districts in Peru), controlling for time-invariant districts characteristics that are potentially correlated with conflict. The final dataset is at the district level, including both district and department level controls when necessary.

Time series of export crop prices comes from the International Monetary Fund which collects monthly data on crop prices from which I created a simple annual average of the price and used it directly in the estimation as the number of US cents per pound of coffee[6]. Since it is an international price, it represents a benchmark price representative of the global market and determined by the largest exporter of a given commodity. For none of the commodities included is Peru the largest exporter for the years under study.

Data on Peruvian exports was obtained from ECLAC (Economic Commission for Latin America and the Caribbean) which provides the value in dollars per year of Peruvian exports.[7] This data is limited to the period 1983 to 2000. Yet, because of the limitations imposed by other district controls, most of my estimates come from the period 1990 to 2000 such that the information provided appropriately describes the data used. In addition, information on the market share for coffee was provided by the International Coffee Organization (ICO) from 1990 to 1999.

Information on crop cultivation was obtained from the 1972 Agricultural Census, which provides a time-invariant measure of the number of hectares cultivated per districts of a specific crop. This variable measures crop cultivation intensity for each district thus avoiding potential endogeneity concerns when using time-varying measures of production, since these might respond to prevailing violence. The 1972 census includes the number of hectares, number of farms and tons produced per district cultivating coffee. A concern with this data is that it is not possible to identify both the type of land tenure and their crop cultivation at the level of the agricultural unit, therefore I use district totals. Among the other crops included in the analysis is that of coca cultivation. Due to the increasing salience of Peruvian coca production, and mainly for political and security reasons, the hectares of coca cultivation for the period 1980 - 2000 were not published by the Ministry of Agriculture. Yet, information on coca cultivation was coded from the agricultural census of 1972 at a time in which coca cultivation from peasants was not banned. Although more reliable accounts of coca production would be desirable (e.g. satellite images) it has the advantage of preceding the period of observed violence, and provides and approximation for historical zones of coca production and a lower bound of actual production. Finally, additional district controls such as district population from 1990 to 2000 was included in all specifications and obtained from INEI (*Instituto Nacional de Estadistica e Informatica*).

[6]Data for monthly prices: http://www.imf.org/external/np/res/commod/External_Data.xls

[7]The specific data source is the Statistical Data Base of Foreign Trade (BADECEL, Base de Datos Estadisticos de Comercio Exterior). I used the classification of exports given by CUCI Rev 2 to the group and partida level. http://websie.eclac.cl/badecel/basededatos.asp

3.1 Descriptive Statistics

Table 1 summarizes the descriptive statistics of the main dependent and independent variables in districts with a large presence of coffee or sugar cultivation. It is noteworthy that on the aggregate, overall violence, guerrilla and army attacks are not different depending on whether they cultivate coffee or not. That is, violence does not occur exclusively in coffee producing areas. However, as shown in Figure 3 (below), violence does seem to respond to changes in the international price of coffee: high prices are associated with lower violence while a steep decrease in prices also sees a surge in guerrilla violence. With regards to the overall number of farms and hectares per district, we can see that both the number of farms (agricultural units) and the number of square kilometers per district are significantly higher in coffee producing areas than otherwise. These patterns suggest that land concentration is lower in coffee producing areas. Finally, there are no differences in the 1981 average population among coffee and non-coffee areas, as well as in the average population levels between 1990 and 2000, thus suggesting that population dynamics are not driving the result.

Looking at land tenure arrangements, the differences are statistically significant between coffee producing districts and not coffee producers. For example, there is a smaller proportion of owned land in coffee districts in comparison to all other districts. A similar case is that of tenants, in which there is a lower proportion of tenant land in coffee areas than in non-coffee areas. The opposite is true for communal land when looking at coffee districts: there is greater presence of communal land in non-coffee districts. Nonetheless, once we look at *concentrated* land tenure I find that most districts with more than 50% of its area in either ownership, tenant or communal arrangements are more prevalent in coffee areas than in non-coffee areas. This suggests that districts cultivating coffee exhibit less variation within districts than across districts. Although clearly constrasting from non-coffee areas, it is also true that we are comparing across different land-tenure arrangements in cultivating coffee areas. Given the non-overlapping nature of these regimes, a large presence of these concentrated land tenure arrangements in coffee areas would help to compare their effect on violence more clearly than if every district had no majority of any specific type.

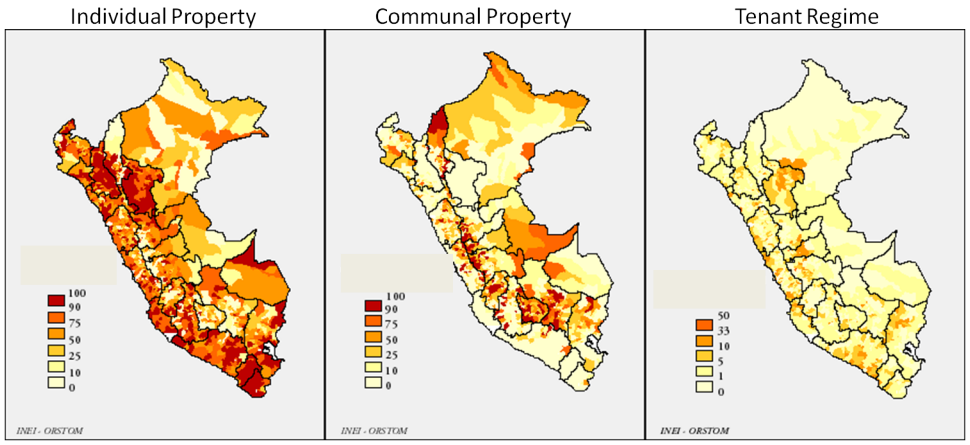
Finally, from Table 1 we should also notice the higher proportion of coca farms and coca cultivation in coffee areas. Since coca and coffee often benefit from same climatological conditions, we must account for the substitution between coca and coffee in the case of a drop in the international price of the latter. Considering these differences I will account for coca production including the number of hectares interacted with coffee and sugar prices to control for changes in violence in these coca production zones.

4 Empirical Strategy

The paper uses a difference in difference (DID) approach to estimate whether the effect of price shocks affected violence disproportionately in places under specific land tenure arrangements or not. The heterogeneity and widespread distribution observed in the

Peruvian land tenure system ensures no single type of tenure is clustered regionally as shown in Figure 2. Although individual property arrangements are the most prevalent form, communal and tenant regimes are also present in every Peruvian department.

Figure 2: Peruvian Land Tenure Arrangements Distribution in 1994

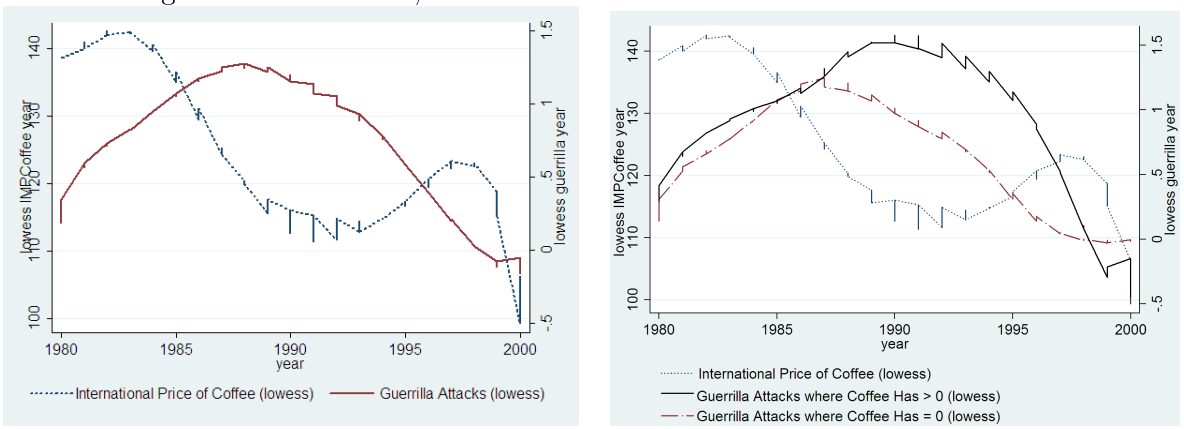


[Note: Darker areas reflect higher intensity of a specific land tenure arrangement].

To account for the change of income of Peruvian peasants I use *international* crop prices which are clearly exogenous to Peruvian production. Local prices would raise serious endogeneity concerns if prices respond to violence levels (e.g. reduced production increasing prices) thus affecting my estimates. Since violence *does* tend to disrupt productive activities, especially when the victims are peasants or landowners as many of the victims were, I use the price of Peruvian export crops. Coffee, the main export crop of Peru, only holds a small fraction of the Latin American market, let alone of the international market thus Peru can be considered a price-taker for practical purposes. As seen in Figure 5 of Appendix A, the share of the market for Peruvian coffee is only 1/5 of Brazil's (the major exporter) and behind producers such as Vietnam, Mexico, Indonesia and Colombia as well as producers from Africa and the Middle East (not shown). Therefore, I am rest assured that changes in the conditions prevailing in Peru will not affect coffee prices as events in Vietnam, Brazil and Colombia would. Moreover, Figure 6 of Appendix A show that the Peruvian value obtained from coffee exports are small in comparison to Brazil, the United States, and in some cases from the Argentinean value obtained from export agricultural production. Some of these goods have been generally expanding from 1980 onwards, consistent with the liberalizing politics of the period and the growth of export agricultural production. This shift has turned Peru into a new player in the world commodity markets. Figure 7 of Appendix A shows

the time series of international commodity prices (in real US dollars). Using changes in the international commodity prices allows me to assess whether price shocks affect conflict differentially in zones under particular land tenure arrangements. As shown in Figure 3 (below), the price of *coffee* exhibits a large increase between 1994 until 1997 when coffee prices sharply decline until the end of my sample. Moreover, this pattern of price decline mirrors the increase in violence observed from Shining Path between 1985 to 1992 in coffee versus non-coffee areas.

Figure 3: Coffee Price, Coffee Production and Guerrilla Attacks



Other endogeneity concerns arise if specific land tenure arrangements are associated with features potentially fostering violence (e.g. mountains as hideouts, or roads susceptible to be attacked). In such case, conflict would be correlated with land tenure via a third unknown factor (omitted variable bias). Similarly, it is possible that violent conflict promotes a switch towards specific land tenure arrangements (reverse causality). For example, if conflict reduces land productivity and therefore pushes peasants to leave their land and become wage laborers elsewhere. To address both concerns I first use exogenous price shocks to make sure changes in income and prevailing land tenure are not due to local conflict. Second, I use a measure of district land tenure conditions, the agricultural census of 1972, which measures district level land tenure arrangements before the conflict period started and are therefore unlikely to be related to it. However, potential concerns arise from land reforms themselves. For instance, the land reform launched in 1969 appeared to be one of the most comprehensive reforms in Latin America which drastically changed Peruvian rural landscape in the 1970s (Guillet 1979). These changes in land tenure would be of concern if one particular type of land tenure were to be grown exponentially and devoted to particular land crops. In such case, the census of 1972 would no longer truly reflect the conditions prevailing in 1990.

However, as shown by MINAG[8], the variation in land tenure between 1972 to 1994 was minimal for individual proprietors. Thus, there was no large increase in individual property due to communal lands being divided and sold as the 1990 land reform allowed. If anything, there was a notable increase in communal lands between 1972 and 1994 by the reform. However, this expansion of communal land was accompanied by a decrease in the number of cooperatives or "cooperativas" (a pre-1969 land tenure form). According to qualitative accounts, the functioning of "cooperativas" and "communal land" became very similar due to a decree in 1970 issued as an adjunct to the Agrarian Reform Law of 1969. As Guillet (1979: 98-99) explains:

> "Prior to the Peasant Communities Law, indigenous communities had a peculiar organization [...] dating from the provisions of the Constitution of 1920. Under the provisions of the new law, peasant communities now have an organization almost identical to that specified in the General Law of Cooperatives (No. 15260). There is an administrative council, charged with the administration of community affairs; a vigilance council, which overlooks the activities of the administration council; and a general assembly of *comuneros*, the maximum decision-making body of the community, which sets long-term policy and review the actions of the administrative councils" (p.98-99)

Thus, although there is an increase in the number of communal lands, part of this growth can be counteracted by the decrease in the number of "cooperativas" arrangement. However, additional increases in communal land arrangements would then affect my estimates on communal land, although not those concerning ownership and tenants.

Another concern arises if those benefiting from land redistribution were for some reasons more belligerent and politically active thus exhibiting a higher level of violence. Although this possibility is real, those benefiting from the 1969 land reform were collective forms of land tenure such as communities and cooperatives. Therefore, if these districts were simply more belligerent, we should expect them to exhibit larger violence when a negative shock ensues. The fact that those most benefited from the reform were indigenous communities, and that these do not exhibit a higher propensity to violence during crises make this option less plausible. In fact, those *not* benefited from the reform responded more promptly to price shocks and higher violence overall. How the 1969 reform might have triggered such forms of violence in the presence of income shocks is an interesting avenue for future research.

Finally, an alternative approach to the DID is to instrument local prices with international prices. However, it was not possible to instrument the internal price per department with the international price provided by the IMF given the two hyperinflation periods experienced in Peru. International prices, once converted to Peruvian Soles to make them comparable with local real prices, reflects the spikes of the exchange rate and the internal consumer price index. Thus, changes in international prices would no longer be driven by exogenous market jumps but rather by these inflationary periods

[8] Available at: http://iinei.inei.gob.pe/iinei/cenagro1994/ under "Formas Juridicas de Tenencia"

clearly due to internal Peruvian politics of which civil war most likely played a role. Figure 8 of Appendix A shows the international price converted to Peruvian soles as well as the internal prices (wholesale average prices across Peruvian departments) of the same commodities. As seen, the spikes in prices reflect internal Peruvian conditions and not exogenous price shocks. For this reason, I use directly the international price in US dollars.

4.1 Estimation

My empirical strategy relies on the heterogeneity of Peruvian land tenure arrangements which creates spatial variation across districts. I use measures preceding the conflict period (census of 1972), thus I can be sure that the land tenure distribution is not a response to violent conflict dynamics.

As mentioned above, local prices could be endogenous to violent dynamics: If violence affects crop production, this could confound any estimates on the effect of price shocks on conflict. Specifically, if violence reduces agricultural productivity thus increasing prices, this would generate a downward bias considering the opportunity cost for a peasant of fighting is now higher. Conversely, if for some reason violence increases agricultural output thus reducing prices, this creates an upward bias in my estimates. To address the potential endogeneity of local prices, I directly use changes in international commodity prices as a proxy for changes of internal prices in Peru. To look at the differential effect of price shocks on conflict I estimate:

$$Attacks_{ijt} = \alpha_i + \gamma_t + \lambda(IPCrop_t \times Exp_{i1972}) + \mathbf{X}_{ijt\theta} + \epsilon_{ijt} \tag{1}$$

Where j is the department, i is the district and t is the year (1980-2000). $Attacks_{it}$ can either refer to aggregate number of violent episodes, or to specific acts committed by the government or guerrilla groups in department j, district i and year t. $IPCrop_t$ is the international price of the crop at time t. Exp_{i1972} is the number of hectares per districts in a given department dedicated to the cultivation of that crop in 1972. $\mathbf{X}_{ijt}$ are control covariates including district levels controls such as population to account for the magnitude of the dependent variable. α_i is the district fixed effect, and γ_t are the time effects. Equation 1 is estimated using OLS.

Since the variable of interest is the effect of land tenure, I look at whether there are differential effects in districts with specific land tenures using a triple interaction specification. I estimate:

$$Attacks_{ijt} = \alpha_i + \beta_t + \delta(IPCrop_t \times Exp_{i1972} \times Tenure_{i1972}) \tag{2}$$

$$+\phi(Tenure_{i1972} \times IPCrop_t) +$$

$$\sigma(IPCrop_t \times Exp_{i1972}) + \mathbf{X}_{ijt\nu} + \epsilon_{ijt}$$

Where $Tenure_{i1972}$ is a continuous measure of the prevailing type of land tenure in the district, prevalence is measured as the proportion of the district which is under one arrangement or other. All specifications will include the standard deviation of the total land held under ownership, tenant or communal land arrangements. The coefficient of interest is δ, which captures the differential effect of price shocks on violence in districts which a specific land arrangement relative to regions *not* exhibiting such land arrangements. Other sub-interactions are absorbed either by the district or by the year fixed effects.

5 Results – Export crops, Land Tenure and Conflict.

In this section I present the results for the period 1990-2000 for which I have the population data. As argued earlier, the international price of export crops is considered exogenous to Peru's production during the period, and is used to approximate changes in local prices.

5.1 Is there a Price Shock effect on Conflict?

Table 3 shows the results of estimating the price shock effect on conflict (two way interaction) of Equation 1. All regressions presented include a large set of district fixed effects controlling for any district specific characteristic. Similarly, the year fixed effects controls for any shock common to all districts in the same year. In addition, all regressions have clustered standard errors at the district level, to control for potential serial correlation in districts over time and across districts within a department. The main identifying assumption needed to consistently estimate the causal effect of price crop changes on conflict is that the changes in the international price of exports crops are exogenous to Peruvian conflict conditions, thus the error term is uncorrelated with these changes. This assumption would be violated if there is a selection problem whereby districts with more violence would be affecting international prices there which seems a rather unlikely scenario.

Table 3 shows the results of changes in international prices which are therefore, exogenous to the Peruvian civil war. Coefficients of the interaction term indicate that the crop prices of coffee have a negative relationship to overall violence (perpetrated by either group): when the price of coffee increase, violence is lower in districts of export crops (coffee) relative to districts not oriented towards agricultural exports, for example, subsistence agriculture districts. These estimates imply that the average *coffee* prices, from 1990 to 2000 which is around 111 cents per pound, was accompanied by an *increase* in overall levels of violence in coffee intensive districts relative to non-coffee districts.[9] Specifically, given the average coffee intensity per district is of .84 (square kilometers) and that the average price in the 1990's was of 111.1 (US cents per pound)

[9]Note: From 1998 to 2000 there is a second drop in coffee prices, which meant a decrease in 39% of the price. The price kept falling until 2003, yet the analysis ends in 2000.

the coefficients imply that the price fall resulted in 0.058 more violent episodes in coffee districts relative to non-coffee districts throughout this period.[10] The number appears small, yet once we consider that the mean number of overall attacks per district in the period is 0.573 for coffee districts, then the coefficient suggests that this drop in coffee prices increased violent episodes in the average coffee export districts by 10.11 percent. Such effects for coffee are not negligible.

The estimates shown in Table 3 Column (1) reflect the effect of price shocks on overall levels of violence, regardless of who the perpetrator was. Therefore, in Columns (2) and (3) of Table 3-Panel A I estimate Equation 1, that is, the effect of price shocks on conflict but now distinguishing a specific type of violence: the violence perpetrated by the guerrilla movement and by the army. Given the type of strategy followed by the rebel group, in which they settled in a village monitoring and punishing non-compliance, we would expect that deteriorating economic conditions increases the recruitment opportunities and violent episodes of rebel groups (Nillesen and Verwimp 2009). In the case of government violence, I grouped together violence perpetrated by army forces (military, police, or secret security forces) but excluded crimes committed by the paramilitaries and the "rondas" during the period 1990-2000 given the small number of the latter. However, the inclusion of paramilitary violence does not alter the results obtained for army attacks. During these years, paramilitaries were only responsible for 1 case while self-defense or "rondas" were behind 5 cases throughout the 10 year period under analysis. It is before 1990 when "rondas" and paramilitaries were most violent in their attacks against alleged guerrilla members of sympathizers. In addition, the grouping is only natural given well-known links between the military and the self-defense organizations, in which civilian defense was often promoted and even armed by the military (McClintock 1984). Therefore, I included the paramilitary attacks under the "army" label, which does not change the results obtained in Table 3 - Column (3) .

The most salient result is the negative relationship between coffee prices and guerrilla violence: *increases* in coffee prices *reduce* the number of guerrilla victims per district in coffee export zones. In fact, the coefficients are negative for overall crimes, which appears to be mostly driven by attacks committed by the guerrilla group given the similarity of the coefficients. In numbers, the coefficients imply that the average price between 1990 and 2000 translated into .033 more violent episodes in coffee areas. In percent terms, the average coffee price increased by 13.73% the number of guerrilla attacks in coffee districts . Therefore, it appears that the changes in export crop prices meant a larger increase in guerrilla attacks and overall violence for coffee districts.

In Table 4 I present a robustness check of the results by regressing the price shock treatment on the number of attacks by the guerrilla, the army, or either. Because it is possible that the effect of coffee shock depends on the extent to which the production of coffee is prevalent in the district. Therefore, the dependent variable measures the number of attacks from the guerrilla, the government, or both, weighted by the total

[10] Obtained by multiplying the estimated coefficient, with the change in prices and the mean coffee production.

size of the districts. The coffee price shock negatively affects the likelihood of aggregate and government violence. In the case of guerrilla and army violence the coefficient is still negative and within conventional levels of statistical significance, yet not so precisely estimated.

Overall, these findings are encouraging to the identification strategy adopted: negative exogenous price shocks are associated with increased violence committed by the rebels group yet less so in the case of the government violence. This result is also consistent with previous literature finding that income shocks increase the likelihood of civil war onset (Miguel et. Al 2004) potentially lowering the opportunity cost of fighting (Collier and Hoeffler 2004).

5.2 Price shocks and Coca production

Since the 1970's Peru has become an increasingly prominent supplier of coca in the world market. Unlike other cases (e.g. Colombian guerrilla movements), it is still unclear whether Shining Path financed its activities by taxing coca production. For instance, it appears that Shining Path's functioning did *not* depend on the revenues obtained through coca trade. Rather, taxes obtained remained in the region where they were generated (Huallaga) and did not serve to wage the war elsewhere (McClinctock 1998). Other studies are more cautious and highlight the lack of conclusive evidence in that regard (Weinstein 2007: 93). Nonetheless, given the correlation between coca and violence found in other cases (Angrist and Kugler 2008) the illicit drug trade can be regarded as a confounding factor. Therefore, in Table 5 I control for the number of coca hectares per district cultivated in 1972 using an interaction term of the coca cultivation intensity and the international price of coffee. This term would then assess whether increases in violence during falling coffee-prices periods are related to coca production areas and not due to lower opportunity costs of fighting in coffee production. To account for this possibility, I therefore estimate:

$$Attacks_{jit} = \alpha_i + \gamma_t + \varphi(IPCrop_t \times Exp_{i1972}) + \omega(IPCrop_t \times Coca_{i1972}) + + \mathbf{X}_{ijt\theta} + \epsilon_{ijt} \tag{3}$$

The variable $coca_{i1972}$ refers to district level hectares used for coca cultivation in 1972. The interaction term between coca production levels and coffee prices controls for changes in violence of coca areas occurring while coffee prices are changing. Table 5 shows that the estimate of the parameter (φ), that is, the coffee price shock remain negative and statistically significant and similar in magnitude to the baseline results (Table 3). However, the interaction between coca intensity and the international price of coffee reveals that a drop in coffee prices actually led to a *reduction* in guerrilla attacks when coffee prices drops, thus suggesting that the violence surge was not driven by districts cultivating coca. Results from other export crops, such as sugar and cotton are not statistically different from zero.

Table 5 and Panel C also shows the results when I exclude from the sample major

Coca production zones (Huallaga Valley Province)[11] to make sure that the increase in violence is not driven by drug-trafficking activities, for example. As shown in Table 5 Panel C– drops in coffee prices are still associated with increased violence after excluding major coca production areas. The coefficients remain practically identical in magnitude and statistical significance to the baseline results shown in Table 3, if not larger. However, the coefficient on the coca interaction is still positive and significant indicating that guerrilla attacks actually *decreased* in coca areas when coffee prices drop again suggesting these are not driving the results.

5.3 Price shocks, Land Tenure and Conflict.

Peruvian politics have been characterized by the recurrence of land conflict both on the highlands and the coastal areas of Peru[12]. Especially in the 1960's, when the largest number of land invasions from peasants and communities occurred, their demands were posed in terms of land tenure. In some cases the demands have been for redistribution from plantations and *haciendas*. In other cases peasants have lobbied for an expansion of labor rights. These demands have often motivated land reforms to defuse and meet the demands of peasants. On the other hand, it is possible that these areas were particularly belligerent and would not be appeased by land reforms but rather support the presence of guerrilla forces.[13] To distinguish both I will look at whether indigenous communities appear to have a greater presence of Shining Path to a greater degree than other areas.

Despite extensive land reform, Shining Path gained footing in the southern highlands of Peru starting in the 1980s and spreading throughout the country in the following years. Many arguments have been put forward which can be summarized around two hypotheses. The first hypothesis is that increased economic vulnerability of peasants lead them to violent actions (Hobsbawn 1959; Wolf 1969; Scott 1977). Using the current literature on civil war, this is analogous to claim that fighting is more likely in the aftermath of economic shocks that reduce income (Miguel et. al. 2004; Collier and Hoeffler; Dube and Vargas 2012). As shown in the previous sections, there appears to be strong evidence in this regard. Yet, I posit these effects will vary according to land possession. First, as argued by Paige (1978) and Wickham-Crowley (1992) peasants *not* owning land are *more* prone to conflict given they will be the first to be laid off when profits from export crops is reduced. This hypothesis predicts that landless peasants (e.g. those working for a wage, usufructuaries, tenants) will be more prone to violence than otherwise. The reason being their lack of ownership will render them unemployed in the face of lower returns from production and therefore more susceptible to "radical appeals". In contrast, individual landholders would be better able to face economic crisis by shifting to subsistence crops and in defense of their land plot therefore refraining from

[11] For a complete treatment on the mechanisms through which coca and Shining Path related to each other see Weinstein (2007)

[12] See Paige (1978) for a detailed account of peasants rebellions prior to 1980

[13] Guillet (1979: 97) provides some numbers regarding the distribution of land: 40.7% formed "cooperatives"; 34.8% SAIS, 17.8% Communities and only 6.7% were distributed to individuals.

violence.

H2: Negative price shocks will increase violence more among those *not* individually owning land, than among individual land owners.

While it is agreed how rural wage laborers are the most exposed to income price shocks, it is less obvious in the case of communal land tenure. On the one hand if the community is unable to collectively switch to subsistence crops they may not be able to smooth income shocks and therefore be more prone to violence. That is, the collective nature of communal arrangements might difficult collective action and decisions which is a problem not faced by the small landowner. Similarly, as argued by Fearon (2007), is it possible that land tenure arrangements in which a proportion of the cultivation is divided among various individuals (e.g. communal lands) reflects this case: higher productivity of the plot provides them with a larger incentive to grab a larger portion of their share than when land productivity is lower.[14]

On the other hand, it is possible that communal land arrangements based on shared ownership may be better in attenuating declining profits by establishing collective or social insurance mechanisms. For instance, indigenous communities may be better at smoothing income shocks will fuel less violent that those leaving peasant vulnerable to international markets. In sum, although price shocks change peasant's opportunity costs of fighting, it is largely contingent on the relationship to their source of production (land). In this section I analyze whether the effect of commodity price shocks on violence is different under various tenure arrangements zones.

Table 6 shows the results of land ownership on the aggregate level of violence. The first three rows presents the estimates of δ, the triple interaction term of interest comparing the three main types of land tenure: ownership, communal and sharecropping. While the coefficient on ownership suggests there is no difference across districts, that of sharecroppping is consistently positive and robust to controlling by the conflict dynamics of the other two types of land tenure. In the case of communal land tenure the effects are only visible for attacks commited by the army, yet, still consistent with the importance of shared forms of property rights on conflict dynamics. The positive estimate on the three-way interaction for sharecropping shows that coffee price shocks in coffee districts leads to a differential increase in violence in sharecropping districts relative to non-sharecropping ones. In addition, the temporal variation in coffee prices has a positive effect on violence in sharecropping districts (second set of rows). What this means is that while a negative price shock will tend to increase violence as shown earlier, yet, such increase will be smaller in tenant districts thus suggesting these property arrangements may attenuate such effect. In addition, note that the effect of the coefficient on the price shock is always negative as found in baseline estimates.

Therefore, when comparing the two coefficients (ownership and tenant regimes) we can see that the increase in guerrilla violence is smaller in districts with a majority of

[14]This mechanism would be also similar to the "rapacious channel" described in Dube and Vargas (2012).

tenant than in those with a owner regime. This difference entails that while the negative price shock increased violence, this effect was smaller in tenant districts than in owner districts. That is, the increase in guerrilla attacks associated with the price-shock was lower in tenant districts. For instance, the average coffee price between 1990 and 2000 for the average coffee producer district decreases violence in sharecropping districts by 0.02 or a 9.22% increase, while guerrilla violence will increase differentially in .009 or 10.42% more attacks. The effect of the price shock establishes the incipient impact of world markets for civil conflict in Peru. In addition, coffee price shocks show a similar pattern when coffee intensity is measured as produced tons (columns, 4, 5 and 6).

Although the effect for communal land is only borderline significant, the interesting result is the positive coefficient on the triple interaction term (Table 6), which suggests a *smaller increase* in fighting when coffee prices drop. The most likely explanation for this case lies in that put forward by mechanisms of social insurance given the fact that these arrangements involve some sort of contract in which the rents of coffee are not entirely obtained by their cultivators but in turn insures them against risk. In the case of sharecropping, there is an arrangement between the landowner and the peasant (tenant), in the second case, the communal arrangement obliges the division of production among the members of the community. The same occurs at difficult times, in which the shared obligations might cushion these peasants from slipping into outright poverty. Although certainly the case for communal arrangements is puzzling, the mechanisms of insurance in communal land tenure areas are straightforward. In particular, communal lands were obliged, by law, to operate under the express prohibition of selling, dividing or renting the land assigned (Guillet 1979). Similarly, their administrative councils are in charge of major productive decisions, thus shifting the economic decisions from the household unit to the community council. These restrictions were intended to provide economic security to peasants during times of distress which suggests they were indeed more insulated from changes in the international market. To provide more evidence in this regard, I use as a measure of coffee intensity, instead of hectares under production, the number of tons produced per district in 1972. The idea is to assess whether district income from coffee (measured as coffee tons by price) is related to guerrilla attacks or not.

For all cases we can observe that the estimates of the price shock (σ, two-way) are negative and significant, thus meaning that negative coffee price shocks increased overall violence in coffee intense districts relative to non-coffee districts. For other export crops, such as sugar, the coefficients of the two-way interaction turned out insignificant (not shown) suggesting that price shocks and land tenure arrangements do not induce differential effects on the aggregate levels of violence. Also, the results corroborates that violence is responding to price shocks of coffee crops, not to what is happening to other crops or to economy-wide difficulties. In sum, the negative coffee price shocks increases overall violence more in ownership areas, while the effect the opposite occurs in communal land tenure arrangements.

Finally, as seen in Tables 6, the effect of land tenure on the amount of government violence is small or null. I interpret these results in the light of the relative insulation of

the army members to price shocks (e.g. wages not coming from the agricultural sector) as shown in Table 3 (baseline). However, if price shocks increased the number of guerrilla attacks, the government should have seen an increase in their response. Therefore, I created a lead variable to see whether price shocks in one year increased the army response in the following (not reported). Although the coefficient on the price shock is now negative, it still does not achieve conventional levels of statistical significance. Therefore, it appears that the lack of clear front lines made army violence less systematic in this regard.

In sum, combining the results from Table 3 through 6 suggests that a negative coffee price shocks increases guerrilla attacks and violence in general, yet, such increase in much smaller in areas under tenant and communal land districts. Although the results for communal lands will be further explored, the findings for tenant districts suggest their particular property arrangement made them less vulnerable to price shocks suggesting that the opportunity cost of fighting increased or is unchanged when the price of coffee drops. In the next section I assess whether price shocks effectively changed the opportunity cost of responding to increased unemployment and patterns of harvesting as a proxy for demand for labor.

5.4. Price shocks, land tenure and unemployment: a mechanism.

The effect of price shocks has been interpreted as affecting the returns from export crop cultivation: When prices are higher the returns from export crop cultivation are higher thus increasing the amount of labor available as well as those willing work in the crop cultivation areas. Employment and higher returns from crop cultivation increase the costs of participating in the guerrilla movement therefore reducing violence. In this section I use individual census data aggregated at the district level to assess whether crop price shocks affects the levels of unemployment across districts with varying levels of tenure arrangements. The household-census of 1993 is ideal for estimating any effect of price shocks given it immediately follows a period of low prices in both coffee and sugar crops (from 1990 to 1992 and from 1990 onwards). Therefore if the mechanism described above is true, I should see a negative effect of a drop in prices on employment in coffee-intense areas with high number of individual landowners. I estimate a first difference model:

$$\triangle Unemployment_{i1993-1981} = \phi(Exp_i \times Tenure_{i1972}) \tag{4}$$

$$+\mu Tenure_{i1972} + \xi Exp_i + \mathbf{W}_{i1993\nu} + \epsilon_{ijt}$$

Where $Unemployment_{ij1993-1981}$ is the difference in the percentage of individuals in the district obtaining a wage in the agricultural sector per district i in department j between 1993 and 1981; $Exp_i \times Tenure_{i1972}$ is level of exposure to changes in coffee prices during the period interacted with the type of land tenure prevailing; $\mathbf{W}_{itv}$ are other district level controls, aggregated at the district level that may influence employment

decisions: percentage of incomplete primary school education, percentage of men population among working ages, percentage of female among working ages, the average of economically dependent members per district (e.g. kids), and the number of individuals that work within their household. An additional control variable is the population for 1993 which was also included in all previous specifications. Unlike previous estimations, district fixed effects cannot be included due to the cross-sectional nature of the data, yet I cluster the standard errors at the district level. Similarly, temporal effects are not possible to include, therefore I rely on the knowledge that price changes between 1981 and 1993 were downward sloping and common to all districts. Therefore, if we observe a difference in employment due to the intensity with which coffee is cultivated, we would expect price changes to be part of that effect, even if not directly accounted for. Finally, the data distinguishes the percentage of agricultural workers dedicated to cultivation in general, thus I estimate equation (4) in a sample with a majority of agricultural workers. I use these additional variables to restrict the sample of analysis and therefore make sure that the levels of employment refer to districts where actual coffee is cultivated and involves actual agricultural workers. I am interested in whether the interaction term exhibits a positive coefficient: exposure to price shocks increased unemployment in certain land tenure arrangements districts than otherwise.

Table 7 presents the estimates for districts exposed to coffee price shocks: the coefficient shows that an increase in the exposure to coffee price shocks leads to an increase in unemployment in places with higher ownership relative to those non-owners. However, this effect is much smaller than the one observed for tenant regimes, and much less to those places with communal land tenure. Given the size of the coefficients their effect appears to be sizable in general. This finding favors the channel proposed: price-shocks affect peasants through the levels of unemployment and this effect is higher in places with ownership than other cases. In addition, the increase in the exposure to coffee prices shows a negative effect on the unemployment rates of *communal* districts and tenant districts, thus mirroring their economic response to violence.

Finally, Table 8 presents the findings showing that the price shocks has a negative effect on violence in general and that such effect is driven by the events occurring outside harvesting season, when the demand for labor is lower. The similar effect is captured in Table 9 when there is no price effect during the coffee harvesting season.

6 Conclusion and Extensions.

This paper has examined how export crop prices shocks affect violence during an armed conflict episode. I present evidence showing that coffee price shocks have different effects on violence contingent on the type of land tenure involved. A reduction in the price of coffee increased violence overall and guerrilla violence in particular among coffee districts in comparison to non-coffee districts. These results are robust to a variety of specifications, including the possibility that violence were to be fueled by coca production. However, the increase in violence appears to be mediated according to the type of land

tenure prevailing: ownership regimes exhibit a higher increase in violence during negative price shocks than districts with greater communal and land tenure arrangements. This pattern suggests that communal and tenant land districts appear to provide better insurance mechanisms to smooth income shocks in the presence of an exogenous change in coffee rents.

I also present evidence on a plausible mechanism of how commodity price shocks might increase violence: an increase in unemployment rates. I find that this mechanism was particularly applicable to districts with greater exposure to price shocks from international prices of coffee and under individual ownership arrangements. That is, in the face of drops in the international prices of coffee, unemployment levels were higher in districts with greater ownership than otherwise. The opposite was true for shared land arrangements (communal and tenant). In addition, given that the type of violence that increased in coffee-owner districts was guerrilla violence, these findings support the idea of a greater ability to participate in armed groups among those owning land than among those not owning it in coffee districts.

One implication of these findings is that the land reform of 1969 may have been quite successful in de-radicalizing demands of communal land peasants. Given these areas were the most benefited from the reform, it could be the case that these peasants were particularly prone to conflict and after the reform they were not. A second implication is that small coffee landowners appear vulnerable to price-shocks and therefore tend to be recruited in radical rebel groups such as Shining Path. Thus, insurance against bad harvesting should be included as a part of agrarian policy. Third, the absence of army violence in coffee areas suggest that their response to violence was motivated by other dynamics and not due to the agricultural cycle.

Finally, these findings encourage further research in three directions: i) The seasonality of violence. One plausible extension of this paper is to look into the seasonality of the crops cultivated to find whether violent crimes follow periods of crop harvesting, when peasants dedicate to other activities rather than the land. Since one of my findings is that the effect of price shocks can vary by crop and type of land tenure an additional factor to look at is the timing of the attacks. ii) The role of private conflicts in the extent of violence. Although much is said about the violence perpetrated from Shining Path, it is well known that selective killing was more the norm than the exception which can only operate in situation of peasant collaboration. Finding out whether distribution of coffee rents fueled violence will be further explored. iii) The historical dimension of peasant rebellions. It is well established (Dell 2010) how colonial policy of certain areas historically undermined further development. Whether these past policies induced certain districts to be more conflict prone or not nowadays, is a topic to be further explored.

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Appendix A

Figure 4: Market Share of Coffee: 1990-1999

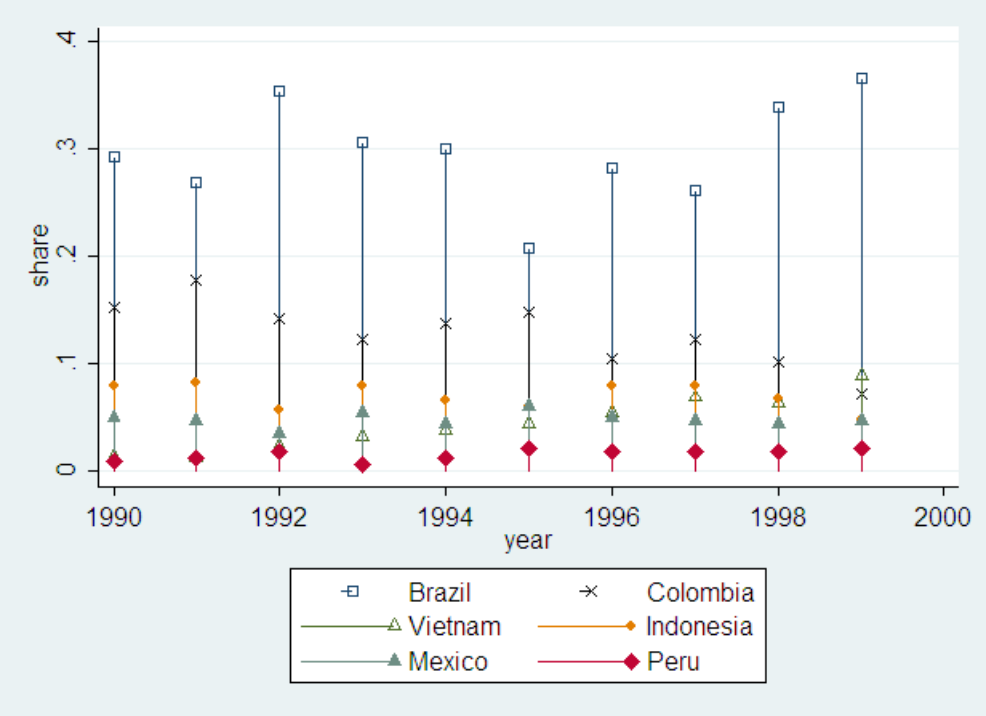

Figure 5: Value of Exports (in thousands of dollars) of Latin American countries.

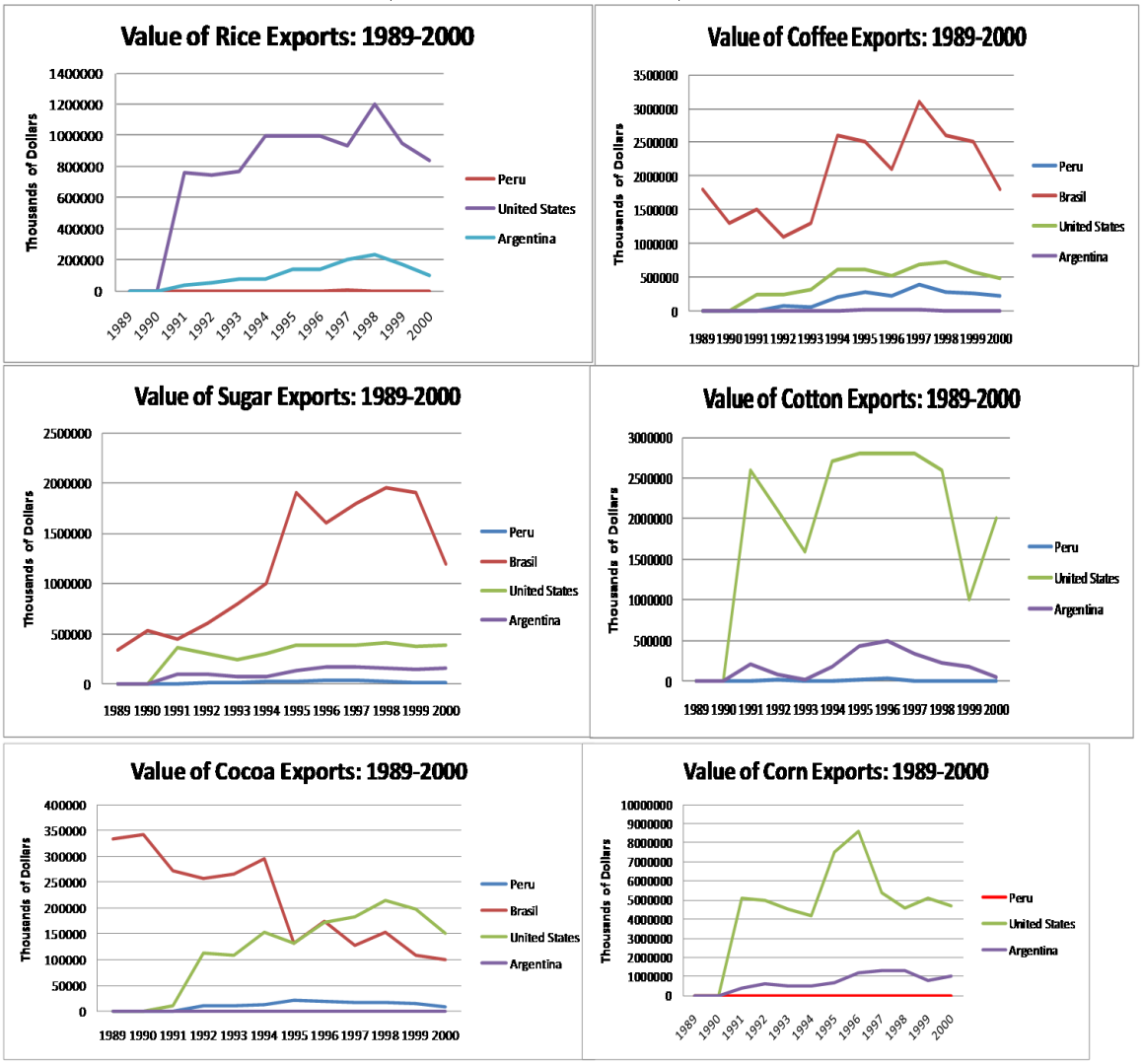

Figure 6: International Prices of Main Crops (US real dollars per kilo)

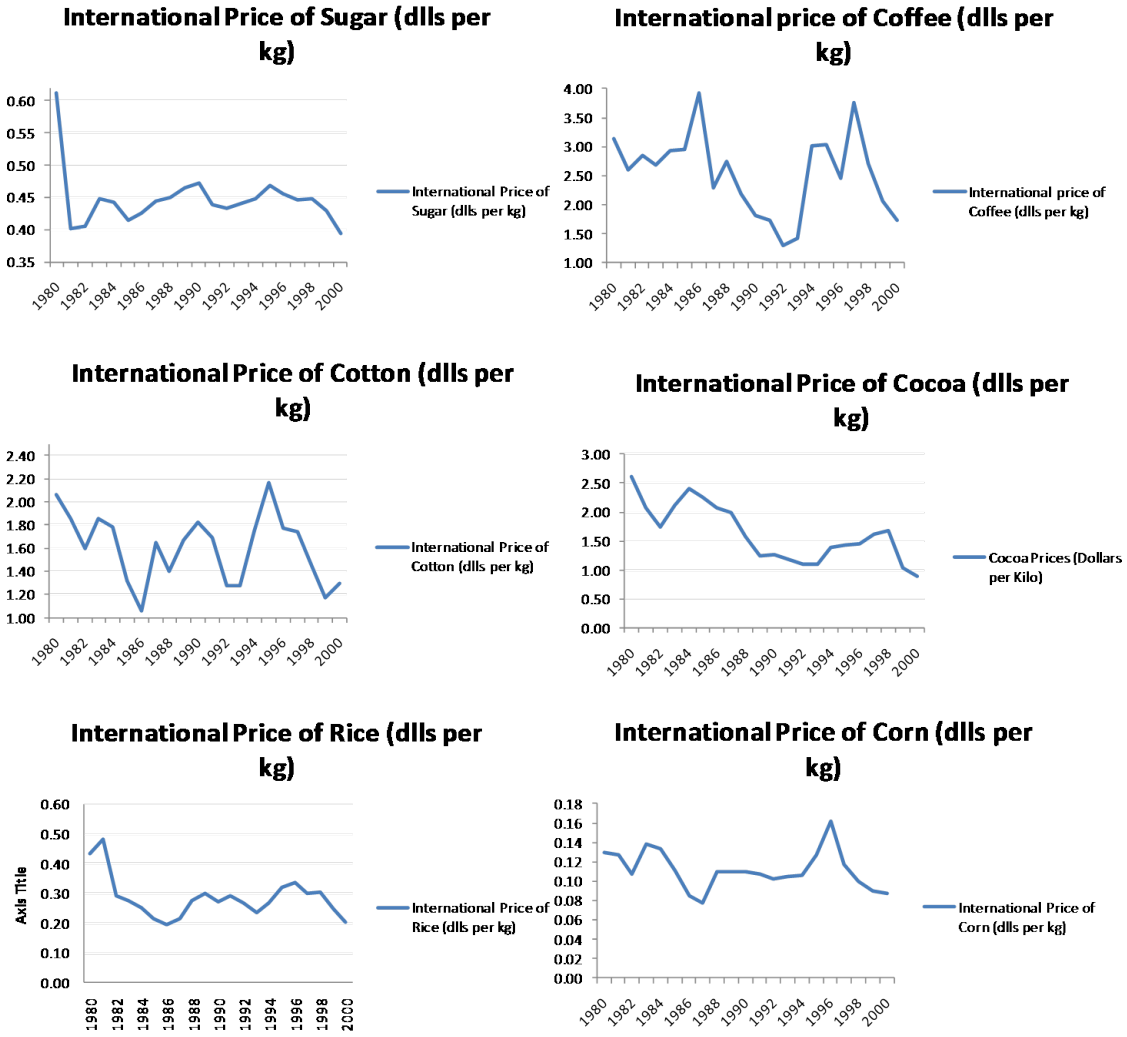

Figure 7: Real International and Local Prices in Peruvian Soles: 1980-2000

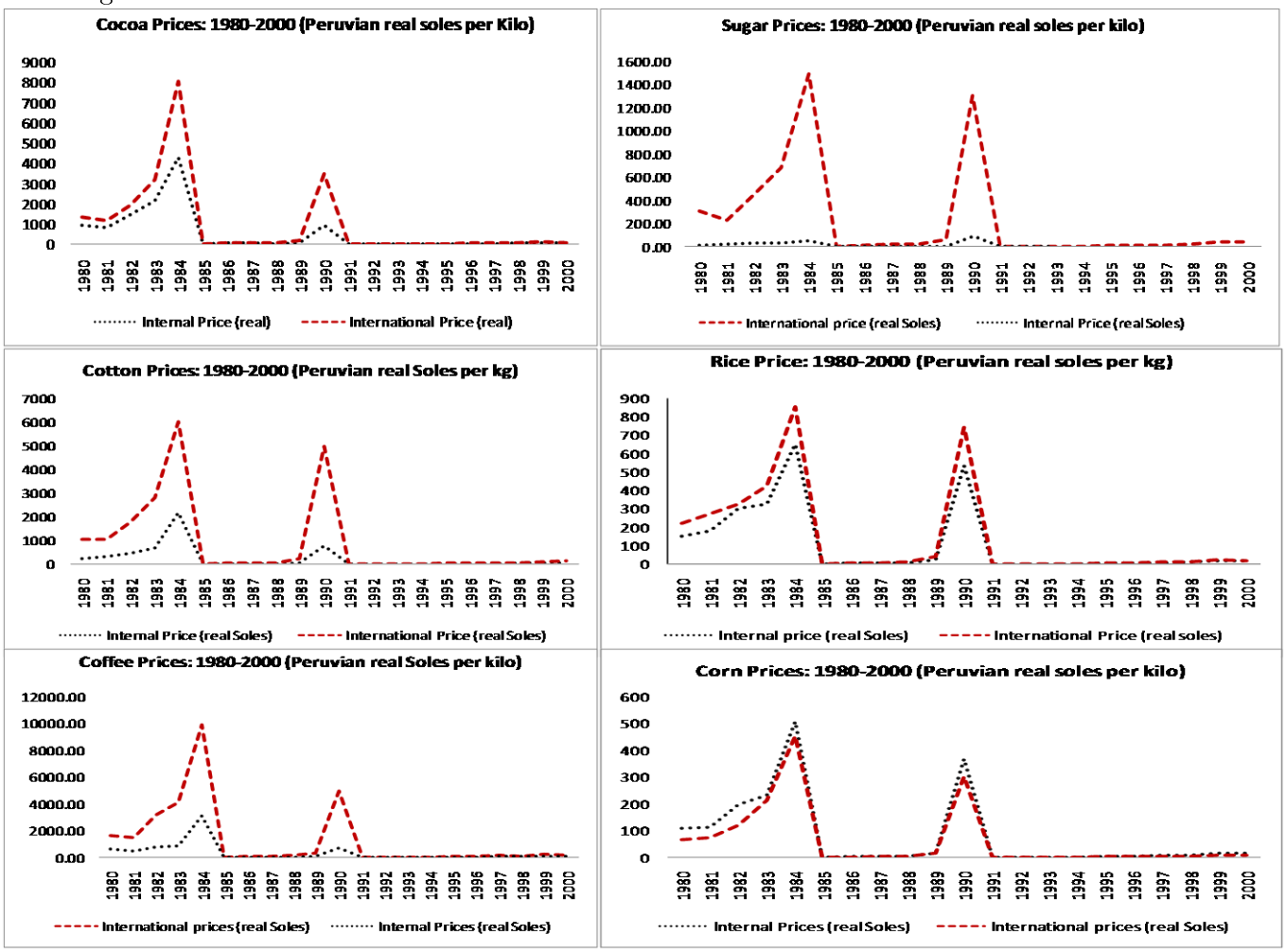

Table 1: Summary statistics 1

Coffee Producers				Non Coffee Producers		
Variable	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	**N**
% Owner	0.602	0.272	26607	0.543	0.276	7056
% Adjudicatario	0.063	0.166	26607	0.099	0.199	7056
% Sharecropper	0.048	0.109	26607	0.036	0.09	7056
% Communal	0.019	0.078	26607	0.036	0.124	7056
Total Hectares	13187.4	31990.0	26670	18308.8	36013.5	7056
% Coca	0.811	8.428	26670	49.143	183.68	7056
Coca Hectares	0.542	7.227	26670	49.324	230.471	7056
Coca Tons	0.318	4.702	26670	19.522	87.019	7056
Total Cases	0.336	3.982	26670	0.858	8.041	7056
Guerrilla Attacks	0.118	1.706	26670	0.364	2.99	7056
Army Attacks	0.197	2.786	26670	0.445	5.286	7056
Log(Pop)	8.294	1.345	13915	8.74	1.087	3674

Ownership distribution by Coffee Production

			Total
	No Coffee	Coffee	
$< 50\%$ Owners	12,768	3,885	16,653
	47.87	55.06	49.38
$> 50\%$ Owners	13,902	3,171	17,073
	52.13	44.95	50.62
Total	26,670	7,056	33,726
	100	100	100

Tenant distribution by Coffee Production

	No Coffee	Coffee	Total
$< 50\%$ Tenants	13,419	3,171	16,590
	50.31	44.94	49.19
$> 50\%$ Tenants	13,251	3,885	17,136
	49.69	55.06	50.81
Total 26,670	7,056	33,726	
	100	100	100

Communal distribution by Coffee Production

	No Coffee	Coffee	Total
$< 50\%$ Communal	13,713	3,087	16,800
	51.42	43.75	49.81
$> 50\%$ Communal	12,957	3,969	16,926
	48.58	56.25	50.19
Total	26,670	7,056	33,726
	100	100	100

Table 2: Summary statistics 1

By Land Tenure							
Variable	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	**N**	*p value*
Total Units	753.478	760.347	11508	861.550	1442.211	20055	0.00
Total Hectares	12164.395	41553.112	11508	15534.582	28515.841	20055	0.00
Owner Hectares	2618.895	6961.272	11508	12964.736	25279.965	20034	0.00
Tenant Hectares	841.647	8917.460	11508	272.437	877.922	20055	0.00
Communal Hectares	177.086	746.529	11508	65.082	225.742	20055	0.00
Coffee Units	53.148	256.554	11382	26.396	136.945	19992	0.00
Coffee Hectares	1.303	9.864	11382	0.353	2.306	19992	0.00
Coca	19.356	120.937	11382	6.597	64.506	19992	0.00
Coca Hectares	20.93	156.729	11382	5.634	73.148	19992	0.00
Sugar Units	10.257	66.787	11508	9.795	69.943	27006	0.2
Sugar Hectares	0.618	4.326	11508	0.102	1.235	27006	0.00
Pop 1980	13533.157	39268.197	11403	9478.163	23528.958	26901	0.00
Pop 1990-00	15825.245	40407.74	5962	11889.536	34126.254	14080	0.00
All Attacks	2.132	89.501	11508	2.181	149.249	27006	0.5
Guerrilla	0.887	45.863	11508	0.761	30.711	27006	0.3
Army	1.196	76.611	11508	1.381	144.885	27006	0.5
By Tenant Regime							
Total Units	827.095	1244.655	31059	517.167	756.791	504	0.00
Total Hectares	14330.027	33633.544	31059	12812.65	47277.568	504	0.1
Owner Hectares	9309.549	21309.648	31038	1833.313	6454.151	504	0.00
Tenant Hectares	315.396	1165.241	31059	10622.05	40817.23	504	0.00
Communal Hectares	107.601	492.099	31059	2.3	6.909	504	0.00
Coffee Units	36.683	191.269	30849	1.88	7.667	525	0.00
Coffee Hectares	0.709	6.289	30849	0.011	0.043	525	0.00
Coca	11.37	90.156	30849	2.72	9.674	525	0.00
Coca Hectares	11.322	112.17	30849	3.016	10.242	525	0.00
Sugar Hectares	0.292	2.723	31059	0.107	1.945	7455	0.00
Sugar	11.882	76.149	31059	1.82	19.162	7455	0.00
Pop 1980	9951.031	27193.483	30933	13766.847	36176.088	7371	0.00
Pop 1990-00	12516.943	37017.564	16192	15345.568	32168.194	3850	0.00
All Attacks	2.615	149.435	31059	0.295	4.187	7455	0.00
Guerrilla	0.947	39.954	31059	0.18	3.519	7455	0.00
Army	1.622	142.918	31059	0.092	1.867	7455	0.1
By Communal Regime							
Total Units	824.443	1243.609	31206	621.412	700.343	357	0.00
Total Hectares	14430.57	34064.976	31206	3399.259	3663.287	357	0.00
Owner Hectares	9289.98	21275.233	31185	464.247	603.255	357	0.00
Tenant Hectares	485.147	5467.415	31206	27.747	69.201	357	0.00
Communal Hectares	78.801	291.932	31206	2476.406	2823.537	357	0.00
Coffee Units	35.466	189.293	31017	91.235	216.819	357	0.00
Coffee Hectares	0.689	6.258	31017	1.471	3.842	357	0.2
Coca Units	11.257	89.856	31017	8.529	33.172	357	0.00
Coca Hectares	11.272	111.866	31017	3.441	13.784	357	0.00
Sugar Units	11.9	76.268	31206	1.537	13.28	7308	0.0
Sugar Hectares	0.315	2.876	31206	0.004	0.052	7308	0.0
Pop 1980	10499.243	29680.334	31080	11485.905	26887.394	7224	0.0
Pop 1990-00	13002.504	38601.76	16280	13310.476	22692.777	3762	0.6
All Attacks	2.586	149.071	31206	0.371	5.772	7308	0.1
Guerrilla	0.934	39.85	31206	0.221	3.996	7308	0.0
Army	1.609	142.579	31206	0.117	2.355	7308	0.1

Table 3: Price Shocks and Violence: OLS

Panel A: Coffee Districts – Hectares			
	All Cases	Guerrilla Attacks	Army Attacks
$ICoffeePrice \times CoffeeIntensity$	-10.4***	-5.92**	-4.37**
	(3.77)	(2.79)	(2.13)
Observations	17,556	17,556	17,556
R-squared	0.020	0.017	0.011
Number of coddist	1,596	1,596	1,596
Panel B: Coffee Districts – Tons Production			
	All Cases	Guerrilla Attacks	Army Attacks
$ICoffeePrice \times CoffeeProduction$	-28.9***	-15.9**	-12.6*
	(9.74)	(7.14)	(6.63)
Observations	17,556	17,556	17,556
R-squared	0.020	0.018	0.011
Number of coddist	1,596	1,596	1,596
District FE	YES	YES	YES
Year FE	YES	YES	YES

robust standard errors in parentheses clustered at the district level
All specifications include log(population)
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Price Shocks and Violence: Weighted by District Size

Panel A: Coffee Districts – Hectares			
	All Cases	Guerrilla Attacks	Army Attacks
$ICoffeePrice \times CoffeeIntensity$	-0.00068**	-0.00039*	-0.00029*
	(0.00031)	(0.00022)	(0.00016)
Observations	17,556	17,556	17,556
R-squared	0.006	0.015	0.001
Number of coddist	1,596	1,596	1,596
Panel B: Coffee Districts – Tons Production			
	All Cases	Guerrilla Attacks	Army Attacks
$ICoffeePrice \times CoffeeProduction$	-0.0017**	-0.00095*	-0.00075*
	(0.00076)	(0.00052)	(0.00044)
Observations	17,556	17,556	17,556
R-squared	0.006	0.015	0.001
Number of coddist	1,596	1,596	1,596
District FE	YES	YES	YES
Year FE	YES	YES	YES

Robust standard errors in parentheses clustered at the district level
All specifications include log(population)
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Price Shocks and Violence: Account for Coca Production

Panel A: Coca Time Trend			
	(1)	(2)	(3)
VARIABLES	All Cases	Guerrilla	Army
$CoffeeIntensity \times InternationalPrice$	-9.92***	-5.69**	-4.09**
	(3.69)	(2.79)	(2.06)
$CocaIntensity \times Year$	-1.35	-0.63	-0.73
	(1.26)	(0.64)	(0.64)
Observations	17,556	17,556	17,556
R-squared	0.020	0.017	0.011
Number of coddist	1,596	1,596	1,596
Panel B: Coca Price Trend			
	(1)	(2)	(3)
VARIABLES	All Cases	Guerrilla	Army
$CoffeeIntensity \times InternationalPrice$	-10.2**	-5.95*	-4.12*
	(4.02)	(3.07)	(2.16)
$CocaIntensity \times InternationalPrice$	-0.017	0.0026	-0.020
	(0.085)	(0.052)	(0.039)
Observations	17,556	17,556	17,556
R-squared	0.020	0.017	0.011
Number of coddist	1,596	1,596	1,596
Panel C: Exclude Huallaga Region			
	(1)	(2)	(3)
VARIABLES	All Cases	Guerrilla	Army
$CoffeeIntensity \times InternationalPrice$	-10.4***	-5.92**	-4.36**
	(3.77)	(2.79)	(2.13)
Observations	17,490	17,490	17,490
R-squared	0.020	0.017	0.011
Number of coddist	1,590	1,590	1,590
District FE	YES	YES	YES
Year FE	YES	YES	YES

Robust standard errors in parentheses clustered at the district level
All specifications include log(population)
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Price Shocks and Violence: Differential Effects by **Land Tenure**

Panel A: Main Land Tenure Types						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All Attacks	Guerrilla	Army	All Attacks	Guerrilla	Army
$CoffeeIntensity \times InternationalPrice \times Self-Owner$	3.52	0.0010	3.65*	1.85	-3.21	5.40
	(4.09)	(2.86)	(1.98)	(7.48)	(5.57)	(4.04)
$CoffeeIntensity \times InternationalPrice \times Communal$	2.13	0.71	1.45**	4.47	1.27	3.27**
	(1.31)	(0.80)	(0.72)	(2.96)	(1.85)	(1.65)
$CoffeeIntensity \times InternationalPrice \times Sharecropping$	8.29**	3.79*	4.48*	21.4**	9.43*	12.0
	(3.71)	(2.09)	(2.28)	(10.5)	(5.41)	(7.61)
$InternationalPrice \times Self-Owner$	0.0011	0.00029	0.00087	0.0012	0.00033	0.00093
	(0.00095)	(0.00034)	(0.00069)	(0.00100)	(0.00035)	(0.00072)
$InternationalPrice \times Communal$	0.00077**	0.00036***	0.00039	0.00077**	0.00037***	0.00039
	(0.00037)	(0.00012)	(0.00029)	(0.00039)	(0.00012)	(0.00030)
$InternationalPrice \times Sharecropping$	0.00086*	0.00048***	0.00044	0.00089*	0.00050***	0.00046
	(0.00048)	(0.00014)	(0.00035)	(0.00050)	(0.00015)	(0.00036)
$CoffeeIntensity \times InternationalPrice$	-7.46**	-5.34*	-1.88	-23.4***	-15.7***	-7.04
	(3.45)	(2.83)	(1.52)	(7.19)	(6.00)	(5.08)
Observations	17,556	17,556	17,556	17,556	17,556	17,556
R-squared	0.021	0.018	0.012	0.021	0.018	0.012
Number of coddist	1,596	1,596	1,596	1,596	1,596	1,596
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses clustered at the district level
*** p<0.01, ** p<0.05, * p<0.1

Table 7: First Differences: Change in Unemployment in Coffee Intense Districts between 1993 and 1981

	(1)	(2)	(3)
VARIABLES	Unemployment 93 - 81	Unemployment 93 - 81	Unemployment 93 - 81
$CoffeeIntensity \times Ownership$	0.027***		
	(0.007)		
$CoffeeIntensity \times Tenant$		-8.650***	
		(1.324)	
$CoffeeIntensity \times Communal$			-0.054***
			(0.011)
Ownership	-2.159		
	(1.518)		
Tenant		-2.849	
		(3.482)	
Communal			4.152*
			(2.295)
Coffee Has	-0.572***	-0.317*	-0.290
	(0.106)	(0.160)	(0.180)
Population	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)
Incomplete Primary	-0.409***	-0.405***	-0.405***
	(0.094)	(0.096)	(0.095)
$\%EAP > 15$	-0.207	-0.182	-0.214
	(0.238)	(0.233)	(0.242)
$\%6 < EAP > 14$	0.361**	0.365**	0.370**
	(0.134)	(0.127)	(0.129)
$\%EAPFemale > 15$	-0.203	-0.229	-0.211
	(0.152)	(0.147)	(0.154)
Economic Dependants	0.007	0.007	0.007
	(0.012)	(0.012)	(0.012)
House Workers	-0.456***	-0.463***	-0.465***
	(0.096)	(0.094)	(0.097)
Observations	689	689	689
R-squared	0.267	0.266	0.263

Robust standard errors in parentheses clustered at the district level.
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Price Shocks and Violence: Differential Effects by **Land Tenure**

VARIABLES	(1) No Harvesting Season	(2) No Harvesting Season
$CoffeeIntensity \times InternationalPrice \times Self-Owner$	1.12	-3.09
	(3.48)	(6.22)
$CoffeeIntensity \times InternationalPrice \times Communal$	1.54	3.22
	(1.09)	(2.50)
$CoffeeIntensity \times InternationalPrice \times Sharecropping$	7.20**	19.2**
	(3.26)	(9.77)
$InternationalPrice \times Self-Owner$	0.00100	0.0011
	(0.00073)	(0.00077)
$InternationalPrice \times Communal$	0.00065**	0.00065**
	(0.00026)	(0.00027)
$InternationalPrice \times Sharecropping$	0.00065*	0.00067*
	(0.00035)	(0.00037)
$CoffeeIntensity \times InternationalPrice$	-7.89**	-24.3***
	(3.18)	(6.90)
Observations	17,556	17,556
R-squared	0.016	0.017
Number of coddist	1,596	1,596

Robust standard errors in parentheses clustered at the district level
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Price Shocks and Violence: Differential Effects by **Land Tenure**

VARIABLES	(1) Harvesting Season	(2) Harvesting Season
$CoffeeIntensity \times InternationalPrice \times Self-Owner$	2.27**	4.56**
	(0.90)	(1.84)
$CoffeeIntensity \times InternationalPrice \times Communal$	0.74*	1.62*
	(0.39)	(0.89)
$CoffeeIntensity \times InternationalPrice \times Sharecropping$	1.04	1.75
	(0.94)	(2.85)
$InternationalPrice \times Self-Owner$	0.00031	0.00034
	(0.00028)	(0.00029)
$InternationalPrice \times Communal$	0.000023	0.000029
	(0.00019)	(0.00019)
$InternationalPrice \times Sharecropping$	0.00034***	0.00036***
	(0.00013)	(0.00013)
$CoffeeIntensity \times InternationalPrice$	-0.58	-1.66
	(0.54)	(1.36)
Observations	17,556	17,556
Number of coddist	1,596	1,596

Robust standard errors in parentheses clustered at the district level
*** p<0.01, ** p<0.05, * p<0.1