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Abstract

Income shocks affect violence through the opportunity cost and rapacity effects. Existing studies focus on the impact of transitory shocks, especially commodity price innovations. This paper builds on this literature and studies the causal effect of permanent income shocks on armed conflict in Colombia. Using a rich dataset reporting all guerrilla and other armed groups' attacks by municipality between 2009 and 2014 and information on the provision of banking services, it shows that increasing bancarization leads to reductions in violence. These results have important implications for public policy in countries with a long history of violence. They suggest that promoting financial inclusion is useful for reducing conflict.

JEL Classification*:* H41; G21; C26.

Keywords*: Violent attacks; Bancarization; Instrumental variables; Negative Binomial regression.*

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Resumen

Los choques de ingreso afectan la violencia a través de los efectos de rapacidad y costo de oportunidad. Los estudios existentes se enfocan en el impacto de choques transitorios, especialmente innovacionesen los precios de los bienes básicos. Este documento se basa en esa literatura y estudia el efecto causal de choques de ingreso permanentes sobre el conflicto armado en Colombia. Usando una base de datos que reporta todos los ataques de la guerrilla y otros grupos armados por municipio entre 2009 y 2014, al igual que información sobre la provisión de servicios bancarios, muestra que aumentos en la bancarización llevan a reducciones en la violencia. Estos resultados tienen implicaciones importantes para la política pública en países con una larga historia de violencia. Sugieren que aumentos en la inclusión financiera sirven para reducir el conflicto.

Clasificación JEL*:* H41; G21; C26.

Keywords*: Ataques violentos; Bancarización; Variables instrumentales; Regresión binomial negativa.*

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1 Introduction

Several recent studies have shown that financial development and bancarization have many positive impacts on a country's well-being. Evidence shows that improving access to financial services reduces poverty, especially in countries with high levels of financial exclusion (Armendáriz, 1999). Access to formal saving and credit instruments improves households' consumption smoothing capacities and enhances families' resilience to temporary income shocks. People participating in the financial system are better able to manage risk, start a business or invest in it, and fund large expenditures like education or home improvements (Dupas and Robinson, 2013b; Cull et al., 2014).

There is a growing literature studying the relation between income shocks and violence. Most papers have focused on the causal relation from commodity price shocks to violence (see, for instance, Bruckner and Ciccone, 2010; and, Bazzi and Blattman, 2014). Theory postulates two opposite effects of income shocks on armed conflict. On the one hand, the opportunity cost effect suggests that a higher income may lower conflict by reducing labor supplied to appropriation. On the other hand, the rapacity effect implies that revenue may increase violence by raising gains from appropriation. Empirical papers have found heterogeneous results on which force prevails.

In a recent study using Colombian data, Dube and Vargas (2013) show that shocks to different types of commodity prices have different effects on violence. Specifically, they find that a significant negative shock in coffee prices during the 1990s lowered wages and increased violence in important coffee producing municipalities. This is consistent with the prevalence of the opportunity cost effect after the happening of a coffee price shock. In contrast, a positive oil price shock increased violence more sharply in oil-producing municipalities. This is consistent with the oil shock inducing a rapacity effect.

While the effect of temporary income shocks on violence has been widely studied in the literature, less attention has been given to the impact of permanent income shocks on violence. Studying this relation is of major importance for at least two reasons. First, violence is a long-run institutional variable. Hence, a permanent reduction of violence would require the happening events with permanent impact (e.g., signing a peace treaty). Second, contrasting the effects of permanent versus temporary income shocks on violence is vital for public policy concerns.

Increasing bancarization in financially sub-served regions can be understood as the occurrence of a positive permanent income shock for the regions' households and entrepreneurs. More access to credit and additional saving facilities can be

useful for improving the allocation of resources. For instance, it can offer new funding sources for starting new businesses and for increasing the scale of production in existing firms. This benefits can be larger for municipalities without previous banking branches.

Hence, studying the relation between financial inclusion and violence can bring valuable empirical evidence to this strand of the literature. While important gains can be derived from studying this relation as there are no previous papers, examining it entails an important challenge concerning causality. While bancarization may impact violence, violence can also affect both the decision of financial institutions to set a branch in a given location and the development of financial markets.

In this paper, we study the causal effect of bancarization on armed conflict in Colombia. We use a rich dataset reporting all guerrilla (and other illegal groups) attacks by municipality between 2009 and 2014. Additionally, we use data on several financial variables related with bancarization by municipality for the same time interval. We implement an instrumental variable approach to address the potential endogeneity problem mentioned above. We use the distance from each municipality to its closest capital city as an instrument for bancarization. We show it is a valid instrument as it is negatively and significantly correlated with the supply of financial services, but independent of the degree of violence.

The variable of interest in this study is the number of attacks. We perform separate regressions for different types of violent groups, emphisizing on the guerrillas. We use a negative binomial model given the count nature of the dependent variable. We control for several variables that have been used in the related literature, and find that there is a negative and significant effect of bancarization on violence. In other words, increases in the number of banking branches and services in a given municipality lead to reductions in the number of guerrilla (and total) attacks. This result, which is robust to various specifications, shows that the opportunity cost effect prevails over the rapacity effect.

These results are of great importance for countries that have been immersed in an enduring violent conflict. Our country of study, Colombia, has had a long and painful history of violence characterized by the confrontation of guerrillas, paramilitaries and the State. The conflict has generated thousand of deaths, kidnappings and extortion to civilians. Recently a peace agreement was signed by the government and the FARC, the strongest and more numerous guerrilla in the country. The number of deaths and violent attacks have in fact diminished. However, it is crucial to consider different strategies that can reinforce and make more effective the peace process.

Our results show the important impact that increasing the availability of financial services can bring to municipalities with a high degree of violence in which a large proportion of their population has been financially excluded. We show that increasing the number of banking branches and facilities is beneficial for violence reduction.

Recently, other forms for increasing financial inclusion have emerged. For instance, during the last few years banking correspondents have gained importance in many Colombian regions. These correspondents (drugstores, supermarkets, among others) perform some basic formal financial activities and allow clients to make payments. Their impact on violence would be interesting to study. However, we do not include information on correspondents for two reasons. First, while they offer basic payment facilities, correspondents are not appropriate vehicles for offering saving and credit facilities to the population. Second, information on them is scarce and available for a very short period of time.

The remainder of the paper is organized as follows. Section 2 presents a context of violence and financial inclusion in Colombia during the last decade. The data used in this study, its sources, and the construction of the bancarization variable are presented in Section 3. Section 4 describes the empirical model used in this study. Section 5 shows the main empirical results and the last section concludes.

2 Context

This section presents a brief context of the evolution of financial inclusion and violence in Colombia. Due to the complexities they entail, we briefly present the most relevant facts regarding these two processes separately. The first subsection refers to the history of violence in Colombia, emphasizing on the last decade, and the second presents the most recent advances produced in bancarization.

2.1 A brief history of violence in Colombia

Violence in Colombia has been present over the last sixty years. The death of the presidential candidate Jorge Eliecer Gaitan on 1948 led to the beginning of violence in Colombia. Poverty in rural areas, the lack of political participation of large population segments, and a very unequal economic structure generated the adequate conditions for the organization of violent groups.

Initially, violent confrontations were between Conservatives and Liberals, the

two most traditional Colombian parties. However, through the years the left wind ideology took position creating groups such as the Fuerzas Armadas Revolucionarias de Colombia (FARC), the Ejercito Nacional de Liberacion (ELN), and the Ejercito Popular de Liberacion (EPL). These and other guerrilla groups became organized to fight against the government, claiming to represent the rural poor by supporting objectives such as land redistribution (Dube and Vargas, 2013).

Differences between the main guerrilla groups are worth to mention. Since its origination, the FARC were constituted as a communist rural guerrilla organization with military operation in vast areas of the country's territory. Meanwhile, the ELN and the EPL were initially organized as urban guerrilla groups in which its members were mainly students and young professionals. They later extended their operation to rural areas too. These guerrillas quickly expanded and reached the most geographically distant municipalities (i.e., the Catatumbo, located in the Pacific region).

Despite their ideological motivation, the guerrillas started to use drug production and distribution, kidnappings and extortion as ways of financing their military activities in the early 1980s. Production of cocaine and other illegal substances grew importantly in areas in which these groups had large influence.

Paramilitary groups emerged with the objective of combating guerrilla groups that were rapidly growing in members and influence in several Colombian rural areas. The Autodefensas Unidas de Colombia (AUC), the largest of these groups, was an actively belligerent armed force who fought against the revolutionary Marxist Leninist guerrilla forces between 1997 and 2006. They also controlled large areas of cocaine production. In fact, guerrillas and paramilitaries focused their clashes in municipalities with large extensions of coca crops. In the early 2006, the bulk of the AUC's blocs demobilized. However, some successor organizations continued to operate such as the neo-paramilitary alliances and the BACRIM (criminal bands related with drug production and trafficking).

The armed conflict has been costly for the country. Many deaths have occurred and a considerable proportion of the population has been negatively affected by the ongoing war. Colombia's governments have struggled to defeat illegal armed groups and to eliminate cocaine production. Military efforts have been done as well as several attempts to sign peace agreements with the largest illegal groups. Important results have been produced in both fronts, but there is still a long way to walk. Regarding cocaine production, Figure 1 shows how the extension of crops has decreased over time. A reversion in this tendency occurred in 2014. One of the factors that may explain it was the decision made by the government to end aerial fumigation due to concerns of their effect on human health.

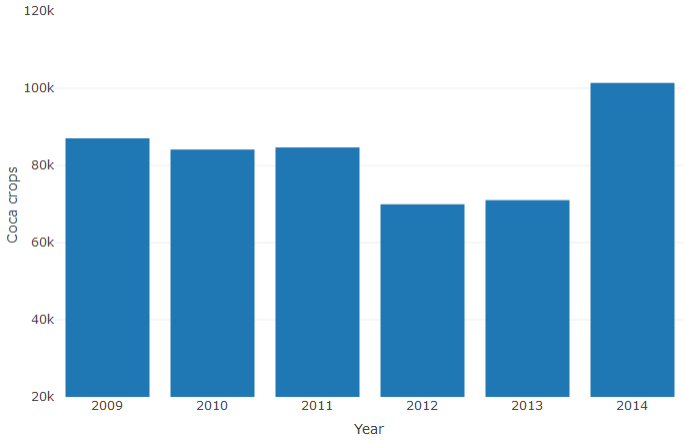

Figure 1: Hectares of coca crops over time

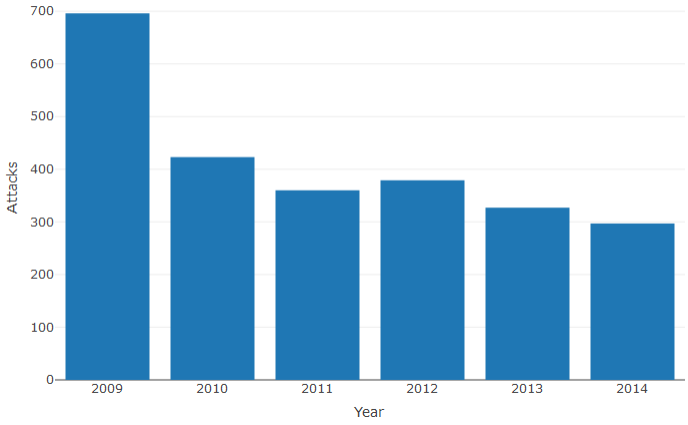

Figure 2: Total attacks over time

Arguably, the two most important advances towards peace in Colombia have been the demobilization of the AUC in 2006 and the peace agreement signed by the government and the FARC in 2016, after four years of negotiation. The conversations, that began in 2012, focused on six main topics including rural development, political participation, the end of armed conflict, drug trafficking, rights for victims, and the implementation of the accord. Figure 2 shows the evolution of total attacks over time. A negative trend is observed, with a small increase in 2012, year in which peace conversations with the FARC began. As shown in Table 1, since 2012 the FARC's participation in attacks decreased while the participation of the ELN increased.

Years	FARC	EPL	ELN	Others
2009	89.6%	0.4%	5.9%	4.2%
2010	91.8%	0.5%	6.5%	1.2%
2011	91.7%	0.1%	6.5%	1.6%
2012	92.1%	0.5%	7.1%	0.2%
2013	88.0%	0.2%	10.4%	1.3%
2014	81.2%	0.3%	18.5%	0.0%

Table 1: Participation in attacks

2.2 Evolution of bancarization in Colombia

Access to financial services in Colombia has traditionally been provided by commercial (private and public) banks. Financial markets are underdeveloped, and firms' and households' financing has been provided principally by financial institutions. The only liquid market in Colombia is the public bonds market (see, for instance, Dalazar et al., 2011; Kshetri, 2014). Therefore, banks loom large for the country's private sector.

During the 1980s, Colombia's financial system was subject to elevated reserve requirements and forced investments, and to strong constraints on foreign investment, as well as on the types of operations that intermediaries could do and on interest rates. Additionally, a process of bank nationalization was held during that decade.

In contrast, at the beginning of the 1990s, a program of financial liberalization was implemented. The process was supported by the laws 45 of 1990 and 9 of 1991, which eased the conditions for the entrance of foreign investment to Colombia, promoted more competition in the financial system, and gave financial institutions more liberty in the management of financial operations and interest rates. The number of financial institutions increased significantly, the participation of the assets of foreign banks in the total assets of the system increased (several foreign banks, many of them Spanish entered the country buying state-owned banks), and most of the government-owned financial institutions were privatized.

As a result, private credit in Colombia increased significantly (the ratio of intermediated assets, i.e., loans plus bonds, to GDP passed from 31 percent in 1990 to 47 percent in 1996, see Gomez-Gonzalez and Kiefer, 2006) and firms and households obtained better access to credit. However, the expansion of financial services provided by this growth in the banking system was regionally unequal. Due to several reasons, among which the country's topology and low investment

in public infrastructure in some regions pay an important role, many municipalities remained excluded from the services provided by the financial system. For instance, even now-a-days private banks do not reach the whole number of municipalities. While the government has made efforts to improve access to financial in unattended municipalities through a public bank (the Banco Agrario), near 300 (out of 1100) municipalities still lack of traditional banking branches (Formats 322 and 323, Superientendencia Financiera de Colombia).

Financial markets in Colombia have been recently transformed by the appearance of new providers and new intermediation channels such as agent and mobile banking. Many of these new actors, products and channels have appeared to provide financial services to certain segments of the population that have been traditionally excluded from the financial system. Between 2011 and 2015, the number of financial access points increased substantially. Currently, all municipalities have at least one financial access point available. This is explained by the spread of banking agencies throughout Colombia, increasing from around 19.938 in 2012 to 95.000 in 2015 (Garcia et al., 2017).

Today, however, the percentage of individuals with savings accounts or credits with the financial system remains low with respect to international standards. In the case of savings accounts, which are usually the first product linking Colombian consumers to the financial system, only 50.5% of the population had one in 2015 (Garcia et al., 2017). This percentage, which is clearly below the average for OECD countries, may show that the country has yet important barriers to overcome in order to enhance growth in household savings. It is worth mentioning that many households still use informal ways to save. Twenty-four percent of respondents of a survey conducted by Banca de las Oportunidades and the Financial Superintendence of Colombia in 2015 reported participating in Rotating Savings and Credit Unions. In addition, only 26.2% of the population reported having a loan from a financial system while 33.0% reported having informal loans.

Although efforts to promote financial inclusion have shown some success, many challenges remain, especially in rural municipalities. In particular, dispersed rural population do not have access to financial products that meet their needs. Colombia enacted Law 1735 of 2014 to encourage the design and implementation of electronic payment services that should ease access of the rural population to the financial system.

The relatively low percentage of the population using the formal financial system for making payments and the large lack of access to formal credit shows that the new intermediation channels (i.e., banking correspondents) have not been able to fully substitute traditional commercial banks in Colombia. The latter provide more effectively some services than the former. Therefore, the country requires

more effort to increase the number of banking branches in small municipalities, especially in those in which due to the lack of an adequate public infrastructure remain lagged behind average standards for the country.

The results provided by this study show that increasing the number of banking branches can have important side effects (different from the positive effects traditionally pointed-out in the literature and in policy circles), such as reducing the number of violent attacks to municipalities.

3 Data and variable construction

We study the effect of bancarization on violence using municipal-level information. Two datasets are used. The first is a unique event-based dataset recording two distinct measures of violence, namely guerrilla attacks and attacks performed by other illegal groups such as neo-paramilitaries and BACRIM. We gather information for all Colombian municipalities between 2009 and 2014. As a robustness check of our results, we use an alternative dataset for violence provided by the Fundacion Ideas para la Paz. The second is a dataset that results from merging Formats 322 and 323, reported by the Superintendencia Financiera de Colombia. These formats contain information on several variables related to the provision of formal financial services by municipality.

Bancarization is unobservable. We construct an index using various variables that have been identified in the literature as adequate proxies, such as the number of banking offices, the number of banking accounts (demand and time deposits), the number of banking transfers and withdrawals, the number of loans (different types of loans), among others. Given none of these proxies is individually adequate for representing the population's access to banking services, we use a convex combination of them. The index is constructed by principal component analysis. We use the first component, explaining around 80% of the total variance. Figure 3 shows the evolution of the average index over time. Notice it exhibits a positive trend, with a temporary reduction in 2013. It exhibits considerable variation between municipalities, as the provision of financial services is highly heterogeneous in Colombia.

We include different variables that have incidence on the origin, intensity and duration of the violent conflict in the country. We include an institutional-type dummy variable, "Conflict 1948-1953", taking the value one for municipalities in which armed groups operated in the five years after the Bogotazo. Due to the important interrelation between coca crops and conflict, we include a variable

indicating the number of planted hectares. The variable "Global performance index", calculated by the National Planning Department (DNP) stands for municipal governance and good practices. "Rural index" is the percentage of rural population out of the total population.

Additionally, we include regional dummies accounting for the fact that some departments are more violent than others (the base is the Andean region), and time dummies.

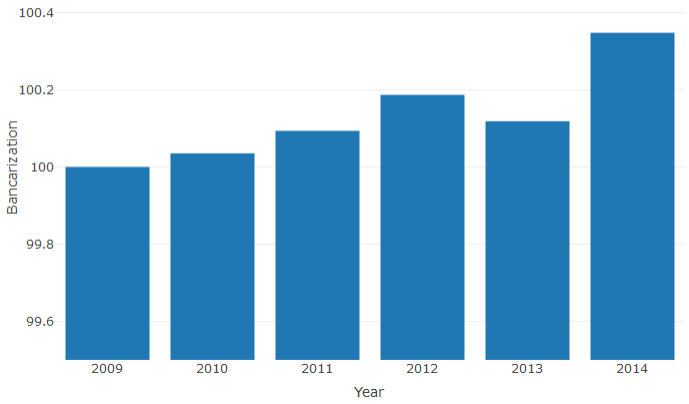

Figure 3: Average of bancarization over time

4 Empirical Model

The variable of interest in this study is the number of guerrilla attacks by municipality in Colombia. This is a discrete random variable which may take any non-negative value. Therefore, we use count data models to study its determinants, emphasizing on the role of bancarization measured by the number of banking branches actively operating in each municipality.

Studies using count data models usually assume the dependent variable follows either a Poisson or a negative binomial distribution. The former is frequently used due to its simplicity. If x is a Poisson random variable then,

$$Pr\left(X = x\right) = \frac{exp^{-\lambda}\lambda^{x}}{x!}; \lambda = 0, 1, 2, ... \tag{1}$$

Where $\lambda > 0$ is the unique parameter characterizing the distribution. The poisson regression model is obtained by replacing this parameter by a non negative

function of covariates and parameters. A simple way of doing so is by choosing a linear index function and an exponential transformation. In that case,

$$\lambda_i(\beta) \equiv exp\left(x_i'\beta\right) \tag{2}$$

The contribution of municipality to the likelihood function is given by

$$\frac{exp(-exp(x_i'\beta))(exp(x_i'\beta))^{x_i}}{x_i!} \tag{3}$$

Where x_i represents the number of guerrilla attacks for observed municipality i.

The main drawback of this regression model derives from its simplicity. Under the Poisson distribution, the mean and variance of the random variable are assumed to be identical (in fact, they are both equal to λ). In real life application, however, the variance of the random variable is larger than its mean (over-dispersion).

Our dataset includes several municipalities registering the attacks. In fact, the number of such municipalities is way higher than the expected number implied by the Poisson regression model. We tested formally using Lagrange multiplier tests and likelihood tests and encountered evidence of over-dispersion. Hence, we chose the negative binomial distribution in order to accommodate the excess residual variation.

The negative binomial model derives from a Poisson regression model in which a random effect γ_i is included to represent unobserved heterogeneity. Suppose the conditional distribution of x, given γ_i, is Poisson with mean and variance $\gamma_i\mu_i$. If γ_i were observed, the data would be Poisson. As γ_i is not observed, assuming it follows a Gamma distribution with parameters $\alpha = \beta = \frac{1}{\sigma^2}$, where σ^2 is the variance of the unobservable random effect, then

$$Pr(X = x) = \frac{\Gamma(\alpha + x)}{x!\Gamma(\alpha)} + \frac{\beta^\alpha \mu^x}{(\mu + \beta)^{\alpha+x}} \tag{4}$$

The mean and variance of random variable x are μ and $\mu(1 + \sigma^2\mu)$, respectively. Note that if $\sigma^2 = 0$, the mean and variance are identical and the distribution is Poisson. However, when $\sigma^2 > 0$, the variance is larger than the mean.

5 Empirical results

We are interested in estimating the effect of changes in the provision of financial services on violence. Specifically, we want to compute the impact of increases in bancarization on the number of armed-group attacks in Colombian municipalities. We use a count data model that accounts for the fact that the dependent variable is discrete and nonnegative. Additionally, given the large number of zeros (municipalities without any violent attack) we use a negative binomial model.[1]

Studying the causal relation between the provision of financial services and violence encompasses an important challenge. Increasing access to banking services may be considered as the occurrence of a positive permanent income shock in a given population, as discussed above. However, violence may also affect the location decision of banks and other financial services providers, especially in a country with an enduring history of violence such as Colombia. In fact, in the last few years the bancarization strategy in Colombia has been enforced using banking correspondents, that arguably are less affected by the presence of armed-groups.

We face this issue of potential endogeneity using instrumental variables. Our instrument is the linear distance in kilometers between each municipality and the nearest capital city. The value of this variable is zero for each department's capital city and positive in every other case. Table 2 shows estimation results for the first stage. As expected, distance to the capital city is negatively and significantly related to bancarization. In other words, the farther a municipality is located with respect to the capital city, the lower its degree of access to formal financial services. The high significance of the distance variable implies the relevance of our instrument.

The distance to the nearest capital city does not depend on violence. In fact, even though force displacement has been an important phenomenon in Colombia, there has not been any municipality that has changed its geographical location due to the violent conflict.

Table 3 shows second stage estimation results. We estimate our negative binomial model following a control function approach that corrects first-stage standard errors reducing the number of false positives (Papke & Wooldridge, 2008). Results for three different empirical models are presented. The dependent variable for Model 1 is the total number of guerrilla attacks. They include attacks from the FARC, the ELN, the EPL, among others. Model 3 corresponds to the to-

[1]Results provided by Lagrange multiplier and likelihood ratio tests indicate the presence of over-dispersion in the data.

tal number of attacks by subversive groups, and Model 2 presents those attacks that were executed by all violent groups except guerrillas (i.e., neo-paramilitary groups, criminal bands, etc.). Coefficients, rather than marginal effects, are reported in the table.

VARIABLES	(1) Bancarization
Distance to the nearest capital city	-0.0033***
	(0.0007)
Hectares of coca crops	0.0001
	(0.0001)
Global performance index	0.0084**
	(0.0033)
Rural index	-2.1343***
	(0.1664)
Conflict 1948-1953	-0.0940
	(0.1070)
Amazon region	-0.3830
	(0.2374)
Caribbean region	-0.1570
	(0.1284)
Pacific region	-0.0159
	(0.1100)
Orinoco region	-0.3990**
	(0.1630)
2010	0.0158
	(0.1307)
2011	0.0763
	(0.1303)
2012	0.1650
	(0.1305)
2013	0.0512
	(0.1320)
2014	0.2535*
	(0.1336)
Constant	0.8085***
	(0.2793)
Observations	4,968
R-squared	0.0498
Prob > F	0

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: First stage estimation

VARIABLES	(1) Guerrilla attacks	(2) Subversive non-guerilla attacks	(3) Total
Bancarization	-1.1270*	-0.9714	-0.9516*
	(0.6393)	(0.6104)	(0.4878)
Hectares of coca crops	0.0008***	0.0010**	0.0010***
	(0.0003)	(0.0004)	(0.0003)
Global performance index	0.0130	-0.0192*	-0.0084
	(0.0079)	(0.0114)	(0.0089)
Rural index	-2.8155*	-7.7286***	-5.8466***
	(1.4392)	(1.2866)	(1.0943)
Conflict 1948-1953	0.5571*	0.8920**	0.9422***
	(0.3118)	(0.4238)	(0.3351)
Amazon region	0.4398	-2.8859**	-1.0947**
	(0.4806)	(1.2650)	(0.5051)
Caribbean region	-0.9286**	-0.9141**	-0.8579**
	(0.3740)	(0.3875)	(0.3362)
Pacific region	0.8376***	0.1604	0.4689**
	(0.2536)	(0.3190)	(0.2357)
Orinoco region	1.6011***	-0.5952	0.6585
	(0.4380)	(0.5803)	(0.4294)
2010	-0.7889***	-0.4138***	-0.4624***
	(0.1634)	(0.1463)	(0.1233)
2011	-0.2375	-0.7965***	-0.5607***
	(0.1489)	(0.1855)	(0.1371)
2012	-0.0292	-0.8042***	-0.4302***
	(0.2030)	(0.3053)	(0.1665)
2013	-0.9646***	-0.7670***	-0.7987***
	(0.2027)	(0.2046)	(0.1618)
2014	-0.5093**	-0.8532***	-0.6927***
	(0.2528)	(0.2077)	(0.1765)
Residuals	1.1489*	1.0193*	1.0135**
	(0.6432)	(0.6143)	(0.4880)
Constant	-1.5853***	3.6015***	2.4796***
	(0.6053)	(0.8201)	(0.7233)
Observations	4,968	4,968	4,968
Model chi-square	231.5	249.3	271.2
Prob > chi2	0	0	0

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

Table 3: Second stage estimation

Several interesting findings are worth reporting. Likelihood ratio tests indicate that the null hypothesis that none of the included covariates is important in explaining the dependent variable is rejected. The parameter corresponding to our variable of interest, namely bancarization, presents a negative sign in all three models. This result indicates that increases in the access to financial services lead to reductions in the number of violent attacks. This effect is significant at the 10% level in the cases of guerrilla and total attacks, and at the 15% level in the case of other armed groups.

This result goes in line with those of other studies that have encountered that positive income shocks generate a reduction in violence. However, our results build considerable on the existing literature in the sense that existing papers have reported this evidence for temporary income shocks (e.g., Dube and Vargas, 2013; and, Bazzi and Blattman, 2014), while our evidence relates to the effect of permanent income shocks. Importantly, while the conclusions derived from papers on temporary income shocks hardly lead to public policy recommendations (for instance, commodity price shocks occur randomly and are uncontrollable for policy makers), our results show that financial inclusion policies can derive in desirable violence reductions.

The Appendix shows estimation results using an alternative dataset on violent attacks, provided by the Fundacion Ideas para la Paz. Results are qualitatively identical to those of Table 3.

Importantly, Colombia's government signed a peace agreement with the FARC, the main guerrilla group in the country, on September, 2016. The objective of the agreement is to reduce violence and violent victims in the country. Our results show that increasing financial inclusion, especially in violent municipalities, can contribute significantly to this goal. Therefore, it is of major relevance to promote bancarization in Colombia and other similar countries.

Cocaine production is a relevant variable for explaining violence. In fact, it is positive and significant at the 5% in all models. This finding shows that many violent attacks in Colombian municipalities have been associated with disputes for the control of cocaine production. Hence, this variable controls for income shocks different than those corresponding to increases in bancarization, allowing for a finer measurement of rapacity effects derived from changes in our variable of interest.

The institutional variable relating to the origin of the violent conflict in Colombia exhibits a positive and significant sign. This result indicates that violence has a high persistence in Colombia. Those municipalities in which violent attacks were frequently observed in the 1950s have a higher chance of presenting more

attacks currently.

We also show that violence in Colombia has an important geographical component. Two regions show a higher incidence of violent attacks, the Orinoco and the Pacific. They have had historically low levels of investment in public infrastructure and are relatively isolated from the rest of the country.

The tendency of reduction of violent attacks over the last decade is observed from the result that time dummies, having 2009 as the base year, are negative and statistically significant in our regressions. This reflects the process of peace negotiation and the accord signed with the FARC.

6 Concluding remarks

Two fields that are recently gaining relevance in the financial and economics literature are financial inclusion and the effects of income shocks on violence. In this paper we build on previous papers on both fields and study the relation between bancarization and violence using data for Colombia. This is the first paper using data by municipalities to study the effects of increasing financial inclusion on violent attacks by subversive armed groups.

We construct a rich dataset comprising information on all guerrilla's (and other illegal groups') attacks by municipality and on different proxies for municipal bancarization between 2009 and 2014. Our data covers all Colombian municipalities for this time period and reports information on different types of attacks and distinct variables related with financial operations by banking branches.

Potential endogeneity issues are addressed following an instrumental variable approach. The chosen instrument for bancarization is the distance from each municipality to its closest capital city. We show it is a valid instrument as it is negatively and significantly correlated with the supply of financial services, but it is independent of the number of violent group attacks by municipality.

The variable of interest is the number of guerrilla attacks. A negative binomial model is used for modeling this count variable, as the dependent variable exhibits over-dispersion. Several control variables are included, following the related literature. Empirical results show that there is a negative and significant effect of bancarization on violence; i.e., increases in the number of banking branches and services lead to a reduction in the number of guerrilla attacks. This result, which is robust to different specifications, shows that the opportunity cost effect prevails over the rapacity effect.

Our results show the importance of promoting bancarization in municipalities with a high degree of violence in which a large proportion of their population is financially excluded. While alternative forms of promoting financial inclusion such as using banking correspondents may be useful for promoting access to payment systems to traditionally excluded population segments, these new providers have not been able to perfectly substitute banking branches in Colombia. Therefore, the country requires more effort for increasing the number of banking branches in small municipalities, especially in those that due to the lack of an adequate public infrastructure remain lagged behind average standards for the country.

Our results are relevant for public policy implementation, as we show that promoting financial inclusion, especially in under-served municipalities, can be an effective way of increasing the effectiveness of peace agreements in the reduction of violence.

7 References

Armendariz, B., 1999. Development banking, Journal of Development Economics, 58: 83-100.

Bazzi, S. & Blattman, C., 2014. Economic Shocks and Conflict: Evidence from Commodity Prices, American economic Journal: Macroeconomics, 6: 1-38.

Brückner, M. & Ciccone, A., 2010. International Commodity Prices, Growth and the Outbreak of Civil War in Sub-Saharan Africa, Economic Journal, 120: 519-534.

Cull, R., Ehrbeck, T. & Holle, N., 2014. Financial Inclusion and Development: Recent Impact Evidence, Focus Note No. 92, CGAP.

Dube, O. & Vargas, J.F., 2013. Commodity Price Shocks and Civil Conflict: Evidence from Colombia, Review of Economic Studies, 80: 1384–1421.

Dupas, P. & Robinson, J. 2013. Daily Needs, Income Targets and Labor Supply: Evidence from Kenya, NBER Working Papers 19264, National Bureau of Economic Research.

Garcia, N., Giné, X. & Gomez-Gonzalez, J.E., 2017. Financial Information in Colombia, World Bank Working Paper No. 7998. The World Bank.

Gomez-Gonzalez, J.E. & Kiefer, N.M., 2006. Bank Failure: Evidence from the Colombian Financial Crisis. OCC Economics Working Paper 2007-2, Office of the Comptroller of the Currency.

Kshetri, N., 2014. Global Entrepreneurship. Environment and Strategy, Routledge, New York, NY.

Papke, L.E. & Wooldridge, J.M., 2008. Panel data methods for fractional response variables with an application to test pass rates, Journal of Econometrics, 145: 121-133.

Salazar, N., Becerra, A. & Wills, D., 2011. Impact of Capital Markets Reforms in Colombia's Economic Development, Report by The World Bank and the IFC.

8 Appendix

VARIABLES	(1) Guerrilla attacks	(2) Subversive non-guerilla attacks	(3) Total
Bancarization	-0.7955	-0.8408	-0.2102
	(0.5115)	(0.5433)	(0.4308)
Hectares of coca crops	0.0014***	0.0006**	0.0014***
	(0.0004)	(0.0003)	(0.0004)
Global performance index	-0.0013	-0.0064	-0.0027
	(0.0065)	(0.0089)	(0.0055)
Rural index	-1.3865	-4.8158***	-1.1967
	(1.1449)	(1.2708)	(0.9306)
Conflicto 1948-1953	0.6963***	0.0292	0.7161***
	(0.2236)	(0.3547)	(0.2011)
Region Amazonica	1.6031***	-2.2374***	1.6043***
	(0.3615)	(0.7209)	(0.3525)
Region Caribe	-0.6022*	0.6183*	-0.0889
	(0.3125)	(0.3205)	(0.2301)
Region Pacifica	1.2922***	0.7356***	1.2420***
	(0.1943)	(0.2636)	(0.1752)
Region Orinoquia	1.6534***	-0.2700	1.7288***
	(0.4279)	(0.4031)	(0.3809)
2010	-0.1591**	-1.9428***	-0.2282***
	(0.0618)	(0.2773)	(0.0585)
2011	-0.5738***	-1.7379***	-0.6371***
	(0.0867)	(0.2564)	(0.0743)
2012	-0.3014***	-0.2631	-0.4263***
	(0.1152)	(0.2057)	(0.0950)
2013	-0.1989*	0.1501	-0.1340
	(0.1042)	(0.1586)	(0.0889)
2014	-0.4127**	0.7314***	-0.3100**
	(0.1680)	(0.1944)	(0.1458)
Residuals	0.8765*	0.9405*	0.4593
	(0.5137)	(0.5548)	(0.4291)
Constant	1.2206**	0.7884	1.5291***
	(0.5436)	(0.6191)	(0.4378)
Observations	4,968	4,968	4,968
Model chi-square	296.8	211.8	271.1
Prob > chi2	0	0	0

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

Table 4: Second stage estimation


BANCO DE LA REPÚBLICA
COLOMBIA