

## **Empirical research on the relationship between violence and social development in Colombia**

Alexander Cotte Poveda\*

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### **Abstract**

Violence is a significant development constraint that generates economic problems, limits public and private investments, and damages the country's infrastructure. This paper offers an explanation of violence through an empirical analysis of Colombian departments that takes into account categories of violence and variables of economic development and the deterrence of violence. We use different datasets to measure violence and economic development, and we employ panel fixed-effects regressions and a dynamic panel model for a sample of 32 Colombian departments between 1993 and 2007. We find that the aggregate-level production per capita, education, deterrence variables and employment rate show a negative effect on violence, whereas the GINI coefficient and lagged rate show a positive effect on violence. Moreover, the objective conditions and their interrelationships have been important in the trends of violence in Colombian departments.

**Keywords:** Economic development, categories of violence, deterrence variables, Panel Data, Colombia.

**JEL Classification:** O1, O40, I30, C33.

### **Resumen**

La violencia se ha convertido en un obstáculo para el desarrollo económico y social de los países, que origina problemas en el sistema económico, limita las inversiones públicas y privadas y causa daños en la infraestructura. Este documento ofrece una explicación de la violencia a través de un análisis

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\* Faculty of Accounting and Administration, University of La Salle. Cra. 5 No. 59<sup>a</sup>-44 Bogotá – Colombia. Tel: (571) 3488000, ext 1573 (571) 3500449. Fax: (571) 3477232.

Correo electrónico: acotte@lasalle.edu.com

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empírico para los departamentos de Colombia, teniendo en cuenta las categorías analíticas del problema, así como las variables del desarrollo económico y social y las medidas disuasivas. Se emplea una base de datos tipo panel con efectos fijos y modelos de datos de paneles dinámicos, que se usan en el análisis de algunos de los determinantes de la violencia, para una muestra de 32 departamentos de Colombia entre 1993 y 2007. Los resultados evidencian que la producción *per cápita*, el empleo, la educación y las variables asociadas con la disuasión, muestran un efecto negativo sobre la violencia; mientras que el coeficiente de Gini y las variables asociadas con el tráfico de drogas, indican un efecto positivo.

**Palabras Clave:** Desarrollo económico, categorías de la violencia, datos panel, Colombia.

**Clasificación JEL:** O1, O40, I30, C33.

## **Introduction**

Decreasing violence and increasing economic growth and social development are the main challenges facing developing countries such Colombia that have been affected by violence in recent decades. Several studies show that high levels of violence in a country indicate significant institutional failures (Koonings and Kruijt, 2004; WB, 2003; Broekman, 2000). Violence can have different sources (Soriano, 2000): (1) economic causes associated with societal pressure to seek a larger share of real income and the stock of national wealth; (2) the interest of illegal groups in the appropriation of income derived from national resources or illegal activities such as drug trafficking; and (3) differences in ideas or opinions about how society should be organised or in political ideologies.

According to Moser (2000) violence has been studied in terms of different categories such as political and economic violence. Political violence represents commission of violent acts, motivated by the desire, either conscious or unconscious, to obtain or maintain political power; while economic violence represents violent acts motivated with the objective to obtain or maintain economic power. Several studies have indicated that the category of political violence has increased in recent decades and that the main root causes include poverty, inequality and decreases in economic growth and state capacity (Nafziger and Auvinen, 2002; Sambanis, 2004; Besley and Persson, 2009). Various studies have demonstrated that economic violence is more severe in poorer countries; this type of violence has negative effects on investment and economic growth, and there is a strong relationship between the factors of economic violence and economic

insecurity, as well as a general lack of opportunities (Benson and Fox, 2002; WHO, 2004; Fisman and Miguel, 2008).

However, there are many gaps in the literature with respect to violence and its inter-relationships with economic development, as well as with respect to the main causes that generate different categories of violence. Therefore, the purpose of this paper is to contribute a better explanation of violence through an empirical analysis that takes into account categories of violence, variables of economic development and the deterrence of violence using a case study of Colombian departments.

In recent decades, Colombia has shown an increase in violence across departments that have been explained by various phenomena such as drug trafficking, conflicts between guerrilla and paramilitary groups over economic resources such as oil and metals, and disputes over territorial limits. Gaviria and Velez, (2001) Holmes, Gutiérrez, and Curtin, (2002), Sánchez, Díaz and Formisano, (2003) and Cotte, (2007) have illustrated the dynamics and trends of Colombian violence and have concluded that there are significant connections between coca production, illegal groups and violence.

Other studies have explained Colombian violence as the result of so-called objective conditions which are understood as a series of political, social and economic realities that have created significant decay in the conditions of existence for wide sectors of society. For example, Sánchez and Nuñez (2001) show that the difference between the most violent and least violent Colombian counties is explained by socioeconomic variables such as poverty and inequality and by objective conditions such as political exclusion and lack of opportunities.

Echandía (2003) argues that Colombian violence has traditionally been explained through the existence of objective conditions present in remote regions where the insurgency incites peasants to engage in violence related to land tenancy or state violence; Palalu and Sánchez (2006) analyze the determinants of violence between 1974 and 1982 and demonstrate that the increase in violence during this period coincides with objective conditions such as poverty and inequality. Nevertheless, these studies have not analyzed the relationship between objective conditions and categories of violence. In contrast, this study seeks to analyze the different categories of violence and their relationships with objective conditions using panel data with fixed effects from the Colombian departments between 1993 and 2007.

The paper is organized as follows: section 1 discusses the relevant literature, section 2 presents the methodology and a description of the data available for analysis, section 3 describes the results, and section 4 concludes the paper and presents recommendations for further research.

## 1. Literature review

The definitions of violence are diverse. For example, violence can be understood as the existence of economic, cultural, social, judicial, and political structures that cause human oppression and impede liberation and total human realization. This is termed the violence of the structures (Wood, 2004; Scheper-Hughes and Bourgois, 2004). Alternatively, violence can be understood as the use of weapons to impose force on others to compel their submission, which is commonly known as armed violence (Geneva Declaration, 2008; OECD, 2009). Criminology approaches violence as social or individual conduct that involves destructive aggression, the illicit use of force to achieve a purpose. Buvinic, Morrison and Shifter (1999) define violence as “the use or threat of use, of physical or psychological force, with the intention of doing harm.” Through its various manifestations, including homicide, theft, kidnapping and domestic violence, crime and violence are some of the largest obstacles to the development and welfare of the population of developing countries.

Violence has been analyzed through different approaches (that have generated widely accepted theories) such as economic theories, theories of rational choice, sociological or structural theories and descriptive approximations. These various approaches are explained as follows:

- a) *Economic theory* assumes that there is an implicit relationship among rationality, strategy, violence, conflict and the economy (Schelling, 1960). In Colombia, this theory has been studied by Gorbaneff and Jacome (2000) and Castillo and Salazar (2003) using game theory. They found that violence is the result of the rational action of armed agents who have learned to survive in extreme conditions of uncertainty, scarce solidarity and lack of transparent rules with respect to relationships among individuals and different social groups. Violence and armed conflict are expected to be the result of the learning and adaptation process of armed organizations and the civil population in a context of increasing anarchy and the loss of a state monopoly over weapons and violence (Giugale, Lafourcade and Luff, 2003).

- b) *Theories of rational choice* are based on an individual's choice to conform to or to break the law. Such theory was developed by Rubio (2001), where the rational actor evaluates the possible risks and benefits associated with illegal conduct.<sup>1</sup> Empirical studies that have analyzed these theories show evidence in favour of the economic determinants of violence and conflict, suggesting that the level of economic development of countries is negatively related to the levels of conflict or violence (Rubio, 2001). Likewise, the causes and the time span of violence and conflicts are affected by various processes, including economic and social factors, the system of causalities and geographic features (Camatari, 2006).
- c) *Sociological or structural theories* suggest that violence and conflict are frameworks in which contradictions between material forces of production and the relationships of production historically manifest themselves. According to these theories, although their roots are in economic domination, violence and conflict always present themselves as being related to some form of political domination (Tejerina, 1991). These theories are based on the social, political and economic conditions that determine individual behavior in situations where political conditions (e.g., the type of regime or the opportunities for participation) or economic conditions can determine the situations of conflict or violence and where the probability of an internal war directly depends on the relative situation of the masses and the elites (Durkheim, 1982; Marx, 1853).
- d) *Descriptive approximations* emphasise the detailed analysis of societies involved in conflicts to highlight peculiarities that are susceptible to generalization. In this context, the need to move from a classical model of war to an analysis of civil conflicts is highlighted. The gradual transformation of a war, subjected to rules in confrontations in which virtually "anything goes," makes an analysis of civil conflicts difficult to perform. As such, increasing importance is given to war as its own phenomenon with its own internal dynamics (Rubio, 2001).

Taking into account these theories, Moser (2000) proposes three categories for the study of Colombian violence: political, economic and social violence, specified in terms of the primary motivating factor, either conscious or unconscious, for gaining or maintaining political, economic, or social power

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<sup>1</sup> Rubio (2001) developed this theory based on classical 19<sup>th</sup> century criminological thinkers such as Bentham (1789) and Beccaria (1764) and the recent studies of Fielding, Clarke and Witt (2000).

through force or violence (Table 1). These categories allow the analysis of the dynamics of different types of violence using an approach that is both conceptually and operationally integrated. The categories also allow the determination of adequate strategies to decrease violence according to its category, for example, political violence requires peace negotiations; whereas economic violence requires the design of social policies that address topics such as the labour market, social opportunities and inclusion.

Table 1  
**Categories of Colombian violence**

Categories	Definition	Manifestation
<b>Political</b>	Commission of violent acts, motivated by the desire, either conscious or unconscious, to obtain or maintain political power.	Guerrilla conflict, paramilitary conflict, political assassinations, armed conflict between political parties.
<b>Economic</b>	Commission of violent acts motivated by the desire, either conscious or unconscious, for economic gain or to obtain or maintain economic power.	Street crime, carjacking, robbery or theft, drug trafficking, kidnapping, assaults during economic crimes.

Source: Moser (2000).

This study analyses general violence and one specific category of violence: political, while taking into account different variables that could cause violence and their interrelationships with economic growth and development for Colombia.

## 2. Data and methodology

### 2.1 Data

This paper uses Colombia as a case study. We have used data published by the National Police of Colombia, the Colombian defense ministry, the DNP (National Planning Department), the Colombian Treasury Ministry, the DANE (Colombian Department of Statistics), the National Institute of Legal Medicine and Forensic Sciences, and Conflict Analysis Resource Center (CERAC). We build a panel data at the level of Colombian departments<sup>2</sup> to

<sup>2</sup> In the Colombian case, there are 32 sub-national political territories called departments.

analyse different categories of violence and determinate factors. The analysis is performed for the time period 1993-2007.

## 2.2 Methodology

General types of violence and political violence and their relationships with objective conditions can be modelled by the following function:

$$V_{it} = \alpha_i + \beta_1 P_{it} + \beta_2 GDPpc_{it} + \beta_3 LM_{it} + \beta_4 DV_{it} + \beta_5 ID_{it} + \beta_6 GINI_{it} + \beta_7 EDU_{it} + \mu_{it} \quad (1)$$

In this equation,  $V_{it}$  represents general violence and political violence;  $P_{it}$  is the population of a department;  $GDPpc_{it}$  is the aggregate-level production per capita by department;  $LM_{it}$  represents the relevant characteristics of the labour market, such as the employment rate and employment per industry;  $DV_{it}$  is composed of deterrence variables, such as the number of police officers and the number of captures or apprehensions by department;  $ID_{it}$  represents a variable pertaining to illegal drugs, such as hectares under drug cultivation by the department;  $EDU_{it}$  represents education variables, such as education coverage by department and  $GINI_{it}$  is a measure of income inequality by department. Finally,  $\mu_{it}$  represents the random error.

To examine the levels of general violence and political violence and their relationships with objective conditions, we employ a panel data model with department-specific fixed effects, with the aim of capturing all characteristics specific to each department (e.g., the level of development or economic growth). Moreover, a fixed-effects model helps solving the correlation problem because it can control for various unobservable influences on political violence and economic development across departments and over time (Hanchane and Mostafa (2010).

The fixed-effects model is defined from the F-test for ordinary least squares (OLS) and the fixed effect (FE) and Hausman test for FE and random effects (RE) models. Formally, the model is defined by the following expression:

$$V_{it} = \alpha + x_{it}\beta + v_i + \mu_{it} \quad (2)$$
$$\mu_{it} \sim IID(0, \sigma_\mu^2)$$

The subscript  $i$  represents each department in year  $t$ ,  $V$  is the dependent variable of violence,  $x$  is the vector containing the variables measuring

objective conditions,  $v_i$  is the unobserved individual effect,  $\mu_{it}$  is the error term, and  $\alpha$  could represent motivation, ability, genetics (micro data) or historical and institutional factors (department-level data).

With the aim to capture convergence effects in the level of violence as a dynamic framework, and given that the explanatory variables are likely to affect a violent act not only in the year the event of violence occurs but also in the following years, we consider the classical dynamic model (1) for panel data with individual fixed effects with the following equation:

$$V_{it} = v_i + \alpha V_{it-1} + x_{it}'\beta + u_{it} \quad (3)$$

$i = 1, \dots, N; t = 1, \dots, T$

In this equation,  $V_{it}$  is the dependent variable,  $v_i$  denotes the individual fixed effects,  $V_{it-1}$  is the lag of the dependent variable, and  $x_{it}$  is a p-vector of the exogenous covariates.

The fixed-effects estimator is not efficient because of lagged dependent variable bias, which biases the OLS estimate downwards. However, the fixed-effects estimator is consistent, and the bias is small for large samples. If the parameters differ over groups, there is a further heterogeneity bias, which can be addressed by estimating each equation individually and taking an average of the individual estimates (Pesaran and Smith, 1995).

The dataset used for this study is not large enough to use large-N large-T methods, so we use a Fixed-Effects Model (FEM), but we do introduce dynamic models. While there is a downwards, lagged dependent variable bias, the bias is likely to be small, and when computing the long-run coefficients, the biases are likely to offset each other, Dune (2011). To estimate the model consistently and efficiently, we use a Generalised Method of Moment (GMM) for dynamic panel data models.

The following tests will be estimated to determine the robustness of the estimations:

*a. Testing for heteroskedasticity*

A test for heteroskedasticity is used to estimate the error process that may be homoskedastic within cross-sectional units. This test calculates a modified Wald statistic for group-wise heteroskedasticity in the residuals of a fixed effects regression model.



*b. Testing for serial correlation*

Central to this procedure is Wooldridge's observation that if  $\epsilon_{it}$  is not serially correlated, then  $\text{Corr}(\Delta\epsilon_{it}, \Delta\epsilon_{it-1}) = -.5$ . Given this observation, the procedure regresses the residuals  $\hat{\epsilon}_{it}$  from the regression with first-differenced variables on their lags and tests that the coefficient on the lagged residuals is equal to  $-.5$  (Wooldridge, 2010; Drukker, 2003). The null is no serial correlation. Above, we fail to reject the null and conclude that the data do not have first-order autocorrelation.

*c. Fixed effects regression with Driscoll and Kraay standard errors*

To test for the heteroskedasticity problem or Cross-Sectional Dependence in the estimations with fixed effects, we use fixed effects regression with Driscoll and Kraay (1998) standard errors.

*d. Generalised Method of Moment (GMM)*

To examine the different categories of violence and their relationships with objective conditions, we employ the Generalised Method of Moment (GMM) for dynamic panel data models in this study to be a model consistent with and efficient enough to measure the trends of violence, economic development objective conditions over time.

This model is dynamic because the explanatory variable set includes a lag of the dependent variable and some explanatory variables that are potentially jointly endogenous in the sense of being correlated with the error term. Taking endogeneity into account, it applies lagged explanatory variables as internal instruments, where it controls for endogeneity by using GMM. Arellano and Bover (1995), Blundell and Bond (1998) encompass a regression equation in differences and levels, each one with its specific set of instrumental variables.

The instrumental variables allow driving two issues. First, it can resolve the problem of simultaneity and reverse causation by the likely endogeneity of the regressors used in this type of equation. Second, it reduces the estimation bias caused by the underreporting and homicide rates. The general regression model for the indicator of violence is as follows:

$$V_{i,t} = \beta_1 V_{i,t-1} + \beta_2 X_{i,t} + \eta_i + \mu_{i,t} \quad (4)$$

Equation (4) and a GMM procedure are applied to obtain consistent estimates of the variables of interest and to correct for bias caused by endogenous explanatory variables. A Sargan test of over-identifying restrictions is also applied to assess the overall validity of the instruments.

### **3. Discussion and Results**

This section provides estimates from the fixed-effects model, fixed effects with Driscoll and Kraay standard errors and the Generalised Method of Moment (GMM). This model was used to correct the heteroskedasticity problem, the cross-sectional dependence found in the models from Wald, Wooldridge and endogeneity tests. However, the results of the two estimations show the same coefficients and trends in the study of general violence and political violence as well as their relationships with objective conditions.

The results suggest that violence depends on various factors. Aggregate-level production per capita by department, employment and deterrence variables show a negative effect on violence, whereas the lagged dependent variable shows a positive effect on violence. Labour market and illegal drugs can show either a positive or negative effect depending on the analytical approach. Moreover, the objective conditions and their interrelationships have been important in the trends of violence in Colombian departments see tables 2 and 3.

The tests applied for estimated residuals with the fixed-effects models show heteroskedasticity and Cross-Sectional Dependence problems. To correct these problems, the model is estimated again using Driscoll and Kraay standard errors (1998) and implemented by Hoechle (2007). This estimation takes into account heteroskedasticity and Cross-Sectional Dependence problems. Moreover, this option allows correcting the auto-correlation of any order. Tables 2 and 3 show the estimations with corrections using fixed effects with Driscoll and Kraay standard errors and Generalised Method of Moment (GMM).

In the majority of models, the results of the lagged dependent variables show a positive and significant impact on violence and its categories, which should demonstrate the existence of inertia of violence over time, indicating that violence is persistent over time. Therefore, changes in crime rates tend to persist over time, even after the original causes of the change have disappeared (Fajnzylber, Lederman, and Loayza, 2000; Levinson, 2002).

### *3.1. Results of violence in Colombian departments*

Table 2 shows the results of violence measured by the rate of homicides, which show that the number of police officers has a negative and significant influence on violence, whereas illegal drugs, measured as hectares under coca cultivation, have a positive and significant influence on violence. The former results concur with those of Soares and Naritomi (2007) and Mousumi and Zakir (2009), who demonstrate that the number of police officers is associated with a reduction of incidences of violence. In the latter result, violence arises through the increased cultivation of coca or other illegal drugs (Angrist and Kugler, 2007; Hofmann, 2009).

Moreover, in the Colombian case, narcotics traffickers have generated a new set of values for Colombian society. This process is evidenced by the consumerism and the loss of institutional legitimacy that are reflected in the Generalised crisis of state authority suffered by the country in the mid-1980s and late 1990s. This crisis progressively destroyed all chances of institutional intervention because the drug traffickers are opposed to institutional loyalties of any kind and demonstrate that anyone can attain power through the use of violence (Camacho and Lopez, 2000).

By analysing violence with the homicide rate, the results show that the deterrence variables, GDP per capita and market labour variables all have negative effects on violence, whereas the lagged rate of homicides, population and illegal drug cultivation have positive effects on violence. The lagged rate of homicides, illegal drug cultivation, the population, the number of police officers, GDP per capita and employment per industry have the most significant effects on violence in Colombian departments.

These results demonstrate that violence is closely related to deterrence variables and to economic growth. Deterrence variables are determined by the state's presence because violence tends to correlate with critical variables such as a weak state presence and a lack of effective justice, which is consistent with the Colombian case (Chernick and Bailey, 2005). According to the World Bank (2007), in the context of Latin America, economic growth is impeded by the high levels of violence and insufficient opportunity. Therefore, violence increases when the application of justice is weak, economic opportunity is scarce, and education is deficient.

Table 2  
Results of estimations of violence measured as the rate of homicides

Parameter	Model (1)			Model (2)			Model (3)		
	FE	FEDK	GMM	FE	FEDK	GMM	FE	FEDK	GMM
Constant	7.637** (3.01)	7.637** (2.16)	2.850 (1.27)	5.990** (2.67)	5.990** (1.88)	2.899 (1.05)	6.078** (2.64)	6.078** (1.78)	2.451 (0.99)
Rate of homicides lagged one period	0.204** (3.18)	0.204** (1.41)	0.618** (5.35)	0.221** (3.27)	0.221** (1.47)	0.617** (5.07)	0.220** (3.24)	0.220** (1.50)	0.481** (4.15)
Population	0.824** (3.99)	0.824** (2.69)	0.052 (0.33)	0.603** (2.65)	0.603** (1.70)	0.050 (0.28)	0.597** (2.59)	0.597** (1.61)	0.115 (0.49)
GDP per capita	-0.791** (3.64)	-0.791** (3.17)	-0.077 (-0.19)	-0.488** (2.08)	-0.488** (1.69)	-0.074 (-0.17)	-0.474** (1.93)	-0.474** (1.51)	
GINI	4.186 (0.81)	4.186 (1.79)	0.623 (0.74)	1.241 (0.75)	1.241 (0.94)	0.630 (0.71)	1.405 (0.74)	1.405 (0.97)	0.392 (0.47)
Education	-0.00 (0.01)	-0.00 (0.01)	-0.048 (-0.38)	-0.199* (1.36)	-0.199* (1.05)	-0.048 (-0.37)	-0.201* (1.36)	-0.201* (1.05)	-0.119 (-0.98)
Employment rate	-0.662* (1.77)	-0.662* (1.56)	-0.500 (-1.23)	-0.252 (0.67)	-0.252 (0.55)	-0.497 (-1.17)	-0.263 (0.69)	-0.263 (0.54)	-0.428 (-1.09)
Employment per industry	-0.336** (2.07)	-0.336** (2.56)	-0.108 (-1.30)	-0.320** (1.82)	-0.320** (2.53)	-0.107 (-1.18)	-0.326** (1.82)	-0.326** (2.70)	-0.109 (-1.33)
Hectares under coca cultivation	0.036* (1.59)	0.036* (1.48)	0.053** (2.87)	0.071** (3.08)	0.071** (3.14)	0.053** (2.78)	0.071** (3.08)	0.071** (3.12)	0.038** (2.18)
Captures				-0.027 (0.47)	-0.027 (0.31)		-0.026 (0.44)	-0.026 (0.28)	-0.086 (-0.86)
Number of police officers				-0.271** (2.51)	-0.271** (2.71)	-0.003 (-0.03)	-0.261** (2.14)	-0.261** (3.12)	-0.062 (-0.56)
Budget execution			0.023 (1.20)			0.023 (1.09)			-0.287** (4.08)
Hectares under opium cultivation									0.030 (1.58)
F model	6.24	36.21		7.37	53.85		6.67	109.27	
F-test for OLS vs. FE						(Reject OLS)			
Hausman test*	0.00			0.00			0.00		
Wald test	0.00			0.00			0.00		
Wooldridge test	0.00			0.00			0.00		
Specification test (p-values)									
Sargan test			0.136			0.146			0.202
Second-order	238	238	238	228	228	228	228	228	228
No. Obs									0.318

Note: Generalised Method of Moments (GMM), Fixed-Effects (FE) and fixed effects models with Driscoll and Kraay standard error (FEDK). Significance in parentheses: \*, \*\*, \*\*\* imply significance at the 10%, 5%, and 1% levels, respectively. \* If Prob > chi² < 0.05, reject random effects. Source: own calculations.

### *3.2. Results of political violence in Colombian departments*

Economists working in this category of violence highlight the state's monopoly on coercion and force and see political violence as being related to the state's failure to maintain that monopoly (Solimano, 2004). The results show that deterrence variables, education, budget execution, GDP per capita and labour market variables have negative effects on political violence, whereas the lagged rate of political homicide, the population, the GINI coefficient, and illegal drug cultivation have positive effects on this category of violence (see Table 3).

The variables of economic growth, such as GDP per capita and budget execution, show negative and significant effects on political violence, whereas the GINI index shows a positive and significant effect. This implies that increases in economic growth are linked with decreases in political homicide rates but that departments with high levels of income inequality exhibit comparatively high political homicide rates (Messner, Raffalovich, and Shrock, 2002). In previous studies, high levels of political violence have been shown to cause an economic recession, impose financial constraints on the government, and damage the country's infrastructure (Li, 2006). Such findings are consistent with our results in the Colombian case.

The size of the population shows a positive correlation with violence. This may be true because departments with population heterogeneity have weak social ties, poverty and high population turnover, making them more conducive to violence. This explanation is applied by Schichor (1979) in the context of the U.S. and McCall and Nieuwbeerta (2007) in the context of European countries. The results of deterrence variables, measured as the number of police officers and the number of suspects captured, should indicate the importance of the presence of the state in decreasing violence. Moreover, violence reduces social investments that alter the development and economic growth of departments, decreasing the quality and conditions of life and generating more violence, which concurs with Nafziger, Stewart and Väyrynen (2000).

All findings reported in this paper are of particular interest in the formulation and development of social policies and strategies against violence to increase economic growth and development, productivity, and security for the population across all Colombian departments. These policies and strategies ought to include investments in education, increasing opportunities in the labour market, strengthening the justice system, and generating an effective state presence in all Colombian regions.

Table 3  
Results of estimations of political violence measured by the rate of political homicides

Parameter	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)			
	FE	FEDK	GMM	FE	FEDK	GMM	FE	FEDK	GMM	FE	FEDK	GMM
Constant	-4.61 (1.43)	-4.61 (1.76)	-6.00* (1.83)	-5.35** (1.57)	-6.30* (1.69)	-9.66*** (3.05)	-6.472* (1.73)	-6.472* (2.64)	-9.49*** (3.10)	-5.192 (1.36)	-5.192 (2.30)	-7.857** (2.52)
Political homicides lagged one period	0.415** (6.89)	0.415** (5.85)	0.414** (4.01)	0.424** (6.87)	0.420** (6.76)	0.423** (7.72)	0.418** (6.73)	0.418** (5.78)	0.412** (7.57)	0.419** (6.77)	0.419** (5.97)	0.417*** (7.68)
Population	0.938** (2.50)	0.938** (4.77)	0.469* (1.80)	1.062** (2.54)	1.258** (2.40)	0.743** (2.78)	1.260** (2.40)	1.260** (3.30)	0.801*** (3.11)	1.219** (2.33)	1.219** (3.11)	0.681*** (2.61)
GDP per capita	-0.491 (1.28)	-0.491** (3.27)	-0.027 (0.12)	-0.528 (1.36)	-0.547* (1.40)	-0.110 (0.67)	-0.537 (1.37)	-0.537 (2.43)	-1.76-07 (-0.61)	-0.602* (1.53)	-0.602* (2.53)	-2.1e-07 (-0.74)
Budget execution	-0.204* (1.81)	-0.204** (2.56)	-0.196* (1.66)	-0.221** (2.29)	-0.211** (1.81)	-0.202* (1.67)	-0.201* (1.76)	-0.201* (1.63)	-0.169 (-1.39)	-0.192** (1.85)	-0.192** (1.85)	-0.171 (-1.41)
Hectares under drug cultivation	0.090* (1.45)	0.090 (1.04)	0.312** (4.71)	0.097* (1.55)	0.092* (1.45)	0.289** (4.44)	0.094* (1.21)	0.094* (1.47)	0.289** (4.44)	0.097* (1.53)	0.097* (1.34)	0.277*** (4.28)
Captures				-0.070 (0.68)	-0.070* (0.32)	-0.000 (-1.78)	-0.141 (0.92)	-0.141 (0.72)	-0.000* (-1.82)	-0.142 (0.93)	-0.142 (0.74)	-0.000* (-1.79)
Number of police officers							-0.140 (0.62)	-0.140 (1.16)	-0.141 (0.93)	-0.141 (0.90)	-0.111 (0.90)	-0.115 (-0.76)
Education									-0.301** (-2.10)	-0.086 (0.56)	-0.086 (0.55)	-0.291*** (2.93)
GINI										27.41*	27.41*	42.67**
F model	13.23	12.67		11.08	11.85		9.53	18.42	8.35	19.85	7.78	14.90
F-test for OLS vs. FE									F(21, 188) = 1.37 (Reject OLS)			
OLS vs. FE				0.0013	0.0029		0.0029	0.0042	0.0042		0.0042	0.0042
Hausman test	0.0005			0.00	0.00		0.00	0.00	0.00		0.00	0.00
Wald test	0.00			0.00	0.00		0.00	0.00	0.00		0.00	0.00
Wooldridge test	0.00			0.00	0.00		0.00	0.00	0.00		0.00	0.00
Specification test (t-values)												
Sargan test			0.138			0.145			0.257		0.276	0.350
Serial correlation												
Firs-order	0.001			0.001	0.001		0.000	0.000	0.000		0.000	0.000
Second-order	0.590			0.590	0.655		0.675	0.675	0.849		0.849	0.942
No. Obs	266	266	266	266	266	266	266	266	266	266	266	266

Note: Generalised Method of Moments (GMM). Fixed-Effects (FE) and fixed effects models with Driscoll and Kraay standard error (FEDK). Significance in parentheses: \*, \*\*, \*\*\* imply significance at the 10%, 5%, and 1% levels respectively. If Prob > chi² < 0.05, reject random effects.  
Source: own calculations.

#### **4. Conclusions**

In this paper, we attempted to explain and analyse violence and political violence and their relationships with a set of objective conditions using a data panel model with fixed effects in the Colombian departments between 1993 and 2007. To examine the violence and political violence and their relationships with the objective conditions, we employ a panel data model with department-specific fixed effects and fixed effects with Driscoll and Kraay standard errors with the aim of capturing all of the characteristics specific to each department (e.g., the degree of level of development or economic growth).

We find that the aggregate-level production per capita, education, deterrence variables and the employment rate show a negative effect on violence, whereas the GINI coefficient and lagged rate show a positive effect on violence. Moreover, the objective conditions and their interrelationships are important factors influencing the trends of violence in the Colombian departments.

The results demonstrate that violence is closely related with deterrence variables and economic growth. Deterrence variables are determined by the state's presence, and violence tends to be correlated with critical variables such as a weak state presence and a lack of effective justice. Economic growth is impeded by high levels of violence and insufficient opportunities. Therefore, violence increases when the application of justice is weak, economic opportunity is scarce, and education is deficient.

In the case of political violence, the results show that deterrence variables, education, budget execution, GDP per capita and labour market variables have negative effects on political violence, whereas the lagged rate of political homicide, population, the GINI coefficient, and illegal drug cultivation have positive effects on this category of violence. These results indicate that increases in economic growth are linked with decreases in political homicide rates and departments with high levels of income inequality exhibit comparatively high political homicide rates.

The findings demonstrate the importance of generating social policies and strategies to decrease violence and to increase economic growth and development, productivity, and security for the population across Colombian departments. These policies and strategies ought to include investments in education, increasing opportunities in the labour market, strengthening the justice system, and generating an effective state presence in all Colombian regions.

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