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How Much Happiness is Caused by Lower Violence? Measuring Local Market Effects of Homicide Rates

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Abstract

This paper estimates the effects of violence on worker's and firm's welfare. My analysis proceeds in three steps. First, I estimate empirically the elasticity of violence on non-housing good prices, wages, and firm's profits, to then, combine them with a theoretical model, and quantify the welfare effects. This allows disentangling the effects of violence into its direct disutility effects and its indirect effects through changes in market prices. I use unique panel data at the firm level for Colombia throughout 1995 and 2010, when the country faced a 48% reduction on homicide rates, from 65.8 to 33.9, respectively. Using these data I exploit the geographical and annual variation of homicide rates to identify the effects of violence. I instrument violence with the interaction of U.S. international antidrug expenditures–which contributed to improve security conditions in Colombia–and a political competition index for 1946. The political competition index measures the intensity of a past violent episode known as *La Violencia* which historians point as the origin of the current violence spell in Colombia. I find that when homicide rates increase by 1% worker's welfare falls by 0.46%, and firm's profits decrease by 0.18%. Moreover, 96% of the effects of violence on worker's welfare are explained by changes on market prices, mainly driven by changes on non-housing living costs. My estimates suggest that the 48% drop in homicide rates that occurred in Colombia between 1995 and 2010 increased firm's profits by 8.64%, and blue and white-collars worker's welfare by 13.74% and 30.35%, respectively.

JEL Classification: D40, D60, D24, and J31.
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1 Introduction

Epidemic violence continues to be a challenge for most developing countries in Latin America, the Caribbean, and Africa. As of 2012, Southern Africa and Central America were the sub-regions with the highest homicide rates on record with averages over 25 victims per 100,000 population, followed by South America, Middle Africa and the Caribbean, with average rates between 16 and 23 homicides per 100,000 population (UNODC (2013)). Moreover, approximately 11% of global's GDP is spent annually to contain and address the consequences of violence in the world (Institute for Economics and Peace, IEP (2013)). However, little is known on the sensitivity of local markets to violence [1]. This is in part due to the scarce data availability in areas with enough violence and variation to identify any effects.

This paper estimates the effects of violence on worker's and firm's welfare. The contribution of this paper is three-fold. It provides a new theoretical framework to understand how firms and workers modify their decisions in response to local violence and how these responses are reflected in market prices, it quantifies the effects of violence on market prices using a novel and clean identification strategy, and it estimates the effects of violence on welfare by type of agent (i.e., firm, white or blue-collar workers) and by its direct and indirect effects. The direct effects of violence will correspond to the disutility effects on workers, whereas the indirect effects of violence, correspond to the welfare losses caused by changes in market prices. These findings are extremely relevant to guide public policy in designing programs to address and prevent the consequences of violence.

My analysis proceeds in three steps. First, I develop a model that enhances the standard trade framework of multiple regions proposed by Helpman (1998), Redding and Sturm (2008), Redding (2012), Loupias and Sevestre (2013) Allen and Arkolakis (2013) by combining it with traditional labor models formulated by Roback (1982), Rosen (1979), and extending it to include violence. The model presents a small open economy divided in municipalities that face different levels of violence. Violence induces higher costs for all firms, which in reality, can represent additional security and transportation expenditures, and it also, directly reduces worker's utility. I use this model to characterize the welfare impact of violence which is a function of the effects of violence on firm's profits and market prices.

I then estimate empirically the effects of violence on firm's profits and

[1] A detailed literature review is presented in section 2.

market prices using Colombian panel data on firms throughout 1995 and 2010. This is a relevant case because in the early 90s Colombia was the second most violent country (See Table 1) and it experienced 48% in homicide rates per 100,000 inhabitants between 1995 and 2010, from 65.8 to 33.9, respectively. This provides a unique opportunity for identification due to the strong geographic and time variation observed in violence during these years. Finally, I combine the empirical estimates and the theoretical model to quantify the welfare effects of violence.

I use two unique and rich data sets to carry out my empirical an analysis. Data on violence comes from the Observatory of Human Rights of the Colombian Vice Presidency. Data on firm's profits, and market prices comes from the *Encuesta Anual Manufacturera* [Annual Manufacturing Survey], collected by the *Departamento Nacional de Estadística*, the Colombian national statistical agency between 1995 and 2010. It is a census of all the manufacturing plants with ten or more workers or value of total output bigger than USD$95,000. In conjunction with the standard plant information, it contains data on all physical quantities and prices of each output and input used or produced by each plant. As is mentioned by Kugler and Verhoogen (2012), the availability of information on output and input quantities and prices for the entire population of manufacturing firms, makes the Colombian data unique and arguably better suited than any other for studying firm's price-related questions in any developing country.

To identify the effects of violence on firm's profits, non-housing prices, and wages, I exploit the time and geographic variation of homicide rates in Colombia between 1995 and 2010. To solve the endogeneity issues between firm's outcomes and violence I instrument violence with the interaction of U.S. international antidrug expenditures–which increased security expenditures in Colombia–and a political competition index for 1946. The index was collected for the immediate presidential elections prior to the episode of *La Violencia (1948-1958)* which historians point as the origin of the current violence spell in Colombia (e.g., Guzmán et al. (2006), Sarmiento (1985), Henderson (1984), Pécaut (2001), and Roldán (2002)). In particular, it has been widely documented that the current illegal armed groups were created as a consequence of the political discrepancies between the two main political parties that originated in *La Violencia (1948-1958)* and that they were originally located in areas with higher political competition. These groups originated and spread other forms of violence and crime in those areas since they funded their activities mainly through drug trafficking, extortion, predation of public resources, direct theft of natural resources, and *gramaje* a form of tax collected from drug producers in exchange for protection (Rabasa and Chalk (2001)). Thus, it should be expected that those areas with a higher political competition in 1946, where the illegal armed groups were first created, will have higher levels of violence today. Hence, my identification comes from the fact when security expenditures increase today areas with more political competition in 1946, and hence weaker institutions, reduce violence more proportionally today.

I rule out the two main threats to my identification strategy. First, I show that there are no time varying variables that have different effects in areas with different political competition in 1946 that may be correlated with the U.S. international antidrug expenditures. For example, this might occur if increments in U.S. international antidrug expenditures induce local governments in areas that had higher political competition in 1946 to crowd out other public expenditures. To do this, I show that there is no correlation between public expenditures and the interaction of the political competition index and the U.S. international antidrug expenditures throughout the period of analysis. I also control for 44 covariates (which comprises all the information available at the municipality level) in my regressions and find no sensitivity of the results to any of the controls.

Second, I show that areas with different levels of political competition in 1946 did not presented differential time trends before to 1946 which may account for the effects observed today. I do this showing to evidence of significant pre-time trends on general population, prices, and trade flows using the population censuses of 1912, 1918, 1928, and 1938 and historical information published in the Colombian historical statistical archives.

As an additional robustness exercise, I address the possible threat of non-random selection on firms entry and exit in my sample by using variations in the number days and local procedures necessary to open or close a firm in Colombia.

My results suggest that when homicide rates increase by 1% firms increase output prices by 0.68% to compensate for the additional security and transportation costs. Moreover, firms face a wage increase of 0.05% and a rise on other price inputs of 0.25%. Wages increase in response to worker's migration, whereas, higher input prices are explained by the output-input linkages between firms.

To check whether the increase in firm's output prices was traduced into an increase of non-housing living costs, I estimate the effects of violence on the 500 most consumed food products in the 53 biggest markets in Colombia. My estimates suggest that when homicide rates increase in 1%, real food prices increase by 0.59%. Hence, violence increases non-housing living costs. Moreover, my estimates on the effects of violence on wages by type of worker, suggest that there is only a wage compensation for white-collar workers (with an wage-violence elasticity of 0.1%).

I combine the empirical estimates and the theoretical model to quantify the effects of violence on welfare. I find an elasticity of worker's welfare with respect to violence of -0.46%, with different effects for white (-0.28%) and blue-collar workers (-0.63%). This suggests that violence widens the white-blue collar income gap. In addition, despite my estimates suggest that firm's are also harmed by violence–with an elasticity of profit's with respect to violence of -0.18%–the effects are half the of those experienced by workers. Hence, violence tends to disproportionately affect blue-collar workers relative to other types of agents.

When I decompose worker's welfare effects into the direct disutility effects caused by violence and the indirect effects induced by changes in wages and non-housing living costs, I find that the changes in market prices account for at least 94% of the welfare losses.

These elasticities suggest that the 48% drop in homicide rates experienced by Colombia between 1995 and 2010, increased firm's profit by 8.64%, white-collar worker's welfare by 13.74%, and blue-collar worker's welfare by 30.35%.

This paper is structured in 8 additional sections. Section 2 presents a review of the exiting literature, Section 3 describes the historical Colombian background, Section 4 presents the theoretical model, Section 5 describes the data, Section 6 presents the empirical strategy, Section 7 presents the results, and finally, the last section offers some concluding remarks.

2 Literature on the Consequences of Violence

The literature on the economic consequences of violence can be roughly divided into three groups. The first group focuses on identifying the effects of violence on aggregate economic variables. Many of these studies used cross country data on internal conflict or terrorism and identify, in general, negative effects of violence economic activity, with regional heterogeneity on the intensity of the effects, and evidence of a quick recovery once violence is reduced. One of the pioneer examples Collier (1999), uses a cross country regression for 93 countries between 1960 and 1999 to study the effects of civil conflict onset. The author concludes that countries experiencing armed conflict have a 2.2% lower growth of GDP per capita, and that, a conflict of approximately 5 years of duration reduces GDP per capita by 30%. Some additional notable examples are Organski and Kugler (1977), Alesina and Perotti (1996), Imai and Weinstein (2000), Murdoch and Sandler (2004), Hoeffler and Reynal-Querol (2003), Blomberg and Mody (2005), **?**, Busse and Hefeker (2007), Abadie and Gardeazabal (2008), Justino and Verwimp (2008), and Cerra and Saxena (2008).

A potential short coming of the cross country evidence is that violence within different nations may be different in nature, which creates problems when comparing experiences and interpreting results. As a consequence, other studies have focus on within country variation with mixed results which are dependent on the type of violence that is analyzed. For instance, the evidence on the effects of terrorism and internal conflict points to negative effects on economic growth and foreign direct investment (see for example D'Addario (2006), Arunatilake et al. (2001), Deininger et al. (2003), and Pshiva and Suarez (2006)). One notable contribution by Abadie and Gardeazabal (2003) studies the effects of the terrorist attacks to the Basque country. Their results suggest that as a consequence of the outbreak of terrorism in the late 1960s per capita GDP declined about 10% relative to a control region without terrorism. In contrast, recent evidence on the effects of international wars on economic growth points to insignificant long term effects on economic activity (e.g., Davis and Weinsten (2002) and Miguel and Roland (2011)).

The second group of studies, analyzes the effects of violence on individual outcomes, such as health and education using panel data. Some notable examples are Blattman and Annan (2010), Camacho (2008), and De Groot and Göksel (2009). They find evidence of negative effects of any type of violence on the exposed population. In particular, individuals that are exposed to violence in the early stages of their lives tend to be more sensitive to violence.

The third category of literature studies the effects of violence on local markets through its effects on workers, prices, and firms. Regarding worker's responses to violence there is an ample literature in urban economics that considers violence as a city amenity, and as such, applies the traditional analysis by Rosen (1979) and Roback (1982) to understand how workers and wages can react to higher levels of violence. It suggests that workers need to be compensated with higher wages to stay in areas with higher violence, otherwise, they will migrate in the absence of mobility costs. Yet as of today, the wage-violence elasticity has not been credibly measured nor has it been determined whether there are heterogeneous effects of violence by type of worker. Other studies focus on identifying the effects of violence on labor force participation and migration. In particular, Lehrer (2008), Gallegos (2012), and Menon and van der Meulen Rodgers (2013) find evidence of positive effects of violence on female labor force participation; and Ibánez and Moya (2010) and Engel and Ibáñez (2007) suggest strong migration effects of violence on the most vulnerable population.

Concerning the effects of violence on market prices much of the efforts have been directed at studying the effects of urban crime on property prices–e.g., Thaler (1978), Hellman and Naroff (1979), Lynch and Rasmussen (2001), Bowes and Ihlanfeldt (2001), Gibbons (2004), and Linden and Rockoff (2008). Most of these studies report a negative elasticity of house property prices with respect to urban crime that ranges between -0.12% to -4%, with an average value of -1.16%[2]. However, there is little empirical evidence on the effects that violence may have on non-housing goods prices, which is one of directions in which this paper aims at contributing.

Related with the literature that studies the effects of violence on firm's outcomes, some papers have focused on firm's stock market returns and exit decisions assuming homogeneous effects finding negative effects Alesina and Perotti (1996), Abadie and Gardeazabal (2003), Fielding (2003), Singh (2013), Camacho and Rodriguez (2013), and Collier and Duponchel (2010)). On contrast, other papers attempt to identify the heterogeneous effects of violence. For example, Guidolin and La Ferrara (2010) study the effects of the end of the Angolan civil war on stock market returns of firms operating in the diamond sector. The authors find that the sudden death of the rebels' leaders—which marked the end of the civil war—was detrimental for incumbent firms because violence acted as a barrier to international competition. Moreover, Klapper et al. (2013) tests for heterogeneous effects of internal conflict on productivity between domestic and foreign firms in Cote d'Ivoire. His results suggest that foreign-owned firms are more sensitive to conflict. Finally, Mihalache (2006) uses a cross country survey to identify the sectors in which investors perceived political violence as more

[2]See Appendix B for a detailed list of the point estimates of these studies.

threatening. His results suggest that firms that use tangible assets and can substitute foreign affiliate locations more easily, tend to perceive political violence as less threatening. However, so far, there has been no attempts to understand how firms change their decisions in response to violence and how those responses may affect local prices. This is another dimension in which this paper seeks to contribute.

In sum, this paper contributes to the literature on the consequences of violence by first presenting a framework to understand theoretically how firms and workers modify their decisions in response to violence, and how those responses may affect profits, non-housing prices, wages, and ultimately welfare; second, it estimates empirically the magnitude of these effects; and finally, it identifies which types of workers and firms are more sensitive to violence. Our better understanding of how violence affects local markets is extremely relevant to guide public policy in addressing the consequences of violence.

3 Historical Background

During the last 60 years, violence all across Colombia has been traditionally fuelled by the armed conflict between the left-wing guerrillas, right-wing paramilitaries, and the Colombian government. Despite the fact that direct confrontation between the actors has traditionally take place in the rural areas with scarce governmental presence, the conflict has spread other forms of violence and crime all across the country. This occured because these groups funded their activities mainly through drug trafficking, extortion, predation of public resources, direct theft of natural resources (mainly gold and oil), and *gramaje* a form of tax collected from drug producers in exchange for protection (Rabasa and Chalk (2001)).

In particular, it has been widely documented by several historians–e.g., Guzmán et al. (2006), Sarmiento (1985), Henderson (1984), Pécaut (2001), and Roldán (2002)–that the origins of the current violence spell in Colombia can be traced back to the 1960s, a period of strong violence between the two traditional political parties known as *Conservadores* and *Liberales*, that later became to be known as *La Violencia* (Guzmán et al. (2006)).

Before *La Violencia* tensions between the *Liberales* [liberals] and *Conservadores* [conservatives] were increasing in several areas of the country after Mariano Ospina, the leader Conservative, was elected as president as consequence of the division of the liberal's force between two different candidates (Guzmán et al. (2006), Bailey (1967), and Booth (1974)). Hence, liberals began resenting the government and initiated an armed resistance in some areas of the country between 1946 and 1948. For their part conservatives took all public positions and polarized the national authorities against liberal forces. In April of 1948, the liberal's leader, Jorge Eliecer Gaitán, was assassinated escalating dramatically the hostilities between parties. Although an amnesty was declared between parties in 1953, and most of the armed groups were disarmed, the economic conditions in which combatants were left afterwards and the low support they received to reintegrate into society, facilitated the creation of new illegal armed groups.

In particular, in 1964 adherents of the cuban-style revolution founded the National Liberation Army (ELN, for its initials in Spanish). Later, in 1966, a second left-wing group called the Revolutionary Armed Forces of Colombia (FARC, for its Spanish name) was founded as the union of all the remaining communist guerillas. Initially, both groups claimed to fight defending the interests of the rural poor and aimed at overthrowing the government and install a Marxist regime. However, in last decades, both groups have become widely economically motivated (Dube and Vargas (2013)).

Paramilitarism began in the late 1980s as an anti-insurgent response of land-owners and drug traffickers to the left-wing guerilla's actions in areas where the state was unable to provide security. In 1997, the paramilitary forces coalesced into the United Self-Defense Organization of Colombia (AUC, for its Spanish name). By 2003, the AUC declared a partial cease of fire and some paramilitary blocks agreed to participate in a 'disarming program' that concluded in 2005. However, many of the combatants that were part of the AUC fused later into new criminal groups that are known today as *Bandas Criminales* (BACRIM, for its name in Spanish).

According to Rabasa and Chalk (2001), by 2000 the left-wing guerillas grouped around 20,000 men and the right-wing paramilitaries had around 8,000 fighters. Moreover, according to the Colombian Ministry of Defense by 2000, between the military and police, the government employed around 300,000 men. This number increased to 440,000 men for 2010.

4 Model Setup

This section presents a spatial model of workers and firms that provides a framework to understand the effects of violence on local markets, which I use to quantify its welfare implications. The model combines simple ingredients previously presented in the trade and local labor markets literature and extend them to include violence. Specifically, I combine spatial trade models by Helpman (1998), Redding and Sturm (2008), Redding (2012), Loupias and Sevestre (2013), and Allen and Arkolakis (2013) with labor supply models formulated by Roback (1982), Rosen (1979), and more recently by Serrato and Zidar (2014).

The model is setup on a small open economy divided in small municipalities that face different levels of violence[3]. Each municipality is composed by workers and firms and is endowed with H_m quality adjusted housing units. Higher violence reduces worker's utility and induces higher costs for all firms, which in reality, can represent additional security and transportation expenditures.

4.1 Firm's Problem

Following the seminal work by Dixit and Stiglitz (1977) and Melitz (2003) each firm j is a monopolistic competitor producing a unique differentiated product. Here their framework is extended so that each firm employs labor (L) and other firm's outputs (Y_{-jmt}), as inputs of production. Output-input linkages between firms are introduced following the framework proposed by Jones (2011).

Firms are immobile across locations and face different violence intensity v_{mt}, depending on the municipality where they are located[4]. Violence increases their costs through additional transportation and security expenditures. Hence, at the beginning of each period t, each firm j, located in municipality m, chooses its production Y_{jmt} to solve:

$$\max_{Y_{jmt} \geq 0} \left[P_{jmt} Y_{jmt} - C(Y_{jmt}, v_{mt}) \right] \tag{1}$$

[3]Violence is assumed to be exogenous for modeling purposes but the empirical section will account for this issue.

[4]This assumption follows the behavior observed in the Colombian data where firm's mobility between municipalities accounts only for approximately 2% of the sample.

where P_{jmt} represents the price of the firm's output, $C(Y_{jmt}, v_{mt})$ are the firm's costs; and L_{jmt} stands for the units of labor employed by the firm. Following Acemoglu (2002) it is assumed that the production function has a constant elasticity of substitution given by:

$$Y_{jmt} = [\gamma(L_{jmt})^{\sigma} + (1-\gamma)(Y_{-jmt})^{\sigma}]^{1/\sigma} \tag{2}$$

and

$$Y_{-jmt} = [\int_{k\epsilon\{\Omega_m - \{j\}\}} (Y_{kmt})^{\alpha} dk]^{1/\alpha} \tag{3}$$

where Ω_m represents the total mass of firms in each municipality. Given this setup and assuming an interior solution, all firms maximize their profits where they have a constant mark-up of production:

$$P_{jmt} = [\frac{\epsilon}{1+\epsilon}] MC(Y_{jmt}, v_{mt}) \tag{4}$$

where ϵ represents the elasticity of demand and MC stands for the firm's marginal costs.

Finally, at the end of each period changes in profits induce firms to entry and exit the market until the free-entry condition is met, that is where:

$$\Pi_{jmt} = 0, \qquad \forall\, j,\, m, and\, t \tag{5}$$

4.2 Worker's Problem

Workers are mobile and face different levels of violence according to their location. For workers violence acts as a municipality amenity and reduces utility. In practice, the disutility created by violence can represent the higher probability of getting harmed, or the stress experienced by individuals when they have a higher exposure to more violent environments.

At the beginning of each period t, each worker i, located in municipality m, maximizes utility over housing (h_{imt}) and a composite good (C_{imt}) facing wages (w_{mt}), rents (r_{mt}), and non-housing good prices (P_{mt}) as follows:

$$\max_{C_{imt}\geq 0, h_{imt}\geq 0} U(C_{imt}, h_{imt}, v_{mt}) \qquad s.t. \qquad P_{mt}C_{imt} + r_{mt}h^s_{imt} = w_{mt}l + F \tag{6}$$

with:

$$C_{imt} = [\int_{j\epsilon\{\Theta_m\}} (c_{jmt})^{\rho} dj]^{1/\rho} \tag{7}$$

$$P_{mt} = [\int_{j\epsilon\{\Theta_m\}} (p_{jmt})^{\delta} dj]^{1/\delta} \tag{8}$$

where l represent the hours worked, which for simplicity, are assumed to be supplied inelastically[5]; and F represents non-labor income. In this model, F comes via lump-sum transfers of the total revenue collected through housing rents where ownership is symmetrical across individuals. The mass of available goods in each municipality is denoted by Θ_m. As is usual $U(.)$ is assumed to be thrice continuously differentiable, strictly increasing, and strictly concave.

Following the compensating wage differential model in Rosen (1979), Roback (1982), and more recent applications for spatial models by Serrato and Zidar (2014), at the end of each period, given the prices, the violence intensity, the attractiveness of an outside option ($\bar{V}$), and on the moving costs (m) workers decide to move. Formally, the moving decision can be expressed as:

$$Move_{imt} = I[V^s(P_{mt}, w_{mt}, r_{mt}, v_{mt}) < \bar{V} - m] \tag{9}$$

where $V(.)$ represents the indirect utility of each worker, and the outside option is given by: $\bar{V} = V(\bar{P}_t, \bar{w}_t, \bar{r}_t, 0)$. Here the bars denote the average estimated across all the municipalities of the economy for each period t. Hence, when violence changes **individuals move until**:

$$V(P_{mt}, w_{mt}, r_{mt}, v_{mt}) = \bar{V} - m, \qquad \forall\, m\, and\, t \tag{10}$$

4.3 The Incidence of Violence on Welfare

Given the model above the effects of violence on worker's welfare can be approximated by changes on their indirect utility, and the effects on firms, can be estimated through its effects on firm's profits. The following proposition describes the expected responses by type of agent. The formal proof of these results is presented in Appendix A.

[5] Inelastically supplied labor is a common assumption in local labor markets such as Rosen (1979) and Roback (1982). More recent examples can be found in Enrico (2011).

Proposition 1. *If the assumptions above hold, then:*

1. *the welfare change induced by violence* $\forall$ *types of workers can be expressed as:*

$$\frac{dV_{imt}}{dv_{mt}} = \underbrace{\frac{\partial V_{imt}}{\partial P_{mt}}\frac{\partial P_{mt}}{\partial v_{mt}} + \frac{\partial V_{imt}}{\partial w_{mt}}\frac{\partial w_{mt}}{\partial v_{mt}} + \frac{\partial V_{imt}}{\partial r_{mt}}\frac{\partial r_{mt}}{\partial v_{mt}}}_{\text{Market/Indirect effects}} + \underbrace{\frac{\partial V_{imt}}{\partial v_{mt}}}_{\text{Direct disutility effects}} \tag{11}$$

   where:

$$\frac{dP_{mt}}{dv_{mt}} \geq 0, \qquad \frac{\partial w_{mt}}{\partial v_{mt}} \geq 0, \qquad \frac{\partial r_{mt}}{\partial v_{mt}} \leq 0 \tag{12}$$

2. *By the Envelope theorem the change on firm's welfare can be expressed as:*

$$\frac{d\Pi_{jmt}}{dv_{mt}} = -\frac{\partial C(.)}{\partial v_{mt}} \leq 0 \tag{13}$$

   which drives firms to exit until the free-entry condition is met, that is until:

$$\frac{dExit_{jmt}}{dv_{mt}} \geq 0 \tag{14}$$

First, Proposition 1 predicts that when violence is higher firms increase output prices to offset the higher costs they face. Given the output-input linkages between firms, the increase in output prices will be more than proportional to the increase in input prices perceived by each firm. Moreover, in response to worker's migration, wages will increase and housing prices will fall given the fixed housing supply within each municipality. Hence, the effects of violence on worker's welfare can be decomposed on the direct disutility created by violence and on the indirect effects due to the effects of violence on market prices.

Second, the proposition predicts that the effects of violence on firm's welfare can be approximated by the changes induced on firm's profits which are negatively correlated with violence levels. In particular, higher levels of violence reduce profits which induces firms to exit the market until the free entry condition is met.

Equations (11) and (13) are the center of my empirical estimates. Specifically, I first identify the effects of violence on market prices and firm's profits, to then use these estimates and a parametric assumption on the utility functional form, and quantify equation 11.

5 Data

5.1 Data on Violence

Data on violence is available annually by municipality between 1995 and 2010 and comes from the Observatory of Human Rights of the Colombian Vice Presidency. I use intentional homicide rates per 100,000 inhabitants as a measure of violence because they are available for a longer period of time and for all of the municipalities in the country. This is hardly the case for any of the other indicators.

Figure 1 presents the time evolution of intentional homicide rates for the period of interest. It shows that despite the fact that violence was high around 1995—when Colombia was the second most violent country (see Table 1)–it was drastically reduced after 2002 with the election of Álvaro Uribe as president, whose main priority was to improve the security conditions across the country. In particular, between 2002 and 2010 homicide rates declined by 48%, from 65.74 to 33.97 homicides per 100,000 inhabitants, respectively.

Figure 2 presents the geographic distribution of intentional homicide rates for 2002 and 2011, the years before and after the sharp decline in violence. The figure suggests that the reduction on violence that took place in the late 2000s was focused on the center of the country. This occurred since Bogota (the capital city) is located in the center and security conditions were improved more rapidly around it. Moreover, the figure confirms that intentional homicide rates had strong geographic variation during the period of analysis.

5.2 Data on Prices

Data on output prices, input prices, and wages comes the *Encuesta Anual Manufacturera* [Annual Manufacturing Survey], collected by the *Departamento Nacional de Estadística*, the Colombian statistical agency. The data set is a census of all the manufacturing plants with ten or more workers or value of total output bigger than 65 million of 1992 Colombian pesos (approximately USD$95,000). Once a plant is included in the survey, it is followed over time until it goes out of business. Moreover, all multi-plant firms are included even if only one of them satisfies the selection criteria. The dataset is an unbalanced panel data of approximately 16016 firms (16776 plants) for the period between 1995 and 2010, which amounts to a total of 124,247 observations.

The census contains information on their geographic location by municipality, firm's characteristics and production/cost variables. Specifically, in conjunction with the standard plant information, it contains information on all physical quantities and prices (valued at factory-gate prices) of each output and input used or produced by each plant. In this paper, I refer to prices as the plant-product-year observation estimated by dividing the value of revenues or expenditures by physical quantities. Table 2 presents the descriptive statistics of the survey for 1995 and 2010, respectively.

As mentioned by Kugler and Verhoogen (2012) the fact that there is information on inputs and output for the entire population of manufacturing firms with 10 or more workers makes the Colombian data unique, and arguably better suited for studying firm's price-related questions than any other developing country.

All variables expressed in monetary terms (except wages) were transformed into real values using a producer price index generated for each firm using 1995 as a base year[6].

6 Empirical Strategy

My empirical analysis proceeds in two parts. First, I estimate the effects of violence on market prices and firm's profits, to then use these estimates to quantify the effects of violence on worker's welfare using equation (11) and a parametric assumption on the utility functional form.

To estimate the effects of violence on market prices and firm's profits I exploit the geographic and annual variation of homicide rates observed by municipality[7]. The standard deviation of homicide rates by municipality for each year is presented in Figure 3. It confirms that there is an strong

[6]The index was constructed using a Laspeyres methodology.

[7]Colombia is divided in 1,119 municipalities, they are the equivalent to a U.S. county.

geographic variation on violence throughout the period of interest. Because I observe the municipalities where firms are located, their exposure to violence corresponds to the homicide rates observed in that area. Formally, the specification of interest is given by a latent variable model of the form:

$$log(y^*_{jmt}) = \gamma_0 + \gamma_1 log(v_{mt}) + k_j + g_t + \epsilon_{jmt} \tag{15}$$

$$y_{jmt} = s_{jmt} y^*_{jmt} \tag{16}$$

where y_{jtm} represents firm's profits, output prices, or wages of firm j at year t located at municipality m; v_{mt} is the violence in year t and at municipality m; ϵ_{jmt} is the error term; and s_{jmt} is an indicator variable that takes the value of one when the firm is in the market and zero otherwise. Note that y_{jmt} is only observed when $s_{jmt} = 1$. Finally k_j and g_t are fixed effects by firm and year.

The identification of γ_1 is challenging given the endogeneity concerns between violence and the dependent variables because areas with different violence intensities also have different characteristics that induce time-feedback effects. For instance, for the case of firm's profits time-feedback effects may take place in two different directions. First, when production is high economic conditions may improve inducing less poverty, less violence, and hence, better economic conditions as is documented by Miguel et al. (2004) and Miguel and Satyanath (2011). This is the so-called *grievance* channel as defined by Collier and Hoeffler (2004). It implies that high-production areas tend to be less violent, whereas low-production areas tend to be more violent. Moreover, it suggests that this gap in violence and production increases in time. On contrast, as suggested by Dube and Vargas (2013), a rise in contestable income, via an increase in production, may also increase violence by raising gains from income appropriation. This is the so-called *greed or rapacity* channel which suggests that violence may be equally important in areas with high and low production.

For the case of market prices time-feedback effects tend to increase prices in areas with low and high levels of violence despite their different causes. For instance, areas with high levels of violence tend to have weaker institutions and less population agglomeration. Hence firm's costs are higher which is reflected in higher output prices [8]. In turn, higher prices reduce

[8] Assuming the firms that cannot increase prices will face negative profits and exit the market.

consumer's purchasing power and further fuel violence as is documented by Miguel et al. (2004) and Miguel and Satyanath (2011).

Now consider the situation in an area with low violence, where there is high institutional presence and high agglomeration. High agglomeration drives rents up and only individuals with higher willingness to pay can stay there so firms have incentives to increase prices. In turn, higher prices induce selection so that only the wealthiest individuals tend to stay. Because the wealthiest individuals are also likely the most educated, violence is further reduced.

Hence time-feedback effects may reduce the differences on firm's profits, output prices, and wages between areas with different intensity on violence. To solve for endogeneity I estimate the following specification through instrumental variables:

$$log(y_{jmt}) = \gamma_0 + \gamma_1 log(v_{mt}) + k_j + g_t + \epsilon_{jmt} \tag{17}$$

$$log(v_{mt}) = \theta_0 + \theta_1 z_{mt} + k_j + g_t + u_{jmt} \tag{18}$$

where y_{jmt} represents the outcomes of firm j, located in municipality m, at year t, v_{mt} represents observed violence in year t and municipality m, z_{mt} is the instrument for violence and k_j and g_t represent firm and time fixed effects.

6.1 Instrumenting Violence: Political Competition in 1946

It has been widely documented by several historians–e.g., Guzmán et al. (2006), Sarmiento (1985), Henderson (1984), Pécaut (2001), and Roldán (2002)–that origin of the current violence spell in Colombia can be traced back to the 1960s, a period of strong violence between the two traditional political parties known as *Conservadores* [conservatives] and *Liberales* [liberals], that later became to be known as *La Violencia* (Guzmán et al. (2006)) and lasted between 1948 and 1958.

As was documented in the historical background section of this paper, the current illegal armed groups were created in the 1960s as a consequence of *La Violencia* and were initially located in areas with higher political competition between traditional parties. Moreover, those groups have greatly increased and spread other forms of violence by funding their activities with drug trafficking, extortion, predation of public resources, and direct theft of natural resources (Rabasa and Chalk (2001)). Hence, it should be expected that areas that had a higher political competition during *La Violencia* will have higher levels of violence today. Exploiting this idea, I instrument homicide rates with a political competition index for 1946, which corresponds to the closer presidential elections prior to the crisis of *La Violencia*.

The theoretical relation between political competition and violence has been studied recently by Chacón et al. (2011) and Dunning (2011). The authors show that when institutions are weak, and several groups fight for power, democracy in peace is easier to achieve when one group is dominant. Otherwise, although both groups have higher chances of wining the elections, they also have higher likelihood of success on challenging the election results through armed actions.

The political competition index that I use was constructed by Chacón et al. (2011) with information from the presidential election results of 1946 by municipality. It was constructed using the following formula:

$$PC_m = 1 - \frac{|\%\text{Liberal votes}_m - \%\text{Conservative Votes}_m|}{100} \tag{19}$$

thus, PC_{mt} takes values between zero and one. Zero corresponds to the case where one of the political parties had the absolute majority and one corresponds to the case of extreme political competition (equal vote share in each party). The index is available for 755 of the 1,119 Colombian municipalities and has a mean value of 0.5.

To create time variation on the instrument, I interact the political competition index with the U.S. international antidrug expenditures in millions of dollars of 1995. According to the annual budget of the Office of National Drug Control Policy of the White House (ONDCP) between 1995 and 2010 the U.S. disbursed 18.27 billion dollars to reduce the international supply of illegal drugs. The time evolution of these expenditures in real values is presented in Figure 4. Because between 1990 and 2000 Colombia produced more than 50% of the world's cocaine[9], the country received 30% of those resources each year between 1995 and 2010. In particular, according to the data published in the annual budget summary of ONDCP between 1995 and 2010 Colombia received 5.4 billion dollars to improve security condi-

[9]See the annual World Drug Reports by the United Nations Office of Drugs and Crime.

tions. Hence, for each municipality my instrument is constructed as:

$$PC_{mt} = PC_m * US - IAE_t \tag{20}$$

where $US - IAE_t$ represent the U.S. international antidrug expenditures in millions of dollars of 1995. By using this instrument, my identification comes from the fact that areas with higher political competition in 1946, have weaker institutions today, and hence, are expected to be more sensitive to expenditures in security.

Evidence on the correlation between violence and the instrument is presented in Figures 5 and 6. Figure 5 presents a fitted linear regression of the mean value of homicide rates against deciles of political competition for 1946. The sample used to construct this figure includes the homicide rates across the whole period of study, yet, the same behavior can be replicated for each year between 1995 and 2010. The figure suggests that areas that faced a higher political competition in 1946 are more violent today. Moreover, Figure 6 presents the same exercise for years with different levels of U.S. international antidrug expenditures. It suggest that the positive relation between violence today and political competition in 1946 holds for all years, and that, the areas that had a higher political competition in 1946 tend to react more quickly to increases in security expenditures.

A formal test on the correlation between the instrument and violence, is presented in Table 3. The table presents the results of the first stage regression of the logarithm of homicide rates on PC_{mt} including fixed effects by firm and year. The table shows the estimates of three regressions: column (1) present the first stage regression using PC_{mt} as instrument, and columns (2) and (3) present the results of the regression using each PC_m and $US - IADE_t$ as instruments. The two last columns are presented to show the individual contribution of each variable towards the instrument.

The results for column (1) confirm that the relevance assumption is satisfied. The coefficient on the instrument has a negative sign and is statistically significant. It suggests that municipalities with a higher political competition index for 1946 are more sensitive today to increases in security conditions. The partial R^2 is 8% and the F-test for excluded instruments takes a value of 86.07[10]. Hence, these estimates rule out concerns of finite sample bias due to weak instruments as defined by Bound et al. (1995).

[10]For the case of a single endogenous regressor, Staiger and Stock (1997) suggest rejecting the hypothesis of weak instrument if this F-statistic is higher than 10.

Moreover, the estimates in columns (2) to (3) confirm that each of the variables has good predictive power on violence and affect it in the expected direction. In particular column (2) suggests that homicide rates are higher today in municipalities that had a higher political competition index in 1946, whereas column (3) shows a negative effect of U.S. antidrug expenditures on homicide rates.

The second assumption that must be satisfied for the validity of my identification strategy is the exclusion restriction[11]. Because the estimates include fixed effects by year and firm, my identification strategy will not be threatened by static differences between areas with different political competition or time trends. A violation of the exclusion restriction will only occur if there is some variable changing in time correlated with the U.S. international antidrug expenditures that affects differently areas with high and low political competition.

For example, the exclusion restriction will be violated if when U.S. international antidrug expenditures are high the government crowds out other expenditures in different proportions in areas with different political competition. To test this I run a regression of public expenditures on the instrument. The results are presented in table 4 and suggest no correlation of the instrument with total public expenditures, education public expenditures, health public expenditures, or any other type of public expenditures.

To present further evidence on the validity of the exclusion restriction, I control for the 44 covariates available by municipality in the final estimates and find no sensitivity of the results to these sensitivity check. The covariates can be grouped into: i) demographics (e.g., population by sex and age and interactions between these variables), ii) income (e.g., tax and non-tax income collected by the municipalities by type), iii) public expenditures by type, and iv) other variables (i.e., school enrollment and rain). A detailed list of the 44 covariates used as controls is presented in Appendix D. The estimates including the controls are presented in Tables 8, 9, and 12.

Another possible threat to the identification strategy is the existence of previous time pre-trends between areas with different political competition. I address this concern in Figure 7 by showing that there were no systematic differences in population growth between these areas using information from the population censuses of 1912, 1918, 1928, and 1938[12]. This is a strong

[11] A violation of the exclusion restriction will occur if $E[\epsilon_{jmt} PC_{mt} | k_j, g_t] \neq 0$, where each of the variables has the same definition as in equation 15.

[12] The data was digitized from the information available at the *Anuarios de Estadística*

test, since no differences in the population growth will indicate no comparative advantages of living in one of these areas (i.e., hence no differences in institutional development, economic growth, etc.), otherwise, assuming no mobility restrictions, people will migrate to areas that show competitive advantages.

In addition, I check for differences in time pre-trends on the other ten covariates available for the period between 1940 and 1945 by municipality[13]. To check for time pre-trends in any of these variables I run a regression of each of these covariates into an indicator variable that takes the value of one for all the municipalities with political competition higher than 0.5 and year interactions. If there are no pre-time trends these interactions should not be significant. Table 5 presents the results and confirms the expected behavior. This finding is not surprising. Specifically, economic historians have mentioned that the political violence around 1946 was not correlated to socio-economic or geographic characteristics. For instance, after compiling evidence for several years throughout the country on the causes of *La Violencia* Guzmán et al. (2006) mention that: '...the violence during those years did not respected race or economic status, it took place in regions of minifundia or latifundia, among the prosperous and the miserable, in deserts and plains, and in the valleys and mountains'.

6.2 Accounting for Non-random Selection on Firm's Entry and Exit

Any estimates on the effects of violence on firm's outcomes will be threatened by non-random selection, because firms exit and enter the sample each period and those firms are systematically different that the ones that stay in the market. In particular, the most sensitive firms to shocks tend to exit, whereas the least sensitive firms to shocks tend to enter. Hence, the estimates that do not account for non-random selection will be biased towards zero.

In the empirical results I will present the estimates of the instrumental variables regression that only accounts for the endogeneity, and also, the estimates that account for both endogeneity and selection. To solve

General collected by the *Contraloría General de La República* published on 1932 and 1946 (see DCG (1932) and DCG (1946)).

[13]Their source is also the *Anuarios de Estadística General* collected by the *Contraloría General de La República*

both issues and have an identified model, three instruments are needed. One instrument will be used to solve the endogeneity between violence and firm's outcomes, and the other two to solve non-random selection on entry and exit. All instruments should satisfy the exclusion restriction given by $corr(Instrument_{jmt}, \epsilon_{jmt}|k_j, g_t) = 0$, and the so-called relevance assumption, as defined by Imbens and Angrist (1994), Abadie (2003) and Angrist et al. (1996), that requires a strong correlation between violence and the instrument.

Let Z_{jmt} represent a 1x3 vector of the instruments that satisfy the exclusion restriction and the relevance assumption. I use a procedure that follows closely the methodology proposed by Semykina and Wooldridge (2010) to correct for endogeneity and selection when using unbalanced panel data to obtain γ_1 [14]. My main estimates will come by estimating the following specification through instrumental variables:

$$log(y_{jmt}) = \gamma_0 + \gamma_1 log(v_{mt}) + P^k(\hat{\lambda_{jmt}}^{entry})\Gamma_2 + P^k(\hat{\lambda_{jmt}}^{exit})\Gamma_3 + k_j + g_t + \epsilon_{jmt} \quad (21)$$

$$log(v_{mt}) = \theta_0 + Z'_{mt}\Theta_1 + P^k(\hat{\lambda_{jmt}}^{entry})\Theta_2 + P^k(\hat{\lambda_{jmt}}^{exit})\Theta_3 + k_j + g_t + u_{jmt} \quad (22)$$

where y_{jmt} represents the outcomes of firm j, located in municipality m, and at year t; v_{mt} represents observed violence in year t and municipality m; k_j and g_t represent firm and time fixed effects; $P^k(.)$ is a polynomial degree k; and $\hat{\lambda_{jmt}}^{entry}$ and $\hat{\lambda_{jmt}}^{exit}$ are the inverse mills ratios obtained by estimating the probability of entry and exit[15] as:

$$P(entry\, or\, exit_{jmt}) = g(Z_{jmt}\beta + k_j + g_t) + \mu_{jmt} \quad (23)$$

Because my instruments are mainly discrete and semiparametric estimations require continuous regressors, I use the a probit parametric functional

[14] The only difference to their proposed methodology and the one I employ is that I use the within estimator instead of controlling for the mean values of each instrument and exogenous variable in the main equation.

[15] The indicator variable of exit takes the value of one when the firm exits the market and zero for all the firms within the market. The dummy variable for entry takes the value of one when the firm enters the market and the value of zero for all the firms out of the market.

form to estimate the probability of entry and exit. Finally, I estimate the standard errors by bootstrap using the pair cluster sampling scheme[16].

I use the same instrument for violence. To instrument firm's exit and entry I use variations in the number days and local procedures necessary to open or close a firm in Colombia. According to the last reports of Doing Business, in the last decade Colombia was the top reformer in reducing the costs and complexity of business start-up and closure in Latin America (Doing Business (2014), DB (2014)). In particular, several changes in national regulation and new local governmental programs induce a time and geographic variation that I exploit to instrument firm's exit and entry.

In particular, in 2003 the Colombian government, with support from the World Bank, began an initiative called *Centros de Atención Empresarial* (CAEs) [Entrepreneurial Service Centers] to simplify business start-up. The CAEs were small offices created to allow the creation of a firm in only one day and one procedure. Although this goal has not been achieved, according to the Colombian Confederation of Chambers of Commerce (Comfecámaras) the CAES have allowed to reduce the number of days required to open a firm from 60 to 14, and the number of procedures needed from 20 to 9 between 2003 and 2010, respectively. In fact, using a census for new firms created Cárdenas and Rozo (2009) show that the CAEs had a positive an significant effect on firm's creation. Similar evidence for the implementation of these types of programs is found by Bruhn (2011) for the case of Mexico.

Between 2003 and 2009, the CAEs were inaugurated in 15 random municipalities and the 6 biggest cities of the country. They had random inauguration dates to facilitate the program evaluation. The CAEs effectively begin to operate in 2004. I use a dummy variable that takes the value of 1 for the municipalities and years in which the CAEs were open to the public. I use this dummy as an instrument for firm's entry.

There have also been important changes in the regulation regarding the procedures and days needed to close a business in Colombia. In particular,

[16] If there are G clusters in the original sample, the pair cluster sampling scheme resamples G entire clusters with replacement from the original sample. For each pseudo-sample b, the coefficients $\hat{\Gamma_b}$ are estimated and the process is repeated B times. Then the standard errors are computed as:

$$SE = (\frac{1}{B-1}\sum_{b=1}^{B}(\hat{\Gamma_b} - \bar{\Gamma_b})^2)^{1/2} \tag{24}$$

where $\bar{\Gamma_b}$ is the sample average of the estimated coefficients across the B pseudo-samples.

between 1995 and 2010 three laws that modified this process have been approved (i.e., Law 116 of 2006, Law 222 of 1995, and Law 1429 of 2010). The variation in the number of days required to close a business is presented in Figure 8. It shows a sharp decline beginning in 2006 after the Law 116 of 2006 was implemented. In fact between 2005 and 2006 the average number of days required to close a business declined by 37.5%, from 1600 to 1000. I use this variation to instrument firm's exit. Specifically, I interact the variable for the CAEs creation with a dummy variable that takes the value of one after 2006.

Because the CAEs were located inside the local offices that dealt with firm's exit and they came with other institutional improvements–i.e., training, new infrastructure, and recruitment of additional staff, it should be expected that the effects of reductions in the number of days required to close a business that took place after 2006 were more important in municipalities where the CAEs were open to the public.

Evidence on the correlation between the instruments and the probability of exit or entry are presented in Table 7. Columns (1) and (2) suggest that, as was found by Cárdenas and Rozo (2009) and Bruhn (2011), the introduction of the CAEs positively impacted firm's creation. Moreover, column (2) suggests that firm's exit was facilitated more proportionally after 2006 in the municipalities where the CAEs were inaugurated.

I use the probit estimates to predict the inverse mills ratio that will be included in the estimates of equations 17 and 18. The exclusion restriction for the CAEs instruments will be valid if after controlling for fixed effects by firm and year the instruments are related with the market prices (profits, output prices and wages) only through the probability of exit and entry. Since the CAEs location and time of inauguration were mainly random a violation of these assumption should not be a concern.

However, to present evidence that the CAEs implementation was truly random, once we control for fixed effects by location and year, I test for previous time pre-trends between the municipalities that implemented CAEs and those who did not on the number of firms created. For this exercise, I use a census on firm's creation from the *Confederación de Cámaras de Comercio* (Confecámaras) [Association of Chambers of Commerce] for the period between 2000 and 2003 and estimate the mean values in the number of firms created for the municipalities that adopted the CAEs and those that did not, before the program was implemented. I include 2003 because the CAEs only begin to operate in 2004. Table 6 presents the results which suggest similar time pre-trends in the number of firms created in municipalities that had CAEs inaugurated and those that did not.

7 Results

7.1 Effects on Firm's Profits

Table 8 presents the estimates of equations (17) and (21), where the dependent variable is the logarithm of real profits, violence (v_{mt}) is homicide rates per 100,000 inhabitants, and γ_1 is the elasticity of real profits with respect to homicide rates[17].

Columns (1) through (4) suggest a negative effect of violence on firm's profits. The results of columns (1) suggest that not correcting for endogeneity and selection underestimates the effects of violence on firm's profits.

Ex-ante, the direction of the bias was not clear because time-feedback effects may be taking place in two different directions. First, when profits are high economic conditions may improve inducing less poverty, less violence, and hence, better economic conditions as is documented by Miguel et al. (2004) and Miguel and Satyanath (2011). This is the so-called *grievance* channel as defined by Collier and Hoeffler (2004). It suggests that the gap in violence and firm's profits increases in time between areas with different levels of violence. Thus, taking into account only this type of endogeneity we will expect that the OLS estimates overestimate the effects of violence. On contrast, as suggested by Dube and Vargas (2013), a rise in contestable income, via an increase in firm's profits, may also increase violence by raising gains from income appropriation. This is the so-called *greed or rapacity* channel and it implies that violence may be equally important in areas with high and low income. This type of endogeneity biases the results towards zero. The results suggest that the endogeneity caused by the rapacity effect was higher since the effects of violence on profits are biased towards zero in column (1).

Moreover, when controlling for selection on firm's exit the coefficients increase in absolute value, because the selected sample excludes all the firms that are the most sensitive to local shocks, and hence, correcting for their omission should increase the coefficients as shown in columns (3) and (4). The sign of the inverse mills ratio for exit suggests a negative correlation

[17] Firm's profits were estimated as total revenues minus total costs for each firm.

of the unobservables in the probit regression and the unobservables in the profit's regression. Thus, the coefficients without the selection correction were biased towards zero.

On contrast, selection on firm's entry biases the results in the opposite direction because the firms that enter the market are less sensitive to violence. This is shown by the positive sign of the inverse mills ratio for entry. I also checked for sensitivity of the results when including a second and third order polynomial of the inverse mills ratio in equations 21 and 22. I only report the results for the linear case to save space, since the results for polynomials of higher order are very similar.

My most prefer estimates are presented in column (4) and correct for selection and endogeneity. They suggest that when homicide rates increase by 1% firm's real profits drop by 0.18%. This is an important effect taking into account that between 1995 and 2010, homicide rates dropped by 48% which implies an increase on firm's profits of 8.64%.

I also check for the different effects of violence across the distribution of real profits on Appendix C. To do this I combine the methodology proposed by Buchinsky (1998) to control for selection and Lee (2007) to control for endogeneity. A detailed description of the methodology is presented in Appendix C with the results. I find that the effects of violence are very similar across the distribution of real profits so that both small and big firms are equally affected by violence.

7.2 Effects on Firm's Output Prices and Non-Housing Living Costs

According to the theoretical model, firms respond to violence by increasing output prices. This section quantifies these responses.

The annual manufacturing survey contains detailed information on all physical quantities and prices (valued at factory-gate prices) of each output and input used/produced by each plant. Each price observation corresponds to a plant-product-year unit estimated by dividing the real value of revenues or expenditures by physical quantities. For each observation I observe the International Standard Industrial Classification (ISIC) code corresponding to the output or input sold or bought.

Table 9 presents the estimates of equations (21) and (22) taking the real value of output prices as dependent variable. They suggest a positive effect of violence on firm's output prices. Columns (1) through (5) test for the sensitivity of results to the inclusion of firm's fixed effects, year fixed effects, controls by product classification[18], controls for the product-time trends, and other munipality covariates listed on Appendix D. According to Kugler and Verhoogen (2012) the inclusion of controls by product classification and time-product trends is crucial to exclude the variation in prices explained by the dynamics of each product's market.

When comparing the OLS and 2SLS results we see that, the effects grow in size because time-feedback effect tend to increase prices in areas with low and high levels of violence, as was explained in the empirical strategy section.

My most preferred estimates are the ones presented in column (5) which correspond to the specification presented in equations 21 and 22. They account for non-random selection due to firm's entry and exit. The coefficients for the inverse mills ratio on entry are non-significant suggesting no evidence of selection for the firms that enter the market. However, the coefficient for the inverse mills ratio on exit is significant and negative suggesting a negative correlation between the unobservables that explain firm's exit and the ones that explain output prices. In other words, the coefficient of interest was biased towards zero when the correction was not used.

When I correct for non-random selection the estimates on the effect of violence on prices grow because the most sensitive firms to shocks are the first ones to exit the market. Hence, more price sensitivity to any shock is expected once we account for non-random exit. Column (5) suggest that when homicide rates increase by 1% real output prices increase by 0.68%.

I estimate the same specification using input prices as dependent variable. The results are presented in table 10, and show a very similar behavior. This was expected because one firm's output could be used as other firm's inputs. In particular, the results in column (5) suggest that when homicide rates increase by 1% the input prices observed by firms increase by 0.25%. Hence tables 9 and 10 suggest that firms increase output prices more proportionally than the increase they face in their in input prices.

In sum, the results suggest that violence increases output and input prices. Higher input prices will always prejudice firm's profits by increasing its costs of production, if other variables remain constant. They reduce

[18] I use the four first digits of the ISIC codes to create the fixed effects, they include around 115 products

competitiveness relative to firms located in areas with lower exposition to violence. In addition, the inflation caused by violence will induce higher menu costs (i.e., costs of changing price lists) and introduce distortions to the optimal allocation of resources.

So far, I have found a positive effect of violence on firm's output prices, however, it is not obvious that this will also induce an increase in all the non-housing good prices sold within a municipality. For example, firms may sale their products in other municipalities that the ones where they are located. Although, it could be argued that firms will have to pay for higher transportation and security costs to reach places further away and with higher violence, so that higher prices will be offered in more violent places, this has to be ultimately shown in the data.

For this purpose, I use the information on local food prices collected by the Colombian Ministry of Agriculture. The sample includes the average annual prices of the 500 most consumed food products in the country for 53 municipalities located in 20 departments for the years between 1996 and 2010. I use this sample to estimate the effects of violence on food prices using PC_{mt} as the instrument for violence and including fixed effects by municipality and year. As for the case of firm's output prices I include controls by type of product and time-product trends. The results are presented in Table 11 and suggest a similar behavior to the one of firm's output prices. The elasticity of food prices with respect to homicide rates is always positive and grows in size when endogeneity is accounted for. Specifically, the results on column (4) suggest that when homicide rates increase by 1% real food prices increase by approximately 0.6%. This is extremely close to the elasticity obtained with the estimates using the data by firm, and suggests that non-housing goods prices are indeed higher in areas with higher violence.

In particular, according to information of the *Departamento Administrativo Nacional de Estadística*, the Colombian statistical agency, food consumption represents approximately 42% of the consumer price index and is the most important item for living costs, if housing prices are excluded[19]. The second biggest item in terms of weight is transportation with 25%, followed by education with 5%, clothing with 2%, and other categories with smaller shares. Because food prices have the biggest weight and they increase with violence, the results strongly suggest that living costs as a whole (excluding housing) are higher for areas with more violence.

[19] I exclude housing prices of these calculates because they have a separate term in the welfare estimates in equation 11.

7.3 Effects on Wages

Table 12 presents the results of equations (21) and (22) using nominal wages as dependent variable. Note that this mainly corresponds to an hedonic wage equation in the spirit of Rosen (1986). As is pointed by Kniesner et al. (2010) and Lavetti (2012), ideally the estimation of an hedonic equation on wages should include fixed effects by individual and by firm[20].

Despite the richness of the data used in this paper, information on both firm's and worker's characteristics is unavailable; hence, I only include fixed effects by firm. Although, in the literature most estimates of hedonic equations use worker's heterogenity, it is worth mentioning that recent studies have call the attention to the relevance of firm's heterogeneity in explaining wage variation (e.g.,Card et al. (2013)). For instance, Frías et al. (2012) suggest that two thirds of wage variation can be explained by firm heterogeneity, and Abowd et al. (2002) show that worker's and firm's heterogeneity have equal importance in explaining the wages variation. In particular, estimates by Lavetti (2012) show that a wage's hedonic equation that only includes firm's heterogeneity can explain as much as 66% of the wage variation in a linear or a non-linear model[21].

Table 12 reports the estimates of equations (21) and (22) using nominal average wages by firm as the dependent variable. The results suggest a positive but small effect of violence on wages. As for the previous cases, the elasticity of violence on wages grows in absolute value when the corrections for endogeneity and selection are introduced. In particular, the estimates on column (4) that correct for endogeneity and selection suggest that when homicide rates increase by 1% real average wages increase by 0.10%. Non-random selection is not significant, whereas, selection on firm's exit remains important. In particular, the sign of the inverse mills ratio on exit suggests that the unobservables that increase the probability of exit reduce wages. Hence, the coefficients without correction are biased towards zero.

In table 13 I use the logarithm of nominal average wages for white and blue-collar employees as the dependent variable and run equations (21) and (22) again. This tests for heterogeneous effects by types of workers. The results suggest that only white-collar are compensated for higher violence.

[20] Some studies also include fixed effects for matching effects between firms and workers which solves the endogeneity caused by endogenous switching. This last is relevant when there is an idiosyncratic productivity component associated with potential job match in the theoretical model, which is not the case of this paper.

[21] See Table 6, 7, and 10 of Lavetti (2012).

In particular, when violence increases by 1% average real white-collar wages increase by 0.15%. Thus, violence increases income inequality.

7.4 Welfare Effects of Violence

According to Proposition 1 the effects of violence on firm's welfare can be approximated by its effects on firm's profits which where estimated to have an elasticity of -0.18% with respect to violence. The effects of violence on worker's welfare can be quantified by using the expression given by equation (11) and replacing for each of the partial derivatives that were previously estimated.

In particular, I recover the partial derivatives for the change of non-housing good prices and wages with respect to violence from the elasticities already estimated in tables 9, 11, 12, and 13, and the observed mean values for the period of analysis (1995 to 2010) for those variables. The same process is applied to the elasticity of housing prices with respect to violence which is set to -1.6% and corresponds to the average of the 15 studies that have identified this parameter, which are listed in Appendix B. This elasticity was not estimated directly because there is no available micro data on housing prices in Colombia.

To obtain the other terms of equation (11) I make the following parametric assumption for the utility functional form following Redding (2012):

$$U(C^s_{imt}, h^s_{imt}, v_{mt}) = [(\frac{C^s_{imt}}{\alpha})^{\alpha}(\frac{h^s_{imt}}{1-\alpha})^{1-\alpha}]^{\beta}[\frac{1}{v_{mt}}]^{1-\beta} \tag{25}$$

where the indirect utility function can be directly recover and takes the form of:

$$V^s(P_{mt}, w^s_{mt}, r_{mt}, v_{mt}) = [(w^s_{mt}l + F)P^{-\alpha}_{mt} r^{\alpha-1}_{mt}]^{\beta}[1/v_{mt}]^{1-\beta} \tag{26}$$

From this expression, I derive each of the four partial derivatives that need to be estimated and use the observed mean values of P_{mt}, w^s_{mt}, r_{mt}, and v_{mt} between 1990 and 2010 to estimate their magnitudes. The specific values used are presented in Appendix E. Moreover, values for α and β are set to .8 and 0.98 based on the identification strategy described on Appendix F. Note that a very similar value for *alpha* was obtained by Davis and Ortalo-Magné (2011) for the share of housing consumption expenditures using U.S. data. The standard errors for the welfare estimates were computed using the delta method.

Table 14 presents the results of this exercise. The results suggest that when intentional homicide rates increase by 1% welfare falls for all workers by 0.46%, for white-collar workers by 0.28%, and for blue-collar workers by 0.63%. This implies that for the period between 1995 and 2010, when homicide rates decreased by 48% the welfare for white and blue-collar workers increased by 13.74% and 30.35%, respectively. Hence, low skilled-workers are more sensitive to violence. These heterogeneous effects are induced by the differential effects that violence has on worker's wages by type of skill. Thus, the results suggest that violence also increases the wage gap by inducing higher differences on wages and welfare.

In addition, the decomposition of the effects of violence into the direct disutility created by violence and the welfare loss due the market price changes suggests that market effects accounts for at least 95% of the total welfare losses induced by violence.

In Table 14 I also check for the results on welfare when housing is excluded, since it was not possible to estimate an elasticity of housing prices to violence with Colombian data. When housing is not included equation 11 is the same minus $\frac{\partial V}{\partial r}\frac{dr}{dv}$. The results point to a higher sensitivity of welfare with respect to violence, this makes sense since all prices but housing are increasing. However they show a very similar behavior.

8 Conclusions

This paper studies how local markets react to changes in violence. My analysis is carried in three steps. First, I propose a theoretical model to understand how firms and workers change their decisions in response to violence and how those responses may be reflected into market prices and welfare. The model predicts that in response to violence firms increase output prices and workers migrate pushing wages upwards. Higher prices and migration induce lower sales in areas with higher violence which coupled with higher production costs is translated into losses on firm's profits.

I then estimate empirically the effects of violence on local non-housing prices, wages and firm's profits. I use Colombian data for the period 1995 to 2010 to identify the effects of violence on market prices and firm's profits. This is a relevant case study since during this period the country reduced its intentional homicide rates per 100,000 inhabitants by 48.39%, from 65.83 to 33.97, respectively. This drop in violence, coupled with an ample geographic variation of violence inside the country, offers a unique opportunity for identification. I combine this information with a rich and unique census of manufacturing firms to carry out my empirical analysis.

In particular, I exploit the geographic and annual variation of violence to identify its causal effects on firm's profits, wages, and non-housing prices. These estimates are then combined with the theoretical model to quantify the effects of violence on worker's welfare. To correct for the endogeneity issues between violence and firm's outcomes I use the interaction a political competition index for 1946 and the U.S. international antidrug expenditures. The use of the political competition index is motivated by the ample historical evidence suggesting that the current violence spell was originated in areas with higher competition between the two main political parties in a previous violent episode called *La Violencia* that took place between 1948 and 1958. In that sense, my variation comes from the idea that when security conditions improve transversely across the country– driven by higher U.S. international antidrug expenditures– areas with higher political competition in 1946, which have weaker institutions today, respond more proportionally.

I also correct for non-random selection on firm's exit and entry in my empirical estimates, by exploiting the exogenous variation on the number of days and local procedures required to open and close a business.

I find that, conditional on being in the market, when homicide rates increase in 1% firm's profits are reduced by -0.18%. In addition, I find that firms respond to violence by increasing output prices and that their response is always bigger than the increase they face in their input prices. Specifically, I identify a price-violence elasticity of 0.68%. This suggest that in areas with higher violence individuals face higher non-housing living costs. This is further confirmed by the behavior of local food prices.

I also find evidence of a small wage compensation to violence. However, it was only possible to identify a significant effect for white-collar workers. In particular, when intentional homicide rates increase by 1% the average wages for white-collar workers increase by 0.1%.

When combining the empirical estimates and the theoretical model to quantify the welfare effects of violence I find that: i) worker's welfare losses are twice as large as the ones experienced by firms (through lower profits), ii) changes in prices account for at least 94% of the losses caused by violence on worker's welfare, and iii) violence increases the wage gap between blue and white collar workers. This points to an important way in which conflict reinforces the poverty trap for the affected population: if intense violence increases living costs and wages are only partly compensated for white-collar workers, it increases inequality further fuelling social unrest and violence.

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9 Tables

Table 1: Intentional Homicide Rates per 100,000 inhabitants

Panel A. Top 10 most violent countries through 1995-2011				
Mean Values	1995-2000	2001-2005	2006-2011	
1st	El Salvador	El Salvador	Honduras	
2nd	**Colombia**	**Colombia**	El Salvador	
3rd	South Africa	Jamaica	Cote d'Ivoire	
4th	Honduras	South Africa	Jamaica	
5th	Jamaica	Honduras	Venezuela	
6th	Guatemala	Venezuela	Guatemala	
7th	Bahamas	Guatemala	Saint Kitts and Nevis	
8th	US Virgin Islands	US Virgin Islands	US Virgin Islands	
9th	Venezuela	Belize	Lesotho	
10th	Namibia	French Guiana	Malawi	
11th	Puerto Rico	Saint Lucia	**Colombia**	
Panel B. Intentional Homicide rates per 100,000 inhabitants (Mean values)				
Region	1995-2000	2001-2005	2006-2011	1995-2011
Africa	15.95	9.11	14.15	14.46
Americas	16.82	16.63	19.73	17.38
Asia	4.77	3.62	3.49	3.82
Europe	3.84	3.47	2.47	3.27
Oceania	1.43	2.96	3.56	3.56
Top 10% (Most Violent)	32.00	34.10	38.40	35.60
Lowest 10% (Least Violent)	0.70	0.70	0.70	0.90
Colombia	**66.29**	**57.04**	**35.98**	**52.87**
Total	8.85	7.97	9.60	9.37

Note: Intentional homicide rates per 100,000 inhabitants corresponds to all the unlawful deaths purposefully inflicted on a person by another person per 100,000 inhabitants. Source: United Nations Office of Drugs and Crime.

Table 2: Descriptive Statistics - Annual Manufacturing Survey

	1995		2010	
Variable	Mean	St. Deviation	Mean	St. Deviation
Age (years)	18.69	14.90	19.76	15.50
Multiplant	0.07	0.25	0.07	0.26
N of employees	82.08	180.51	66.79	155.82
Share male (% of total employees)	0.62	0.27	0.62	0.25
Real Average Monthly Wage (USD)	419.75	324.26	402.53	253.27
Number of inputs used	13.02	9.26	12.94	13.55
Number of final products	5.53	3.45	4.91	4.34
Real Annual sales (millions of USD)	8.20	4.40	7.90	8.05
Labor Share	0.34	0.19	0.32	0.19
Share blue (% total employees)	–	–	0.62	0.24
Exports (% of n. of plants)	–	–	0.21	0.41
Obs. (N. of Plants)	7909		9944	

Source: *Encuesta Anual Manufacturera* [Annual Manufacturing Survey] collected by the *Departamento Nacional de Estadística*–the Colombian statistical agency. The survey includes all manufacturing firms with more than 10 employees, with detailed information on all prices and physical quantities (valued at factory-gate prices) on inputs and outputs used/produced by each firm. The data is available for the period between 1995 and 2010. Note: * Exchange rates correspond to the average annual rates published by the Colombian central bank and takes avalue of 906 and 1912 Colombian pesos per U.S. dollar for 1995 and 2010, respectively.

Table 3: First Stage Regression

First Stage. Dependent Variable: Log ($Hom\,Rates_{mt}$)			
	(1)	(2)	(3)
PC_{mt}	-0.05***		
	(0.00)		
PC_m		1.42***	
		(0.08)	
$US-IAE_t$			-0.03***
			(0.00)
Firm FE	Y		Y
Year FE	Y	Y	
Clustered errors (mun)	Y	Y	Y
Partial R-squared	0.08	0.18	0.04
F-test excluded inst.	86.07	23.50	256.16
Obs.		124247	
N. of Clusters		317	

Note: The table presents the results of the first stage regression for the specification presented in equations (17) and (18). PC_{mt} is defined according to equations (19) and (20), and corresponds to the interaction of the political competition index of 1946 (PC_m) and the real U.S. international antidrug expenditures in millions of dollars of 1995 ($US{-}IAE_t$). Clustered standard errors at the municipality level are presented in parentheses. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 4: OLS Regression of Public Expenditures on the Instrument

	Dependent Variables in real billions of pesos (1995=100)			
	Public Expenditures	Education PE	Health PE	Other PE
PC_{mt}	-0.02	0.03	-0.05	-0.08
[clust-err]	(0.04)	(0.03)	(0.11)	(0.09)
Mun FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
R-squared	0.01	0.01	0.01	0.01
N. of Clusters	755			
Obs.	11325			

Note: the table presents an OLS regression of public expenditures (total and by type) on PC_{mt}. PC_{mt} is defined according to equations (19) and (20), and corresponds to the interaction of the political competition index of 1946 (PC_m) and the real U.S. international antidrug expenditures in millions of dollars of 1995 ($US - IAE_t$). Clustered standard errors at the municipality level are presented in parentheses. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 5: Excluding Differential Time Pre-trends between Areas with Different Political Competition Index in 1946

	Dep. Variables									
	GPI	Rice Price	Meat Price	Egg Price	Milk Price	Potatoes Price	Coffee Price	Exports	Imports	Cattle Value
$High_m * I(1941)_t$							0.04	-2.45	0.53	
							(0.23)	(3.70)	(3.90)	
$High_m * I(1942)_t$	-0.26	0.05	-0.18	0.28	-0.15	-0.16	-0.15	3.84	4.3	
	(0.2)	(0.12)	(0.23)	(0.23)	(0.18)	(0.12)	(0.19)	(3.69)	(3.90)	
$High_m * I(1943)_t$	0.12	0.02	-0.43	0.44	0.37	-0.23	0.08	-3.64	-1.09	
	(0.15)	(0.14)	(0.29)	(0.36)	(0.23)	(0.26)	(0.19)	(3.23)	(3.33)	
$High_m * I(1944)_t$	-0.03	0.004	-0.52	0.88	-0.04	-0.09	-0.003	-3.12	-3.15	
	(0.13)	(0.18)	(0.43)	(0.33)	(0.29)	(0.14)	(0.18)	(3.16)	(3.33)	
$High_m * I(1945)_t$	0.16	-0.05	0.11	0.41	0.02	0.05	-0.17	-3.67	-3.07	-2.18
	(0.22)	(0.22)	(0.65)	(0.39)	(0.28)	(0.24)	(0.18)	(3.15)	(3.33)	(3.10)
High FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.71	0.66	0.57	0.58	0.21	0.69	0.97	0.07	0.068	0.07
Years available	1941-1945	1941-1945	1941-1945	1941-1945	1941-1945	1941-1945	1940-1945	1940-1945	1940-1945	1944-1945
Obs.	420	420	420	420	420	420	114	63	64	1269

Note: the table presents an OLS regression of the dependent variables observed before 1946 on the interaction of 'High' and dummy variables by years. 'High' corresponds to a dummy variable that takes the value of 1 if the municipality had a political competition index higher than 0.5 in 1946. GPI stands for General Price Index. Exports and Imports are expressed in millions and cattle value in hundreds of Colombian pesos. Clustered standard errors at the municipality level are presented in parentheses. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 6: Means Difference Test of Firm's Creation Growth by CAE's Adopters/Non-adopters

	Number of Firms created		
	Mean of Annual % Change		Mean Difference in % Change (A-NA)
Year	CAEs Adopters	CAEs Non-adopters	
2001	0.12	0.09	0.03
	(0.15)	(0.46)	(0.11)
2002	0.12	0.08	0.04
	(0.53)	(0.03)	(0.14)
2003	-0.05	-0.05	0.00
	(0.24)	(0.02)	(0.02)

Note: Data on firms creation corresponds to a national census implemented by the *Confederación Nacional de Cámaras de Comercio* [National Association of Chambers of Commerce] between 2000 and 2003. The table presents evidence of no pre-trends on the number of firms created between the group of municipalities that implemented the *Centros de Atención Empresarial* (CAEs) and those who did not. The year 2003 is excluded because the CAEs began to operate effectively in 2004. Clustered standard errors at the municipality level are presented in parentheses.

Table 7: Selection Equation for Firm's Entry and Exit

Dep Variable:	$\Pr(Entry_{jmt})$	$\Pr(Exit_{jmt})$
	(1)	(2)
$CAEs_{mt}$	0.17**	-0.22***
	(0.08)	(0.04)
$I(2006)_t * CAEs_{mt}$	0.01***	0.01***
	(0.00)	(0.00)
PC_{mt}	-0.15***	0.01
	(0.03)	(0.04)
Year FE	Y	Y
Municipality's characteristics	Y	Y
Pseudo R-squared	0.17	0.12
N. of Clusters	232	232
Obs.	87441	63012

Note: The table presents the estimates of the probability of exit and entry. $Exit_{jmt}$ takes the value of one if the plant exits the market at t and zero for all the plants within the market at t. $Entry_{jmt}$ takes the value of one when a firm enters the market at t and zero for all the firms outside of the market at t. The additional covariate included is total population. $CAEs$ is an indicator variable that takes the value of one when the municipality had a *Centro Administrativo de Atención Empresarial* inaugurated at t. PC_{mt} represents the interaction of the political competition index of 1946 and U.S. international antidrug expenditures. Clustered error at the municipality levels are presented in parentheses. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 8: Effects of Violence on Firm's Profits

Dependent Variable: Log ($Real\,Profits_{jmt}$)				
	OLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
Log ($Hom\,Rates_{mt}$)	-0.01***	-0.15***	-0.20***	-0.18***
[Clust-er]	(0.00)	(0.03)		
[Boot-clust-er]			(0.06)	(0.07)
$\hat{\lambda^{exit}}$			-1.84***	-1.84***
[Boot-clust-er]			(0.04)	(0.04)
$\hat{\lambda^{entry}}$			0.62***	0.62***
[Boot-clust-er]			(0.19)	(0.19)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Selection Correction			Y	Y
Municipality's characteristics				Y
R-squared	0.08	0.14	0.12	0.15
Obs.	124247			
N. of Clusters	317			
First Stage. Dependent Variable: Log ($Hom\,Rates_{mt}$)				
PC_{mt}		-0.09**	-0.08***	-0.08***
[Clust-er]		(0.03)	(0.01)	(0.01)
F-excluded instrument		15.66	14.14	15.24
Partial R-squared		0.11	0.13	0.14

Note: The table presents the results of the specification presented in equations (17) and (21), which includes the previous estimation of the inverse mills ratios for exit ($\hat{\lambda^{exit}}$) and entry ($\hat{\lambda^{entry}}$) that were obtained through the probit estimates reported in Table 7. PC_{mt} is used to instrument homicide rates and is defined according to equations (19) and (20), and corresponds to an interaction of the political competition index of 1946 and the real U.S. international antidrug expenditures in millions of 1995. Real values for profits were obtained using a producer price index with base year 1995. The other covariates included as municipality's characteristics are described in Appendix D. Standard errors were clustered by municipality for columns (1) and (2). The standard errors in columns (3) and (4) were obtained by bootstrap using the pair cluster sampling scheme by municipality. The number of replications was set to 500. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level

Table 9: Effects of Violence on Output Prices

Dependent Variable: Log ($Real\,Output\,Prices_{jmt}$)	OLS (1)	OLS (2)	2SLS (3)	2SLS (4)	2SLS (5)
Log ($Hom\,Rates_{mt}$)	0.07***	0.07***	0.43*	0.53**	0.68*
[Clust-er]	(0.02)	(0.02)	(0.22)	(0.26)	
[Boot-clust-er]					(0.39)
$\lambda^{\hat{exit}}$					-0.72***
[Boot-clust-er]					(0.09)
$\lambda^{\hat{entry}}$					-0.11
[Boot-clust-er]					(0.86)
FE firm	Y	Y	Y	Y	Y
FE year	Y	Y	Y	Y	Y
Industry FE		Y	Y	Y	Y
Industry*Year FE		Y		Y	Y
Municipality's characteristics		Y		Y	Y
Selection Correction					Y
R-squared	0.57	0.7	0.57	0.63	0.67
Obs.			116468		
N. of Clusters			213		
First Stage. Dependent Variable: Log ($Hom\,Rates_{mt}$)					
PC_{mt}			-0.05***	'-0.05***	-0.05***
[Clust-er]			(0.01)	(0.01)	(0.01)
F-test excluded instrument			17.89	16.05	16.82
Partial R-squared			0.04	0.05	0.05

Note: The table presents the results of the specification presented in equations (21) and (22) using the inverse mills ratios for exit ($\lambda^{\hat{exit}}$) and entry ($\lambda^{\hat{entry}}$) that were obtained through the probit estimates reported in Table 7. Each observation on this sample corresponds to a plant-product-year unit estimated by dividing the real value of revenues (valued at factory-gate prices) by physical quantities. PC_{mt} is defined according to equations (19) and (20), and corresponds to an interaction of the political competition index of 1946 and the the U.S. international antidrug expenditures in real millions of dollars of 1995. Product fixed effects correspond to the International Standard Industry Classification (ISIC) four-digit classification for each product-plant-year observation. There are 115 four-digit codes and 29 departments in the sample. The other covariates included as municipality's characteristics are described in Appendix D. Real values were obtained using a producer price index with base year 1995. Standard errors were clustered by municipality for columns (1) to (4). The standard errors in column (5) were obtained by bootstrap using the pair cluster sampling scheme by municipality. The number of replications was set to 500. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 10: Effects of Violence on Input Prices

	Dependent Variable: Log ($Real\ Input\ Prices_{jmt}$)				
	OLS	OLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)
Log ($Hom\ Rates_{mt}$)	0.03***	0.09***	0.20**	0.20**	0.25**
[Clust-er]	(0.01)	(0.00)	(0.08)	(0.08)	
[Boot-clust-er]					(0.12)
$\lambda^{\hat{exit}}$					-0.05***
[Boot-clust-er]					(0.01)
$\lambda^{\hat{entry}}$					0.05
[Boot-clust-er]					(0.12)
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Industry FE		Y		Y	Y
Industry*Year FE		Y		Y	Y
Other covariates		Y		Y	Y
Selection Correction					Y
R-squared	0.28	0.56	0.3	0.51	0.55
Obs.			395523		
N. of Clusters			218		
First Stage. Dependent Variable: Log ($Hom\ Rates_{mt}$)					
PC_{mt}			-0.06***	-0.06***	-0.05***
[Clust-er]			(0.01)	(0.01)	(0.01)
F-test excluded instrument			18.28	18.72	18.72
Partial R-squared			0.05	0.05	0.07

Note: The table presents the results of the specification presented in equations (21) and (22), which include the previous estimation of the inverse mills ratios for exit ($\lambda^{\hat{exit}}$) and entry ($\lambda^{\hat{entry}}$) that were obtained through the probit estimates reported in Table 7. PC_{mt} is used to instrument homicide rates and is defined according to equations (19) and (20), and corresponds to an interaction of the political competition index of 1946 and the U.S. international antidrug expenditures in real millions of dollars of 1995. Real values were obtained using a producer price index with base year 1995. The other covariates included as municipality's characteristics are described in Appendix D. Standard errors were obtained by bootstrap using the pair cluster sampling scheme by municipality. The number of replications was set to 500. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 11: Effects of Violence on Food Prices

Dependent Variable: Log ($Real\,Food\,Prices_{jmt}$)				
	OLS	OLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
Log ($Hom\,Rates_{mt}$)	0.09**	0.1***	0.56**	0.59**
[Clust-er]	(0.04)	(0.02)	(0.31)	(0.35)
Municipality FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Product FE	Y	Y	Y	Y
Product*Year FE		Y		Y
Other Covariates				Y
R-squared	0.31	0.51	0.48	0.43
Obs.		44724		
N. of Clusters		53		
First Stage. Dep Variable: Log ($Hom\,Rates_{mt}$)				
PC_{mt}			-0.01***	-0.01***
[Clust-er]			(0.00)	(0.00)
F-test excluded instrument			11.89	14.08
Partial R-squared			0.06	0.06

Note: Each observation on this sample corresponds to the real prices of the 500 most consumed products in the 53 municipalities, located in 20 different departments. PC_{mt} is defined according to equations (19) and (20), and corresponds to an interaction of the political competition index of 1946 and the U.S. international antidrug expenditures in real values of 1995. The other covariates included as municipality's characteristics are described in Appendix D. Standard errors were clustered by municipality. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 12: Effects of Violence on Wages

Dependent Variable: Log ($Average\, Nominal\, Wages_{jmt}$)				
	OLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)
Log ($Hom\, Rates_{mt}$)	0.05***	0.07***	0.10***	0.10***
[Clust-er]	(0.01)	(0.01)		
[Boot-clust-er]			(0.03)	(0.03)
$\lambda^{\hat{exit}}$			-0.03	-0.05**
[Boot-clust-er]			(0.02)	(0.02)
$\lambda^{\hat{entry}}$			-0.07	-0.03
[Boot-clust-er]			(0.07)	(0.06)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Selection Correction			Y	Y
Municipality's characteristics	Y	Y		Y
R-squared	0.41	0.42	0.43	0.45
Obs.	124247			
N. of Clusters	317			

Note: The table presents the results of the specification presented in equations (21) and (22) using the inverse mills ratios for exit ($\lambda^{\hat{exit}}$) and entry ($\lambda^{\hat{entry}}$) that were obtained through the probit estimates reported in Table 7. PC_{mt} is defined according to equations (19) and (20), and corresponds to an interaction of the political competition index of 1946 and the real U.S. international antidrug expenditures in millions of dollars of 1995. The other covariates included as municipality's characteristics are described in Appendix D. Standard errors were clustered by municipality for columns (1) and (2). The standard errors in column (3) and (4) were obtained by bootstrap using the pair cluster sampling scheme by municipality. The number of replications was set to 500. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 13: Effects of Violence on Wages by Type of Worker

Dep Variable: Log ($Average\,Nominal\,Wages_{jmt}$) - 2SLS				
	White-Collar		Blue-Collar	
	(1)	(2)	(3)	(4)
Log ($Hom\,Rates_{mt}$)	0.07***	0.15***	0.03	0.03
[Clust-er]	(0.01)		(0.02)	
[Boot-clust-er]		(0.04)		(0.05)
$\lambda^{\hat{exit}}$		-0.37***		-0.08***
[Boot-clust-er]		(0.08)		(0.02)
$\lambda^{\hat{entry}}$		0.52		0.29*
[Boot-clust-er]		(0.33)		(0.15)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Selection Correction		Y		Y
Municipality's characteristics	Y	Y	Y	Y
R-squared	0.33	0.34	0.41	0.42
Obs.	40048			
N. of Clusters	206			
First Stage. Dep Variable: Log ($Hom\,Rates_{mt}$)				
PC_{mt}	0.89***	0.94***	0.86***	0.91***
	(0.05)	(0.06)	(0.06)	(0.06)
F-excluded instrument	17.09	17.11	15.78	15.82
Partial R-squared	0.08	0.08	0.07	0.07

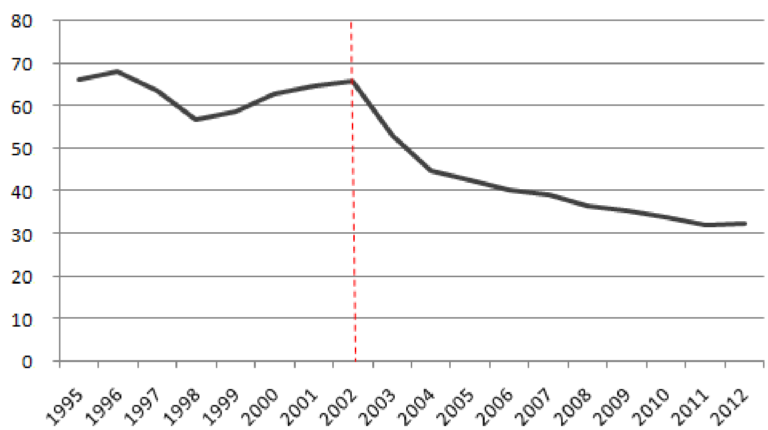
Note: The table presents the results of the specification presented in equations (21) and (22) using the inverse mills ratios for exit ($\lambda^{\hat{exit}}$) and entry ($\lambda^{\hat{entry}}$) that were obtained through the probit estimates reported in Table 7. PC_{mt} is defined according to equations (19) and (20), and corresponds to an interaction of the political competition index of 1946 and the real U.S. antidrug expenditures in millions of dollars of 1995. The other covariates included as municipality's characteristics are described in Appendix D. Standard errors were clustered by municipality for columns (1) and (3). The standard errors in column (2) and (4) were obtained by bootstrap using the pair cluster sampling scheme by municipality. The number of replications was set to 500. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Table 14: Welfare Effects by Type of Worker

Model	Workers	Elasticity Welfare-Violence	Decomposition of Total Effects		Change in Welfare due to violence (1995-2010)
			Market Effects	Direct Disutility	
With Housing	All Workers	-0.46***	95.72%	4.28%	22.60%
		(0.05)			
	White-collar	-0.28*	94.65%	5.35%	13.74%
		(0.05)			
	Blue-collar	-0.63***	96.41%	3.59%	30.35%
		(0.05)			
Without Housing	All Workers	-0.60**	96.70%	3.30%	29.30%
		(0.08)			
	White-collar	-0.38*	96.10%	3.90%	18.82%
		(0.07)			
	Blue-collar	-0.85***	97.13%	2.87%	41.19%
		(0.07)			

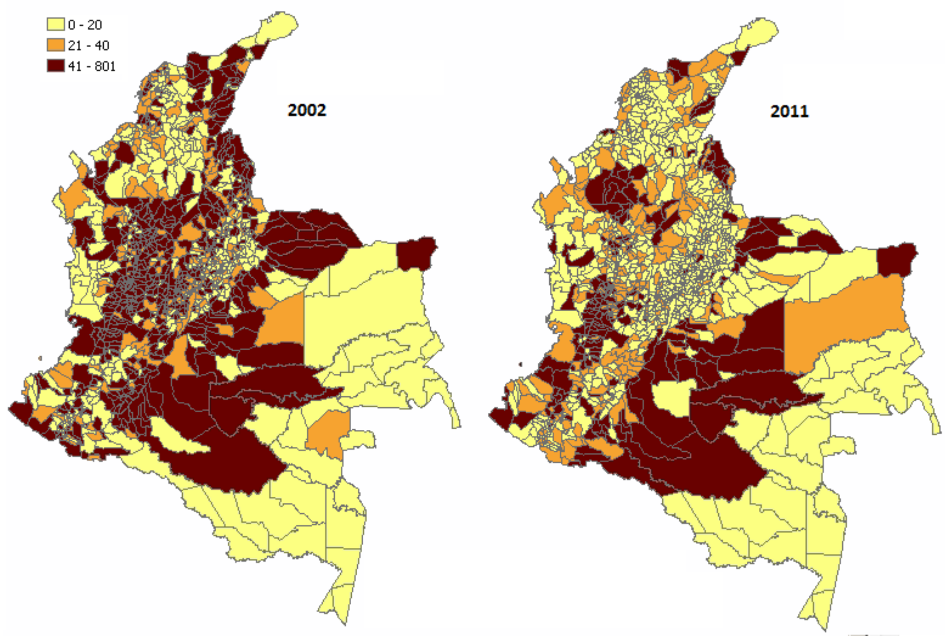
Note: the table presents the estimates of equation 11 where the partial derivatives on the effects violence of non-housing prices and wages were recovered using the elasticities identified in tables 9, 12 and 13 and the mean observed values of each variable as reported in Appendix E. The same process was applied to the elasticity of housing prices with respect to violence, which was set to 1.6 based on previous literature listed on Appendix B. The values of α and β were set to 0.8 and 0.98 according to the identification strategy described in Appendix F. When housing is not included equation 11 is the same minus $\frac{\partial V}{\partial r}\frac{dr}{dv}$. Standard Errors were computed using the delta method. *** Significant at 1% level, ** Significant at 5% level, and * Significant at 10% level.

Figure 1: Intentional Homicide Rates per 100,000 inhabitants in Colombia



Source: Observatory for Human Rights of the Colombian Vice Presidency.

Figure 2: Geographic Distribution of Intentional Homicide Rates per 100,000 inhabitants by Municipality in 2002 and 2011



Note: The maps were elaborated with data from the *Instituto Colombiano Agustín Codazzi*, the Colombian geography agency. Data on homicide rates per 100,000 inhabitants comes from the Observatory for Human Rights of the Colombian Vice Presidency.

Figure 3: Standard Deviation of Intentional Homicide Rates per 100,000 inhabitants for each Year by Municipality

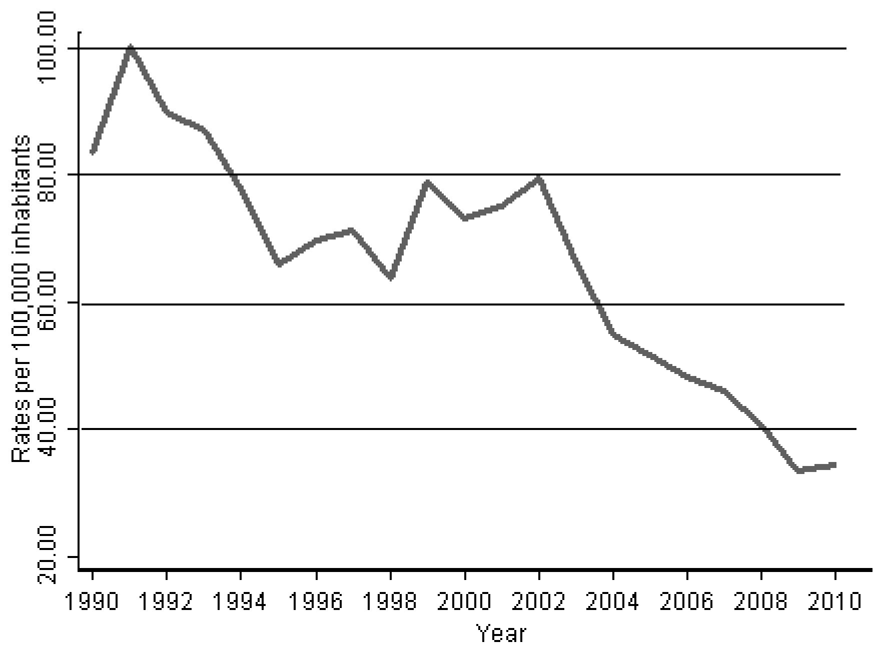
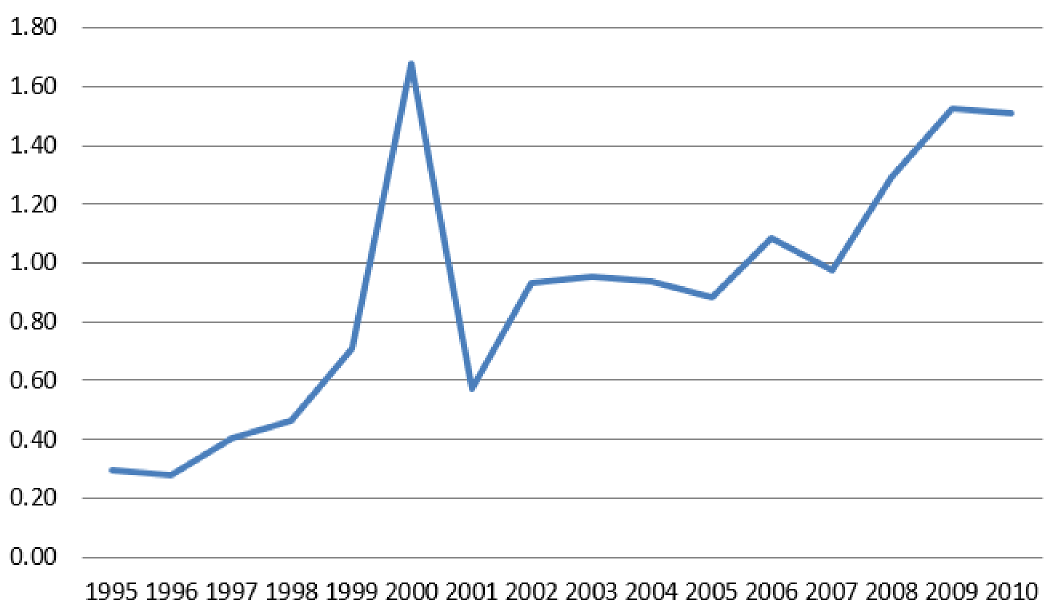
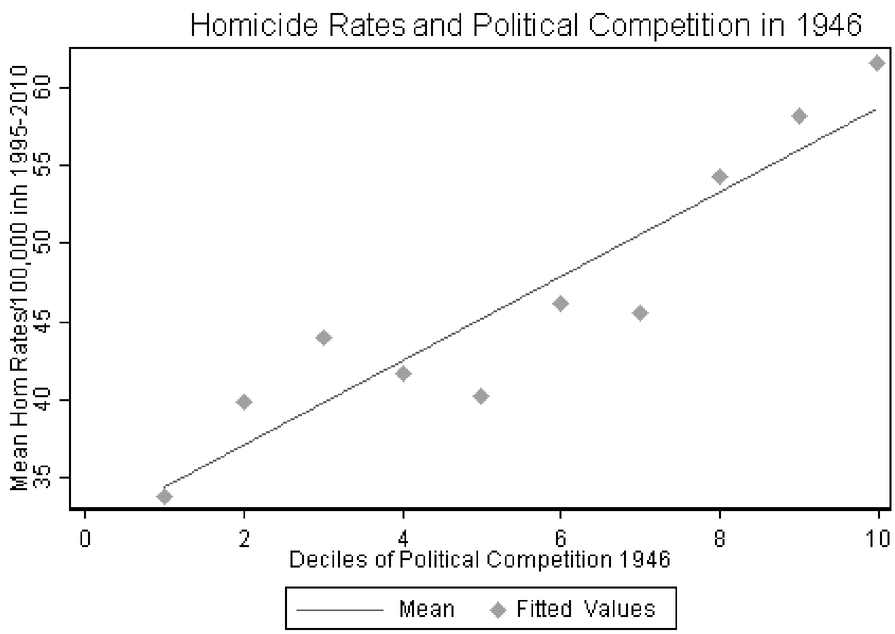


Figure 4: U.S. International Antidrug Expenditures - real billions of 1995



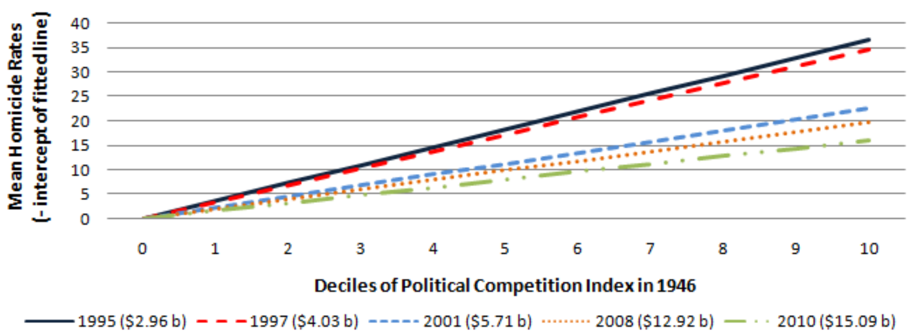
Source: Annual Budget Summary of the Office of National Drug Control of the White House 1995-2010.

Figure 5: Correlation between Political Competition in 1946 and Homicide Rates per 100,000 Inhabitants



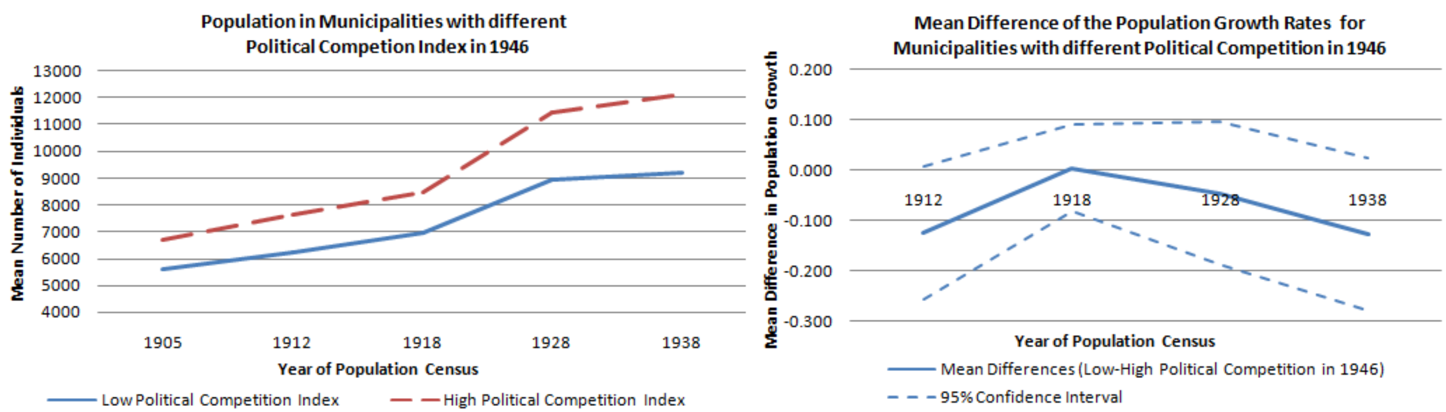
Note: The figure presents a fitted linear regression of the mean homicide rates per 100,000 inhabitants for all municipalities between 1995 and 2010 in deciles of the political competition index.

Figure 6: Political Competition for 1946 and Homicide Rates per 100,000 Inhabitants for Years with Different U.S. International antidrug Expenditures



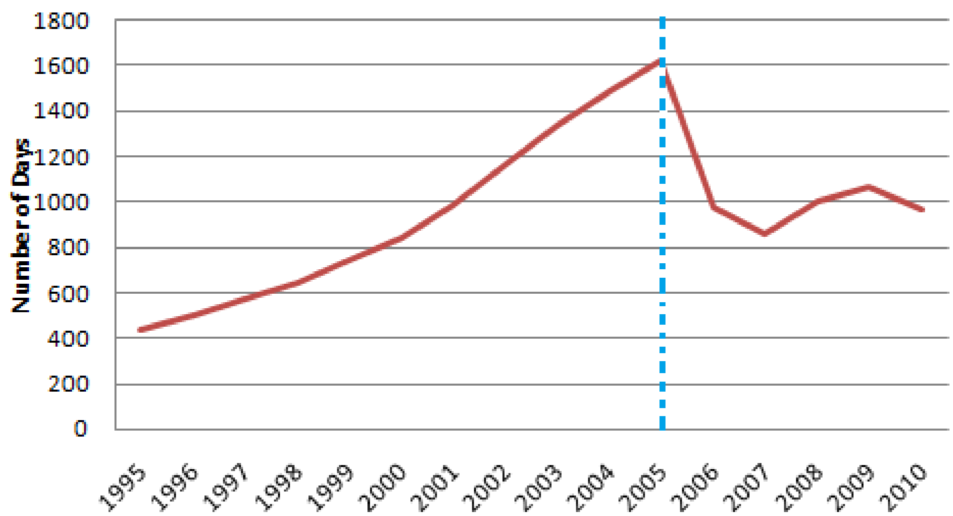
Note: Each line corresponds to the fitted values of a linear regression of mean homicide rates on the deciles of the political competition index of 1946 for different years. The intercept was substracted from each fitted line so that the slopes could be compared. Real US international supply antidrug expenditures are presented in parentheses.

Figure 7: Parallel Time Pre-trends in Population between Areas with Different Political Competition in 1946



Note: All municipalities with a political competition index higher than the median were classified as areas with high political competition index and vice versa. The information was digitalized from the information on the population census available at the *Anuarios de Estadística General* collected by the *Contraloría General de La República* published in 1932 and 1946.

Figure 8: Number of Days required to Close a Business in Colombia



Note: The data comes from the Ministry of Commerce and Doing Business from the World Bank. There were three reforms that changed the regulation on the procedures to close a business during these years in Colombia: i) Law 222 of 1995, ii) Law 116 of 2006, and iii) Law 1429 of 2010. I exploit the variation caused by the reform of 2006.

A Proof of Proposition 1

1. The total derivative of the indirect utility function with respect to violence follows directly from the chain rule. Here I present a proof of the expected changes in market prices:

   I first deal with the effects of violence on output prices. By assumption $P^{gs}_{imt} \epsilon [0, \infty)$, marginal costs are greater or equal than zero, and $0 \geq \psi(Y^{ls}_{imt}) \geq 1$. Hence, given:

$$P_{imt} = [\frac{\epsilon}{1+\epsilon}][\frac{\partial C(Y_{imt}, v_{mt})}{\partial Y_{imt}}][\frac{1}{1-\psi(Y_{imt})}] \tag{27}$$

   then:

$$\frac{\epsilon}{1+\epsilon} \geq 0 \tag{28}$$

   Since wages are higher in areas with higher violence and there is input complementarity, then marginal costs are increasing on violence. Hence, taking the derivative of equation (27) with respect to violence and assuming a constant elasticity of demand:

$$\frac{P_{imt}}{dv_{mt}} = [\frac{\epsilon}{1+\epsilon}][\frac{1}{1-\psi(Y_{imt})}\frac{dMC}{dv_{mt}} + MC\frac{\psi'(Y_{imt})}{[1-\psi(Y_{imt})]^2}] > 0 \tag{29}$$

   where:

$$MC = \frac{\partial C(Y_{imt}, v_{mt})}{\partial Y_{imt}} \tag{30}$$

   I now deal with the effects of violence on wages. The compensation wages differential model, predicts that for municipalities with different levels of violence, worker's will migrate between municipalities until they have the same utility across locations. Since violence directly reduces utility for all workers, it follows that:

$$\frac{\partial V(.)}{\partial v_{mt}} < 0 \tag{31}$$

   Moreover, since higher wages increase the disposable income, it is also true that:

$$\frac{\partial V(.)}{\partial w^s_{mt}} > 0 \tag{32}$$

Hence, three possible cases can be considered. First, consider the case when violence doesn't change non-housing good's prices. Suppose we begin in a situation where all workers have the same utility across location and violence increases in some areas, then in those areas utility will be lower and workers will migrate until wages are increased sufficiently so that the condition is met again, hence:

$$\frac{\partial w_{mt}}{\partial v_{mt}} > 0 \tag{33}$$

Consider now the case when violence increases the aggregate price index P_{mt}. Note than when prices increase, other variables constant, individuals become poorer. Hence:

$$\frac{\partial V(.)}{\partial P_{mt}} < 0 \tag{34}$$

In that case, indirect utility is lower due to the additional expenses induced by violence on the budget constraint and the increase in aggregate prices. Hence, workers will migrate until wages are increased sufficiently so that the condition is met again, hence:

$$\frac{\partial w_{mt}}{\partial v_{mt}} > 0 \tag{35}$$

The case where violence reduces the aggregate price index is inconsistent with the assumptions of the model because $\forall$ goods higher violence implies higher costs of production.

Finally, the effects on rents follows directly from the assumption of a fixed housing supply and the migrations effects caused my violence.

2. Given the profit function the total derivative of profits for any firm with respect to violence is given by:

$$\begin{aligned}\frac{d\Pi}{dv} &= [\frac{dP}{dY}\frac{dY}{dv}Y + P\frac{dY}{dv}] - \frac{dC(Y,v)}{dY}\frac{dY}{dv} - \frac{dC}{dv} \\ &= \frac{dY}{dv}(\frac{dP}{dY}Y + P) - \frac{dC(Y,v)}{dY}] - \frac{dC}{dv}\end{aligned} \tag{36}$$

From the elasticity of demand $\frac{dP}{dY}Y = \frac{P}{\epsilon}$. Replacing this condition and the mark-up optimality condition into the previous expression, it directly follows that:

$$\frac{d\Pi}{dv} = -\frac{dC}{dv} \leq 0 \tag{37}$$

B Literature on Rent-Violence Elasticity

An exhaustive revision of the literature on the effects of crime on housing prices allowed to identify 15 studies that present point estimates of the elasticity of rents with respect to crime. They are cited in the table below:

Authors	Year of publication	Location	Elasticity
Ihlanfeldt and Mayock	2010	Miami	-0.15
Naroff et al.	1980	Boston	-1.67
Burmel	1988	Chicago	-0.1
Gibbons	2004	London	-1
Pope	2008	Florida	-2.3
Linden and Rockoff	2008	North Carolina	-4
Buonnano et al.	2012	Spain	-1.27
Thaler	1978	Rochester	-3
Bowes and Ihlanfeldt	2001	Atlanta	-3
Hellman and Narrof	1979	Boston	-0.63
Clark and Cosgrove	1990	Mulitple locations	-0.125
Schwartz, Susin, and Voicu	2003	New York	-0.12
Ceccato and Wilhelmsson	2011	Sweeden	-0.04
Braakmann	2012	England and Wahles	-2%
Pope and Pope	2012	US, whole country	-0.35%

C Quantile Regression Estimates

To obtain the estimates of Panel B on Table 6 I combine the methodologies by Buchinsky (1996) to control for selection and by Lee (2007) to control for endogeneity. For all the steps where the inclusion of a power series of an inverse mills ratio was necessary it was approximated through a second order polynomial following Staneva et al. (2010). Specifically, the following process was used:

1. Estimate the probability of exit and entry through a probit model. For the entry equation the independent variables include the three instruments (i.e., the dummy for CAEs, the interaction between the chambers of commerce location and the days needed to close a business, and the Bartik instrument for violence) lagged rural and urban population (by municipality), and lagged real per capita GDP (by department) obtained from DANE–the Colombian national statistical agency. The exit equation includes the same independent variables plus the lagged values of sales. Define the estimates of this step as $\hat{\beta^o}$.

2. Use the semiparametric least-square estimator used by Buchinsky (1998) and first formulated by Ichimura (1993) and given by:
$$\hat{\beta} = Arg\, Min_{\beta} \frac{1}{n} \sum_{i=1}^{n} (d_i - \hat{E}(d_i|X\beta)^2] \tag{38}$$
to obtain the estimates for the coefficients in the selection equations, where $\hat{E}(d_i|X,\beta)$
$$\hat{E}(d_i|Z,\beta) = \frac{\sum_{j\neq i} y_j k((X_i^{'}\beta - X_j^{'}\beta)/h_n)}{\sum_{j\neq i} k((X_i^{'}\beta - X_j^{'}\beta)/h_h)} \tag{39}$$
where $k(.)$ is the truncated normal kernel function. In the first round the truncation point is set at the standard errors of $X^{'}\hat{\beta^o}$ (the estimates of step 1), and the kernel bandwidth is set to $n^{-1/5}$ to obtain $\hat{\beta^1}$.

3. Reset the symmetric truncation point to the standard errors of $X^{'}\hat{\beta^1}n^{-1/3}$ and h_n $X^{'}\hat{\beta^1}n^{-1/5}$ and solve again (38) to obtain the final $\hat{\beta}$.

4. Predict $X^{'}\hat{\beta}$ and obtain the inverse mills ratio of each equation.

5. Estimate the quantile regression of equation (12) including a second order polynomial of the inverse mills ratio predicted for the entry and exit selection equations and predict the residuals.

6. Predict the inverse mills ratio of the residuals of the previous step.

7. Estimate the quantile regression of equation (11) including the second order polynomials for the exit inverse mills ratio, entry inverse mills ratio, and residuals inverse mills ratio of the last step.

8. Estimate the standard errors by bootstrap clustering by municipality.

The estimates of these process are reported in the table. They suggest uniform negative effects of violence on firms across the distribution function of real profits.

Dep Variable: Log ($Real\,Profits_{jmt}$)					
	0.1	0.25	0.5	0.75	0.9
Log ($Hom\,R_{mt}$)	-0.25***	-0.24***	-0.24***	-0.25***	-0.24***
[Boot-clust-er]	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Year dummies	Y	Y	Y	Y	Y
Selection Correction	Y	Y	Y	Y	Y
Pseudo R-squared	0.12	0.11	0.10	0.11	0.10
Obs.			124247		
N. of Clusters			317		

D List of Covariates

Number	Variables	Available	Source
1	Population 11 to 20 years	1995-2010	DANE
2	Population 21 to 30 years	1995-2010	DANE
3	Population 31 to 40 years	1995-2010	DANE
4	Population 41 to 50 years	1995-2010	DANE
5	Population 51 to 60 years	1995-2010	DANE
6	Population 61 to 70 years	1995-2010	DANE
7	Population 71 to +years	1995-2010	DANE
8	Male Population	1995-2010	DANE
9	Male-11 to 20 years Pop	1995-2010	DANE
10	Male-21 to 30 years Pop	1995-2010	DANE
11	Male-31 to 40 years Pop	1995-2010	DANE
12	Male-41 to 50 years Pop	1995-2010	DANE
13	Male-51 to 60 years Pop	1995-2010	DANE
14	Male-61 to 70 years Pop	1995-2010	DANE
15	Male-71+ years Pop	1995-2010	DANE
16	Tax Income	1995-2010	DNP
17	Non-Tax Income	1995-2010	DNP
18	Transfers Income	1995-2010	DNP
19	Capital Income	1995-2010	DNP
20	Income from 'Regalias'	1995-2010	DNP
21	Gov. Operational Expenditures	1995-2010	DNP
22	Debt Interest Expenditures	1995-2010	DNP
23	Other Expenditures	1995-2010	DNP
24	Capital Investment	1995-2010	DNP
26	Education Inv.	1995-2010	DNP
27	Health Inv.	1995-2010	DNP
28	Housing Inv.	1995-2010	DNP
29	Other Public Services Inv.	1995-2010	DNP
30	Transportation Inv.	1995-2010	DNP
31	Cultural Inv.	1995-2010	DNP
32	Agricultural Inv.	1995-2010	DNP
33	Environmental Inv.	1995-2010	DNP
34	Justice Inv.	1995-2010	DNP
35	Recreational Inv.	1995-2010	DNP
36	Vulnerable groups Inv.	1995-2010	DNP
37	Disaster prevention Inv.	1995-2010	DNP
38	Education Inv.*Public Services Inv	1995-2010	DNP
39	Education Inv*Justice Inv	1995-2010	DNP
40	Education Inv* Health Inv	1995-2010	DNP
41	Public Debt	1995-2010	DNP
42	Rain	1995-2010	CEDE
43	Primary Enrollment	1995-2010	Ministry of Educ
44	Secondary Enrollment	1995-2010	Ministry of Educ

E List of Parameter Values Used for Welfare Estimation

Variables	**Values**	**Source**	**Period**
% change in homicide rates 1995-2010	-0.48	Human Rights Observatory	1995-2010
Elasticity r and v	0.016	Review of studies	–
α	0.80	National Household Survey	2000-2010
β	0.98	National Household Survey	2000-2010
v	51.86	Human Rights Observatory	1995-2010
r	5040.96	Colombian Statistical Department	1995-2010
P	238.87	Colombian Statistical Department	1995-2010
l	192.00	National Household Survey	2000-2010
w	6085.00	National Household Survey	2000-2010
F	91920.00	National Household Survey	2000-2010
w (white-collar)	8214.75	AMS and National Household Survey	1995-2010
w (blue-collar)	4868.00	AMS Household Survey	1995-2010

Note: AMS stands for Annual Manufacturing Survey.

F Estimates for α and β

The welfare estimates require the estimation of the parameters of the utility function. In order to do so I use the information available in the Colombian National Household Surveys between 2001 and 2010. These surveys are representative at the National level and correspond to cross sections collected annually and contain information on workers and households socioeconomic characteristics. They are collected and processes by the Colombian Statistical Department (DANE, for its initials in Spanish).

To obtain the estimates of α and β I recover the expenditure function from equation (24) which are given by:

$$E(\bar{u}, P, r, v) = P^{\alpha} r^{1-\alpha} [\bar{u} v^{(1-\beta)}]^{\frac{1}{\beta}}$$

From this expression I estimate the following expression:

$$log(E_{mt}) = \underbrace{\frac{1}{\beta} log\bar{u}}_{a_0} + \underbrace{\alpha}_{a_1} log(P_{mt-1}) + \underbrace{(1-\alpha)}_{a_2} log(r_{mt-1}) - \underbrace{\frac{1-\beta}{\beta}}_{a_3} log(v_{mt-1}) + \epsilon_{mt}$$

which gives values of α=0.8, β=0.98