FIRM EXIT AND ARMED CONFLICT IN COLOMBIA[1]

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ABSTRACT

This paper uses two unique panel data sets to study the causal effect that armed conflict has over entrepreneurial activity in Colombia. Using a fixed effect estimation methodology at the plant level and controlling for the possible endogeneity of armed conflict through the use of instrumental variables, we find that a one standard deviation increase in the number of guerrilla and paramilitary attacks in a municipality increases the probability of plant exit in 5.2 percentage points or 0.26 standard deviations. This effect is stronger for younger manufacturing plants, with a smaller number of workers and low levels of capital.

Key Words: Conflict, Firm Exit, Entrepreneurship, Colombia.

JEL codes: D21, J31, R30

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1. Introduction

In a recent study, Harbom and Wallensteen (2007) report that a total of 232 armed conflicts have been active in 148 locations since the end of World War II. This high incidence of armed conflicts around the world has significantly increased the interest of academic research on the possible impact of violence on several outcomes of interest. Most of this research has focused on the direct impact that conflict has on its victims and on the households residing in conflict areas. The questions of interest in these studies include the impact of violence on forced migration (Morrison and May, 1994; and Ibañez and Velez, 2005), households' consumption and investment patterns (Verwimp and Bundervoet, 2008; Grun, 2008), general health of individuals (Camacho, 2008) and on the levels of education attainment and labor decisions of children exposed to conflict (Shemyakina, 2006; and Rodriguez and Sanchez, 2009), among others.

However, little attention has been given to the impact that conflict may have on firms' decisions, performance and activities. This is peculiar given the importance that entrepreneurship and firms' activities have on the economic performance in a country. Moreover, authors such as Lyigun and Rodrik (2004) and Munshi (2007) suggest that low levels of development are in part caused by low levels of entrepreneurship. Understanding if and how conflict affects economic activity at the firm level could provide governments and NGOs with insights on how to reduce the impact of conflict on economic activity and development of a country.

Among the few studies that have addressed the problem of firm activity and civil conflict we find Barro (1991) and Alesina and Perotti (1996). Using cross-country data, both studies show a negative relationship between political instability and economic growth. Similarly, Gaviria (2002) showed that firms' sales in Latin America grow at a lower rate if entrepreneurs believe crime rates are in sufficiently high levels to interrupt business. Of course, this cross-country evidence although suggestive may suffer from omitted variable bias and reverse causality between poverty and conflict if not adequately controlled for.

Hence, recent studies have focused on single country information in order to reduce these estimation problems. For instance, Abadie and Gardeazabal (2003) used information in the Basque country to estimate the impact that terrorist activities have on GDP; Collier and Duponchell (2010) use a cross section of firm data set and find negative consequences on employment and earnings in Sierra Leone; while Pshisva and Suarez (2010) established the negative impact that kidnaps have on firms' investment decisions in Colombia.

This paper enriches the existing literature by estimating the effect that armed conflict has on exit decisions of manufacturing firms. To do so, we use information from two unique panel data sets from Colombia that allow us to directly link firms´ activities with armed conflict intensity at the municipality level. It is relevant to study the manufacturing sector given that it represents approximately 15% of the GDP in Colombia. We also believe that Colombia is an appropriate country to answer these questions given that it suffers from one of the longest internal conflict still present in the world today. Guerrilla and paramilitary groups have been active since the sixties; they have committed several attacks in most of its national territory and with very high intensity during the nineties, affecting in a negative and significant manner most of its population. These attacks have varied in intensity and geographical location during the years and hence provide sufficient variation to capture its effect on economic activity.

The information on entrepreneurial activities used in the present study comes from the Annual Manufacturing Survey (AMS). This is a census of manufacturing plants with more than 10 employees or annual production above 115.5 million pesos measured in 2005 prices (around US$46,000) for the period 1993-2005. Information on armed conflict is obtained from a yearly data set at the municipal level constructed by CEDE (Centro de Estudios sobre Desarrollo Económico - Universidad de los Andes) which contains the number and types of attacks perpetrated by both guerilla and paramilitary groups in Colombia between 1988 and 2004. Our conflict measure is the sum of all attacks perpetrated by all the active armed groups in each municipality. This information is further complemented with information on government deterrence measures.

We use three different approaches in order to obtain the causal link between armed conflict and firms' exit decisions. The first one uses a panel fixed effect estimation at the plant level where the contemporaneous armed conflict measure is our independent variable of interest. To control for possible endogeneity, the second approach uses a lagged armed conflict measure instead of the contemporaneous one. Our third and preferred strategy is an instrumental variable approach in which contemporaneous armed conflict is instrumented with lagged government deterrence measures.[2] Under this last methodology we find that the average violence increases the probability of plant exit in 4.8 percentage points. If we evaluate this same effect with an increase in one standard deviation of the rate of attacks present in the municipality there is a positive and significant increase over the hazard that a plant exits of about 5.2 percentage points or 0.26 standard deviations accordingly. Moreover, we find that this effect differs according to plants characteristics. Specifically, smaller firms in terms of workers and capital used are more likely to exit when civil conflict increases. Results show that violence also has a differential effect according to firms' age suggesting that younger firms are affected the most.

There are several differences between the previous research above mentioned and the one we present in this paper, making an important contribution to the literature. The first one is related to the use of such rich information from a single country with enough armed conflict variation. As it is known, this will reduce problems such as omitted variable bias, reverse causality and measurement errors.[3] Moreover, the available data allows us to construct a panel of firms at the plant level along a period of ten years that constitute the universe of all manufacturing plants in Colombia. In that sense, the quality of the data improves the credibility of the results over those from Collier and Duponchell (2010), that only have information of a sample of firms in four districts and for a given year. Second,

[2] The intuition for choosing these instruments is closely related with recent research by Angrist and Kugler (2008). This will be explained in more detail in the paper. .

[3] On this last point, some of the studies in the literature use perception based crime or conflict levels that are not always necessarily accurate. Moreover, studies that use more formal crime or conflict measures may be difficult to interpret given the differences in registry and measurement of crime in different countries. We do not face such problems given that we use the same measure of armed conflict along the years for Colombia.

there is no other study in the literature that has linked firms' plant level data with violence data at the municipality level.[4] While Pshiva and Suarez (2010) use firm data level the linkage is only at the state level and they concentrate only on one type of crime. Furthermore, the information used in the cited study corresponds to general balances of the firms; this information reports the location of the firm as the place where it is registered. However, the place where the firm is registered is not necessarily the place where the firm operates, especially if firms have several production plants under the same name. In our sample, we find that approximately 10% of the firms have more than one plant. This could measure how much firm misallocation could appear in Pshiva and Suarez (2010) study. In our study we are able to match plant level information with violent acts committed directly in the municipality where the firms' production plants are located and we do so by constructing a panel of production plant's data set.

Third, the available data allows us to study the impact of violence on an entrepreneurial aspect that as stated by previous authors, crucially determines the landscape of the economy, its jobs and development but was not studied before: plant exit. We therefore provide a crucial link through which armed conflict affects economic development and growth at the microeconomic level. Last, but not least, the rich data available allows us to explicitly take into account the possible endogeneity of armed conflict through an instrumental variables approach which has never been carried out at the plant level before.

Given our question of interest, this paper is also related to the general literature by Melitz (2003) and Hopenhayn (1992) that studies the determinants of firm exit decisions in different contexts. For instance, Alvarez & Görg (2009) and Bernard and Jensen (2006) study how foreign ownership affects plant deaths in Chile and the USA respectively. Similarly, under a duration analysis framework, Audretsch & Mahmood (1995) find that survival rate depends on age and firms' size, innovation rate at the industry level, capital intensity and new firms with new branches. Even though all of these studies had information at the plant level they only controlled for industry fixed effects. Finally, we

[4] Colombia has 31 states and 1120 municipalities within those states.

should also mention the work by Eslava et al. (2004, 2008) who have studied plant exit in Colombia during the 1990´s. Their papers use information from the Annual Manufacturing Survey (AMS), the same source of information as this paper uses. However, their focus is different since they relate plant exit to the major labor, trade and financial reforms that occurred early in that decade but do not control for the violence the country experienced during these years. Furthermore, we use slightly newer information that accounts for the years after the reforms took place and control for year fixed effects to capture any reform done after 1993.

The remainder of the paper is organized as follows. Section 2 includes a review of the papers relating conflict with economic activity in the international literature. Section 3, describes the data used in the paper and includes some descriptive statistics. Section 4 presents the possible channels that could be driving changes in entrepreneurial behaviors due to violence. Section 5 explains the empirical strategy used in this paper. Section 6 summarizes the main results of the paper and section 7 concludes.

2. Literature Review

As mentioned before, most of the existing literature on the consequences of conflict on economic activity has focused on cross-country evidence at the aggregate level. The first studies undertaken by authors such as Barro (1991), Alesina et al. (1996) and Alesina and Perotti (1996) focused on analyzing how political instability affected investment rates and economic growth at the national levels. Using cross-country data and different definitions of political instability or conflict, these papers find a negative relationship between these variables and economic activity. Similarly, Collier (1999) estimates that during conflict periods countries' growth is approximately 2.2% lower than that obtained in peaceful times. Moreover, Stewart et al. (2001) find that fifteen out of sixteen countries that have experienced an internal conflict within its borders suffered a decrease in their GDP per capita.

In a more recent study, instead of using macro level data at the country level, Gaviria (2002) used information provided by around 100 middle and top managers from the private sector in 29 different countries. Controlling for firms' characteristics as well as country

fixed effects, the author finds that both perceived corruption and crime have a negative and significant effect on investment and employment growth at the firm level. Although the paper investigates both corruption and crime activity, it is worth noting the apparent importance that the former has compared to the latter. First, according to 53% of the interviewed managers, crime is an obstacle to doing business compared to 46% who think corruption is an obstacle. Second, his empirical strategy suggests that while corruption lowers sales growth by 30%, crime reduces it by 35%. Similarly, while corruption appears to have no effect over investment, crime reduces it by 16%.

Of course, this cross-country evidence although suggestive may suffer from some limitations such as measurement error, omitted variable bias and reverse causality between poverty and conflict if not adequately controlled for. Hence, recent studies have tried to solve these problems by using information regarding conflict in a single country in order to study its possible economic impact. Among these studies we find Abadie and Gardeazabal (2003) who evaluate the economic effects that terrorist activity performed by ETA has imparted in the Basque Country since its outset in the early seventies. They find that the terrorist activity created a gap of almost ten percentage points between the actual and potential GDP per capita in the region.

Even though there is a great potential for studying the effect of conflict in Colombia, Riascos and Vargas (2004) mention that there are few studies that estimate the impact that both violence and armed conflict has on economic growth. The first studies in the country by Rubio (1995) and Trujillo and Badel (1997) estimated the economic costs of conflict through accounting techniques and concluded that the total costs of armed conflict and illegal activities in the country amounted to 15% of GDP. More recent research have used either time series information for the country (Querubin, 2003; Vargas, 2003 and Cárdenas, 2007), or have calibrated theoretical models to Colombian data (Arias and Ardila, 2003 and Mejia and Posada, 2003). However, all of these papers used aggregate level data such as GDP *per-capita* or its growth rate.

To the best of our knowledge, the only papers in the literature that relates conflict variables with firm level data for a single country are Collier and Duponchell (2010), Pshisva and Suarez (2010) and Rettberg (2008). The former study uses information from a firm survey

conducted by the World Bank in 2006 in Sierra Leone, finding that conflict reduces the number of employees a firm hires and also the income they receive. Moreover, it appears that the less productive firms are the ones who are hit the most by the conflict. The latter paper carries out a survey to nearly 1,000 firms in Colombia's six largest cities asking their managers how the armed conflict has influenced their operations. Through a descriptive methodology the author concludes that the armed conflict in Colombia affects its firms through channels such as transaction costs, investment, expansion opportunities and firm sales. Pshisva and Suarez (2010) use firm level panel data comprising nearly 10,000 firms for the period 1996-2002 and combine it with information on the number of kidnappings at the state level in Colombia. The authors estimate the effect that kidnaps have on firms' investment decisions under an OLS framework with fixed effects at the firm level. They find that a one-standard deviation increase in firm-targeted kidnappings reduce the investment rate of the average firm from 0.29% to -0.28% of total assets. The authors suggest that the channel through which the effect of kidnaps is transmitted to investment is through the fear channel and not through demand, costs or credit constraints.

Even though previous researchers have studied the impact of armed conflict on economic activity none have used such a detailed data as the one we use in this paper. As previously mentioned, we are able to construct a panel data set at the plant level for all manufacturing firms in the country for a period of ten years. The special and unique characteristics of the data used as well as the estimation strategies makes the present paper a contribution to the literature. Moreover, no study before has investigated the impact of armed conflict on firm exit decisions.

3. Data

In order to answer our research questions we use Colombian violence and plant level data. Colombia has two detailed and unique data sets that will allow us to study in depth how armed conflict affects entrepreneurial activity.

3.1 Annual Manufacturing Survey (AMS) 1993-2005:

The Colombian Annual Manufacturing Survey (AMS) is conducted by the National Department of Statistics DANE starting in year 1982 and ending in year 2005. This is a

census of industrial plants with more than 10 employees, or production above 115.5 million pesos in 2005 (this value is adjusted every year using the Producer Price Index).[5] This is a unique data set where one can construct a panel of plants by industry sectors over a long period of time. We will use information by year-plant on: wages and benefit payments, investments, value added of production and of course entry and exit of manufacturing plants.

The information we use in this paper relates to the years 1993-2004. We start our panel in year 1993 because only from that year onwards there is information about location (municipality) of the plant. Moreover, in 1992 the National Department of Statistics changed the coding of the plants and even though one could try to identify each plant of the new survey with past information some observations are lost and the methods are not a hundred percent reliable, as documented by Eslava et al. (2004). With these restrictions in mind, we obtain a non-balanced panel including 12,714 plants during the period 1993-2004, accounting for 93,188 observations. These plants are located in 296 municipalities out of 1,120 municipalities of Colombia; they are well spread within the territory. Of course, the most number of plants are located in big cities such as Bogota, Medellín, Cali, Barranquilla, and Bucaramanga concentrating almost 65.23% of the sample. The remaining plants are located in 28 states of the 32 states in Colombia.

Table 1 shows a stable distribution of plants across years, with an average of approximately 7,765 plants per year. We also include descriptive statistics of the number of plants that exit each year, with an average of 452. As observed, approximately 6% of all manufacturing plants in Colombia exit each year. It should be noted an important fact in our definition of exit. The variable exit takes the value of one if we stop observing the plant in a given period and do not observe it again in the sample and zero otherwise. However, as mentioned, the AMS is carried out to all plants with more than ten employees or with a production of above a given range, and hence one could think that a plant that contracts to a smaller scale could be erroneously declared as a plant that left the market .

[5] In US dollars this amounts to approximately $46,000 using an exchange rate of $2,500 Colombian pesos per US dollar.

We believe this is not the case for three reasons. First, the Statistics Department continues to follow any plant that decreases the number of workers below 10 until this condition of less than 10 employees persists for more than 3 years. This will decrease the error of declaring a plant exited the market when it only temporarily contracted. Second, we only assume there is an exit if we never see the plant in the survey again, so we allow for the possibility of plants that are not followed for a year but then they reappear in the sample with the same identification number. Third, it is more likely that an erroneous exit declaration of a plant will occur for those plants with a lower number of workers. Hence, to make sure that we are not erroneously capturing such cases as exits, in the empirical exercises we carry out robustness checks dropping plants that have less than 10 employees or annual production less than 115.5 million pesos measured in 2005.[6]

In Table 2 we include descriptive statistics coming from the AMS for our dependent variable, plant exit, and for each of our control variables used in the empirical exercises such as: wages and benefit payments, investments and value added of production. The table has two panels, the first one contains information on the whole sample of plants, while the second panel contains information on the sub-sample of plants where there is no missing information. Across the decade we find that on average 5.83% of plants exit our sample, the wage paid to production workers is $480,325 (2004 pesos) and for sales workers is $897,650 (2004 pesos), which corresponds to 1.34 and 2.51 of the 2004 minimum wage respectively. Wages and investments are 16% and 17.5% of total value added respectively. We also report the descriptive statistics for our estimated measure of productivity. Specifically, we ran a regression of capital and labor on output, and assuming a log linearized Cobb-Douglas production function, we calculate productivity as the Solow residual. This measure has a mean value of zero and a standard deviation of 2.21. For the subsample of plants we observe that the exit decision is somewhat smaller (4%), these plants are more productive, have a longer duration in the panel and are larger in terms of workers hired. The other plant controls are relatively similar to the ones described above and reported in the first panel of Table 2.

[6] This amounts to drop almost 20% of the observations.

As mentioned, the AMS is a census of all manufacturing plants and hence we believe that these data does not have much biases in terms of firm selection. Two facts give us additional confidence on the accuracy and completeness of the information in this data set. First, Law 79 of October 1993 requires firms to fill out any survey provided by DANE. Second, every year DANE verifies with Confecamaras[7] to send forms to new firms that qualify into the AMS, firms that will potentially enter into the panel receive pre-surveys to verify their characteristics to enter into the sample.

3.2.Armed Conflict Data Base 1993-2004:

The Colombian conflict is one of the longest ongoing domestic confrontations in the world surpassed in length only by the Israeli-Palestinian and the Indian-Pakistani conflicts. There are three main irregular armed groups acting inside its borders during the period we study. Specifically, there are two guerrilla organizations known as the Revolutionary Armed Forces of Colombia (FARC) and the National Liberation Army (ELN) both of which even though originated in communist ideas in the early sixties are now also involved in drug producing and trafficking operations. The third group is a rightwing paramilitary group known as the United Self-Defense Forces of Colombia (AUC) with almost twenty five years of existence, although they demobilized in 2003 and some heads were extradited to the United States, some cells mutated into drug-dealers groups and are still active in the conflict. All three groups besides engaging in direct fight with the national army they also perpetrate crimes against the civil population, private assets and public infrastructure. To finance themselves and try to get political power they kidnap both for extortive or political reasons and engage in drug production and trafficking.[8]

The information on this conflict used in this research comes from a balanced panel at the municipality level from 1988-2004, this data set has been collected along the years through

[7] Confecamaras is the Chamber of Commerce Association where all formal firms are registered and follow certain regulatory standards.

[8] For a detailed description of the Colombian conflict please refer to Echandía (2006) and Sanchez et al. (2005).

different sources by the CEDE at Universidad de los Andes.[9] It has information on all attacks carried out by guerillas and paramilitary groups; as well as deterrence and defensive actions taken by the government during this period of time.

Our measure of conflict in this research will be the total number of attacks carried out by the armed groups against the civil population, its private assets or the public infrastructure. Specifically, the total number of attacks will be the sum of explosive terrorist attacks, arsonist terrorist attacks, private property assaults, entity terrorist attacks, political terrorist attacks, route blocking, armed contact, ambushes, harassing, population incursions, other terrorist attacks, land piracy and illegal road blockings. To get an idea of the variation in the intensity of the civil conflict inside Colombian borders, Figure 1 presents the average rate of attacks in each municipality between the years 1993-2008. From this Figure it is clear that conflict is widespread all over the country. Moreover, it varies in intensity across regions. It is precisely this source of variation that will allow us the identification of the effects of armed conflict on plant exit decisions.

The average rate of attacks per 100,000 inhabitants in the municipalities where the plants in the AMS are located is depicted in Figure 2. This measure significantly increased after 1999 and only appears to start to decrease in the year 2004. Such pattern is consistent with the onset of President Uribe's first term when the country was in a deep civil war and both guerrilla and paramilitary groups were active and very strong. Table 2 also presents the average of 2.42 and standard deviation of 3.14 for this measure of conflict, the latter is almost 30% higher than the mean suggesting that armed conflict intensity varies widely across the country . For the smaller subsample the average number of attacks is practically the same, although the standard deviation is somewhat smaller.

This same table presents the average antinarcotics operations as well as the number of drug laboratories dismantled by the army, navy or the national police. On average there are 6.8 antinarcotics operations in each municipality and 1.2 laboratories dismantled per year.

[9] Data was collected from the Vicepresidencia de la Republica, Departamento Nacional de Planeación (DNP), Departamento Administrativo Nacional de Estadistica (DANE), Policía Nacional, Departamento Administrativo de Seguridad (DAS) and Centro de Estudios sobre Desarrollo Económico (CEDE) among others.

These values are 7.21 and 1.19 respectively for the subsample. As will be explained in more detail later, these variables are of interest because they will be used as instruments for the total attack rate given that they proxy for deterrence actions from the government. As previously mentioned all Colombian armed groups use drug production and distribution as a major financing source. Hence, higher values of such operations will necessarily be associated with a higher presence of government, police forces and criminal groups in the municipality. This in turn will imply that deterrence actions should be highly correlated with armed conflict measures.

3.3. Municipal controls:

After merging the above data sets described, we included additional variables that could help us control for some fixed characteristics at the municipality level different from the level of violence. Among them we include the town surface with an average of 843.97 square kilometers and an average distance of 53.57 kilometers to the largest city in the municipality. Additional descriptive statistics of these variables are presented in the last two lines of Table 2. We also include information that varies at the municipal level and overtime such as: government transfers received by each municipality and GDP levels of the State for each year. Their most relevant statistics are also presented in Table 2, note that both the averages and standard deviations are similar in the complete and in the smaller sample.

4. Changes in Entrepreneurial Activity due to Violence

There are several channels through which armed conflict could interfere in the productive and commercial activities of the plant. One of the most named channels is that of uncertainty or fear. Naturally fear could reduce investment in both factors of production, labor and capital as suggested by Pshisva and Suarez (2010). As documented by Ibañez and Velez (2005) armed conflict could also affect plants' employment if laborers flee the region due to fear of being killed. In some cases, it could also happen that some civilians may even join the armed groups if they are offered higher wages than those obtained in the legal market. To summarize the amount of labor supply could vary in different ways: it could depend on the rate of within and between forced migration. Plants located in urban areas of

municipalities which have migration from rural to urban areas will see their labor force increase. Plants located in areas where migration happens from rural and urban areas to other municipalities, could see a reduction in their labor force.

Another direct impact of conflict may be related with changes in operational costs. It is plausible to imagine situations in which plants that are located in a violent area would need to increase security if private property is subject to acts of violence. In such cases either additional guard(s) or security systems need to be hired or implemented. Likewise, it could be the case that armed groups charge private firms extortion payments with the threat that if not paid direct terrorism acts could be aimed at the firms. Theoretically, such possibility has been previously analyzed by Konrad and Skaperdas (1998).[10]

Indirect effect for the firms may be numerous too. From the demand side, previous authors such as Verwimp and Bundervoet (2008) have shown that households' consumption growth is reduced under conflict. Hence, it is no surprise that demand for products or services produced by the firms could be reduced and hence probably production and sales would decrease too. Moreover, the reduction in investment, production and sales could in turn reduce the number of laborers plants will want to hire. Finally, another indirect effect that could take place is an increase in credit costs or a reduction in available loans to firms. It is plausible that banks will be willing to lend money to firms located in violent regions only at higher rates so that the higher risks that such loans entail are covered. In extreme cases banks will simply close all the credit lines for such regions.

Through their influence in capital investment, labor hiring opportunities, changes in costs of production and effective customers' sales armed conflict could have a significant effect on a plant's exit decision. We can formalize these ideas using a simple model of firms' decisions where for simplicity we abstract from the impact of armed conflict on the supply of factors of production. Let's assume that the plant *i* in municipality *m* at time *t* produces with a traditional Cobb-Douglas production function that depends positively on the amount

[10] Specifically, for Colombia a recent example of such bribes is that supposedly made to Blockbuster by a guerrilla group. The multinational company refused to pay them the demanded bribe and on January 27th 2009 a bomb in one of its stores was exploded in Bogota. (More details in El Tiempo, January 28th 2009 "Autoridades atribuyen a extorsión atentado que dejó dos muertos en Bogotá")

of capital (*k*) and labor (*l*): $Y_{imt} = Ak_{imt}^{\alpha} l_{imt}^{\beta}$ where *Y* represents its production, *A* captures its production technology and α and β represents the capital and labor share of output respectively that are assumed constant and positive.

Given the channels mentioned above, we will assume that violence could potentially affect investment in capital in each period.[11] Specifically, if there is no armed conflict the value of the plants´ capital in period *t* will be its depreciated capital stock from previous period plus any investment done in period *t*. Under conflict plant's capital will be a proportion λ of that same amount of capital where λ is a parameter between 0 and 1 that varies in magnitude according to the intensity of the violent attack that could destroy partially or totally the capital owned by the plant.

Under these assumptions, the expected value of plant's i output will be given by

$$Y_{imt} = \big(1 - p(v_{mt})\big) Ak_{imt}^{\propto} l_{imt}^{\beta} + p(v_{mt}) A(\lambda k_{imt})^{\propto} l_{imt}^{\beta} \qquad (1)$$

where $p(v_{mt})$ is a number between zero and one and represents the probability of having a violent attack in municipality *m* at time *t*. Having a positive probability that violent acts destroy infrastructure makes investment and hiring decisions harder and riskier. In some cases agents may rationally decide to reduce long term investments in factors of production in order to reduce the exposure of their wealth or reduce ties to that specific region. Another way to see it is that plants in a violent context not only need to be efficient in terms of production, but they should have some characteristics that help their factors of production survive to violent environments.

Under these assumptions it can be easily shown that conflict will reduce plant's output. All else equal, $\frac{\partial Y_{imt}}{\partial p(v_{mt})} < 0$.

Although this relationship between violence and production is clear it is not necessarily obvious the effect that violence can have on a plant's exit decision and hence the model

[11] For simplicity, we do not explicitly assume the firm will suffer a labor demand shock due to violence. However, the optimal labor demand will of course be different under armed conflict when the firm maximizes profits.

need to be extended. Under a traditional perfect competition model we know a plant will decide to exit the market if it cannot cover its fixed costs (*FC*). That is if we define exit as a dummy variable equal to one if the plant decides to exit and zero otherwise we will have that:

$$exit = \begin{Bmatrix} 1\ if\ \ \pi < -FC \\ 0\ if\ \pi \geq -FC \end{Bmatrix} \qquad (2)$$

Benefits will be given by the difference between income and variable (*VC*) and fixed costs (*FC*):

$$\pi = PY - VC - FC \qquad (3)$$

where fixed costs include the capital stock (k_t) and variable costs include payroll (wl_t), intermediate consumption goods (*IC*) and investments in period t (I_t).

$$FC = r(1-\delta)K_{t-1} \qquad and \qquad VC = wL_t + rI_t + IC \quad (4)$$

Replacing fixed and variable costs in equation (3) we get:

$$\pi = PY - wL_t - rI_t - IC - r(1-\delta)K_{t-1} \qquad (5)$$

If we allow revenue (*PY*) minus intermediate consumption (*IC*) to be total value added (*VA*) and replace it in (2) we obtain that:

$$exit = \begin{Bmatrix} 1\ if\ \ VA - wL_t - rI_t < 0 \\ 0\ if\ VA - wL_t - rI_t \geq 0 \end{Bmatrix} \qquad (6)$$

Now the effect that violence can have over plant's exit decisions becomes ambiguous. On the one side, as shown above, it will definitely reduce plant's value added through a reduction in production. However, violence will also influence the optimal labor the plant demands given its effect on the marginal product of capital and hence will reduce part of its variable costs.[12] Moreover, violence could have a positive or a negative effect on investment. For fear motives plants may desire to cut back investments. However, if any

[12] Here of course we are assuming that wages are fixed as in a competitive model. In the empirical part we do not have this restrictive assumption given that we will control for labor costs, wages and number of laborers.

attack destroys necessary capital plants will need to replace them and investment will necessarily increase. Under these circumstances, the effect of violence on plant's exit decision may be unclear and the answer needs to be obtained empirically.

5. Empirical Strategy

Having in mind the channels described above, this paper empirically estimates the effect that armed conflict has over plant exit decisions for all Colombian manufacturing plants in the AMS between 1993 and 2004. Based on the model described in the previous section, we have that the reduced form of such decision will be given by:

$$exit = f(VA, wL_t, rI_t, vio) \qquad (7)$$

This is the basic structure that all the estimations presented in this paper will have. The use of the unique data described in Section 3 will allow us to use panel data techniques to answer our question of interest. As it is well know, this technique is highly valuable given that, among other things, it allows the researcher to control for all the constant unobservables that could affect the outcomes of interest. For our specific case, panel data techniques could for instance control for the managerial abilities or political affiliation of the owners of plants that will indeed influence the decisions taken and hence the results attained by them.

Specifically, the simplest specification that we estimate is given by:

$$y_{i,mt} = \beta_0 + \beta_1 v_{mt} + \beta_2 d_{i,m,t} + \beta_3 x_{mt} + \beta_4 f_{i,m,t} + \gamma_t + \delta_i + u_{i,m,t} \qquad (8)$$

where $y_{i,mt}$ represents the exit decisions for plant *i* located in municipality *m* and at time *t*. The variable v_{mt} represents the violence or armed conflict that took place in municipality *m* and at time *t*. As specified above, this variable captures the rate of attacks perpetrated by all the armed groups active inside Colombian borders in the period of study. We include $d_{i,m,t}$ as a variable that capture duration of the plant in the panel. The vector x_{mt} represents constant and time varying municipal characteristics such as the municipality area, the distance to the main city in the municipality, the GDP of the state, and transferences from the Central Government. The vector $f_{i,m,t}$ represents plant characteristics changing over time, such as nominal investment, total nominal wages paid

and added value all of which come from our theoretical model. Finally, γ_t, δ_i represent year and plant fixed effects respectively and $u_{i,m,t}$ is an error term assumed to be orthogonal to plant exit.

Under specification (8), β_1 is our coefficient of interest which will give an estimate of the effect that armed conflict has on plant exit. However, one must be cautious when interpreting this result, given that reverse causality and endogeneity could be biasing our estimation of β_1. A growing literature has previously shown that economic activity is an important determinant on the onset and duration of civil conflict. Among some of these studies we find Collier and Hoeffer (2002), Fearon and Laitin (2003) and Miguel et al. (2004) all of which, using cross-country information, have found that levels and growth rates of GDP have a negative effect on armed conflict measures. There are many channels through which such reverse causality could emerge. For instance, lower economic activity may be associated with fewer labor opportunities or lower wages for young men. Under such scenarios it would be easier for armed groups to recruit new members and an escalation of the conflict could take place. Another possibility is that plant's location is endogenous to levels of violence. A plant will take into account violence conditions when deciding whether to open business or not. The strongest or more able plants to face conflict will open and stay.

For the reasons previously explained we must take into account the possibility of endogeneity in our conflict measure $v_{m,t}$. To do so we follow two different strategies. The first one is to use lagged instead of contemporaneous measures of armed conflict ($v_{m,t-1}$) as follows:

$$y_{i,mt} = \beta_0 + \beta_1 v_{m,t-1} + \beta_2 d_{i,m,t} + \beta_3 x_{mt} + \beta_4 f_{i,m,t} + \gamma_t + \delta_i + u_{i,m,t} \qquad (9)$$

It is plausible to assume that plant managers will take into account last period's armed conflict intensity when making production decisions today or even entering into business. However, it is harder to come up with a story where production decisions of today will

influence armed activity yesterday, eliminating possible reverse causality problems.[13] However, the problem with this approach is that if there is any inertia in the armed conflict measure or in economic activity lagged measures of the former will not necessarily solve the endogeneity problem.

Hence, the second strategy is an instrumental variables approach in which we explain the armed conflict present in municipality *m* at time *t* with lagged laboratories dismantle $z_{1m,t-1}$ and antinarcotics operations $z_{2m,t-1}$ in municipality *m* at time *t-1*. Our first stage will be given by the following equation:

$$v_{mt} = \partial_0 + \partial_1 z_{1m,t-1} + \partial_1 z_{2m,t-1} + \beta_2 d_{i,m,t} + \beta_3 x_{mt} + \beta_4 f_{i,m,t} + \gamma_t + \delta_i + u_{i,m,t} \quad (10)$$

Where violence in municipality *m* at time *t* is explained by all the exogenous regressors. We used these two instruments for two main reasons. First, the laboratories dismantle and antinarcotics operations rate in municipality *m* at time *t-1* should be highly correlated with armed conflict given that it serves as a measure of both the presence and effectiveness of the Government to counteract criminal activity in the region. That is, we would expect to find a negative association between this government's deterrence measure and armed conflict intensity, as will be shown in our first stage regression. However, note that both variables are related to drug production which is known to be the main financing source of the Colombian armed groups. Hence, if these groups try to protect such laboratories or production sites through armed attacks it could also be the case that a positive relationship between armed conflict and such deterrence measures could emerge. The second reason behind our choice of instruments is that we believe on their exogeneity. It is hard to believe that production and commercial decisions of managers today will be based on these specific

[13] Studies such as Collier and Hoeffer (2002) and Fearon and Laitin (2003) have previously used lagged independent variables to solve reverse causality problems between economic activity and armed conflict. However, as previously mentioned their interest is in understanding how the former affects the latter. As detailed in Miguel et al. (2004) under such question the use of lagged variables is more doubtful given that economic actors could anticipate the possible conflict.

central government deterrence decisions which are normally secret operations that occur in environments not easily detected by the civil population.

It should be noted that a recent paper by Angrist and Kugler (2008) gives further support for our instruments. In their study, the authors find that indeed an exogenous upsurge in coca cultivation increased violence in the regions where it was produced. They explain that a possible mechanism through which this takes place is by the resources that drug production give to Colombian armed groups. Furthermore, the authors also find little evidence to suggest that increased coca production benefited economic activity in the producing regions. Although the income of some rural dwellers increased, they argue that regional economies are not closely related to the drug business and that most of the resources from this activity go directly to the insurgent hands. Given that manufacturing is clearly a more urban and legal activity it is even harder to find channels through which antinarcotics deterrence actions should influence plant exit decisions.

The instrumental variable approach is our preferred estimation strategy not only because it addresses the endogeneity problem directly but also because it could also reduce any possible bias due to measurement errors or omitted variables. Of course both requirements for a good set of instruments will be tested empirically. That is we will need to prove that both deterrence measures are strongly related with our variable of interest and that they are exogenous to plants' exit decisions.

6. Results

OLS and lagged values of armed conflict

A preview of our paper can be seen in Figure 3. It shows quintiles for the total attack rate and plant exit rate at the state level. We have information of entrepreneurial activity in most of the Colombian States, with the exception of three eastern states. These are mainly rural states and hence it is not surprising that no manufacturing plant is located there. With some exceptions, the figure shows that in general there is a positive correlation between quintiles of plant exit proportion and attack rates. Of course, this simple relationship does not imply causality and more formal exercises as the ones described in the empirical strategy need to be carried out. Different specifications of equation (8 and 9) are presented in Table 3 as we

gradually include controls into the regression.[14] The first six columns are related with contemporaneous measures of armed conflict while the last six relate with lagged measures. Columns one and seven include as controls only the duration variable as well as plant and year fixed effects; the second and eighth columns add the municipal controls described above; and the last specifications include all the set of controls by adding gradually plants' specific characteristics that arise from the model in section four. Even though we are controlling for fixed effects at the plant level the inclusion of constant municipality characteristics is possible given that out of the 12,714 plants, 862 of them changed location during the period under study.

As shown in all specifications presented in Tables 3, the contemporaneous intensity of conflict appears to have no effect over plant exit. All coefficients of interest in these regressions are actually zero. However, as described above, these results need to be interpreted with caution given the possible reverse causality that can exist between economic activity and armed conflict. The last six columns of Table 3 try to address the problem of reverse causality by using the lagged intensity of the conflict. As described above, while it is expected that economic activity of today could influence armed conflict today it is harder to believe that it could influence yesterday's armed conflict. However, as can be observed in Table 3 there still appears to be no effect of violence on plant exit decisions as the coefficient of interest across all specifications remain equal to zero.

From Table 3 it can also be observed that the longer a plant appears in the panel the probability of exit increases. In general, plants located in municipalities where the local government receives higher transfers from the central government are less likely to exit. In regards to the plants' own characteristics we find that larger plants in terms of value added and those who have a bigger payroll have a lower probability of exiting. This result goes in line with those found in the exit literature such as Bernard and Jensen (2006) and Alvarez and Görg (2005) for the USA and Chile respectively.

[14]We decided to use data only from those plants that have information from all our control variables. That leaves us with 35,000 observations to be able to compare the coefficient of interest across specifications. Nonetheless, results are maintained using the complete sample in specifications that do not include all control variables. All of them are available upon request.

Instrumental variables approach

Even though the lag strategy could in principle solve the reverse causality between armed conflict and economic activity if there is any inertia in the latter variable lagged measures of past conflict may not be a truly an exogenous variable. This would imply that our coefficient of interest could still suffer from a significant bias problem. Similarly, as is well known, measurement error bias may exacerbate in the presence of fixed effects which is the case in this paper. This could be biasing our coefficient of interest toward zero, something that lagged measures of conflict do not resolve either.

Hence, we decided to implement an instrumental variable approach. Specifically, we evaluate the effect that armed conflict measures, instrumented by lagged laboratories dismantle and antinarcotics operations at the municipality level, has on entrepreneurial activities. This is our preferred strategy not only because it directly addresses the endogeneity problems but also because any bias due to omitted variables or measurement errors will also decrease.

Table 4 presents the first stage regression of the IV approach, to check the appropriateness of the instrument used. The columns in the Table correspond to different specifications in which control variables are included gradually. As can be observed, for every specification, laboratories dismantle and antinarcotics operations of the previous period influence in a significant manner the level of armed conflict in the municipality independently of the controls used. Moreover, the F-test shows that under these specifications we will not suffer from any weak instrument problem given that in each case the p-value is very small. The last column of Table 4 presents the coefficients associated with our two instruments after including all control variables and fixed effects. We find that if laboratories dismantle increases in one unit our armed conflict measure increases in 0.138 units. For antinarcotics operations, we find that if this variable increases in one unit, armed conflict measure decreases in 0.01 units. The specific fact that both deterrence measures have the opposite sign is something that was explained above.

Even though relevance of the instruments has been proven, we also need to address the exogeneity of our chosen instruments and the endogeneity of the armed conflict measure in

the exit specification. Both these questions are answered in the lower panel of Table 5 which presents the results for the Sargan and endogeneity test of the instruments and armed conflict respectively. In the former test the null hypothesis is that, assuming that one of the instruments is exogenous, the second one is also exogenous. None of the Sargan tests from different specifications in Table 5 reject the null hypothesis under a reasonable significance level. The null hypothesis of the endogeneity test is that the armed conflict measure is an exogenous variable in the empirical specification and hence no IV procedure should be needed. In this case however, we reject such hypothesis in all specifications with a one percent confidence level implying that an IV estimation is indeed needed.

The results of the second stage for the exit decision of plants are presented in Tables 5. Under the two stage procedure we can observe that armed conflict has a positive and significant effect on plant exit. Column one shows that after controlling only for plant fixed effects, year effects and duration of the plants, the hazard rate that plant exits the market increases in 6.1 or 5.6 percentage points with a one standard deviation increase in the total attack rate or evaluated at the mean respectively. Alternatively, this amounts to a change in 0.3 and 0.27 standard deviations respectively which is clearly not a small effect. Of course, this coefficient may be biased given that there could be characteristics at the municipality level that are constant or vary over time and may be correlated both with plant exit decisions and armed conflict. To reduce these possible sources of biases column two includes municipality characteristics that are constant as well as some that vary over time. As can be observed, there was a significant bias in the coefficient given that it reduces in nearly 25%. However, it remains economically important and highly significant. Specifically, it is estimated that an increase in one standard deviation of our armed conflict measure increases the probability that a plant will exit the market by 0.22 standard deviations.

Given that we control for year and plant fixed effects, and for municipality characteristics that proxy for the potential size of the markets as well as economic activity and poverty levels, we can say that the effect observed in column two must be the impact of armed conflict on plant exit decision. However, as explained in section four there are numerous channels thorough which this effect may take place. By adding the plant's control variables

we can disentangle some of these channels and get a first estimate of how important each may be.

The first channel that can be influencing these results is the fear channel. It is expected that under fear, entrepreneurs may decide not to invest as much in the plant as they would have done if no conflict was present. To see how important this channel may have been we include plants' investment as a control variable in column three. We find that plants with larger investment levels in the respective year have a lower hazard of exiting the market. Moreover, our coefficient of interest remains intact suggesting that fear, expressed as investment decisions, is not a significant channel driving the results found. Alternatively, armed conflict could affect operational cost or bring a negative shock into the labor market. To proxy for this channel we included in the regression plant's payroll. Column four shows that plants with higher expenditures in wages have a lower probability of exit. More importantly, not including this variable significantly biased downwards our coefficient of interest given that it increases back to 0.2. This provides preliminary evidence that suggest further and more detailed future research on this channel is necessary. Finally, we also include measures of value added of each plant (to proxy for indirect effects such as prices of the goods produced or costs of intermediate production) as well as our productivity measure, all of which could also be influenced by armed conflict. Both variables enter with the expected sign into the regression and are highly significant. However, after including these channels, our coefficient of interest does not vary significantly.

Under this last specification we find that an increase in one standard deviation of armed conflict increases the probability of plant exit by 0.26 standard deviations. Nonetheless, it is important to note that, regardless of the channel that is driving this result, this negative effect is of course, at least in the short run negative for the municipality's economy given that jobs will be lost and poverty could increase. Furthermore, precarious socioeconomic conditions could lead to increases in armed conflict creating a vicious circle.

Heterogeneous effects of conflict on plant exit

Finally, we also investigate whether certain types of manufacturing plants are more vulnerable to the negative effects of armed conflict than others. Specifically, we investigate

whether the size, fixed costs (proxied by the value of buildings and structures, and the value of machinery and equipment, as two measures of capital), the age, or the operating sector of the plant influence the magnitude of the effect of armed conflict on exit decisions.

Analyzing whether the plant´s exit decision differs according to its size relates to the empirical question of whether economies of scale may dilute the effect of armed conflict. Table 6 presents evidence on the effect of armed conflict on plants according to four characteristics: i) the number of workers; ii) value of buildings and structures; iii) value of machinery and equipment and; iv) age of the plant. For each category we divided the sample in those plants that are below and above the median respectively and ran the 2SLS estimation on each group separately. Results from Table 6 suggest that armed conflict affects in a stronger proportion plants: with a smaller number of workers, that have a lower value of buildings and machinery and are on average younger. These findings go in line with those found by Konrad and Skaperdas (1998) in which under extortion the smaller and less productive plants are the ones forced to exit the market.

These results suggest two important issues. First, indeed plants that operate at smaller scale will, for obvious reasons, be more vulnerable to conflict and exit decisions will not be postponed if necessary. Larger plants, given the important fixed costs they probably have to assume, will deter exit decisions even if armed conflict negatively affects them. Second, the general result found in Table 5 could be downward biased. As explained above, the AMS surveys only manufacturing plants with more than 10 workers leaving out the smaller ones. If indeed conflict affects in a stronger manner these types of plants our coefficient of interest should be larger in magnitude.[15]

Finally, we investigated if plants operating in different sectors are affected differently by armed conflict. To do so, we divided the sample of manufacturing plants according to the

[15] As previously mentioned, we did some robustness checks to be sure the possibility of wrongly categorizing a plant contraction with plant exit was not driving the results. To do so, we ran all regressions excluding plants with less than 10 employees. All the results hold, but are smaller in magnitude with this sub-sample. This result corroborates that violence affect in bigger magnitude smaller firms as shown in Table 6. In a related matter, another potential source of bias in our coefficient of interest is the fact that conflict could deter the entry of firms in very violent municipalities. However, this hypothesis cannot be tested with the current available information.

SIC codes at two digit levels of aggregation[16]. Table 7 shows that there are three sectors that are significantly affected by armed conflict and they are: Textile, Wearing Apparel and Leather Industries; Manufacture of Wood and Wood Products, Including Furniture; and Manufacture of Paper and Paper Products, Printing and Publishing. Specifically, an increase in one standard deviation of armed conflict increases the exit hazard of each sector in 0.21, 0.57 and 0.68 of a standard deviation respectively.

7. Conclusions

Using a combination of two unique data sets this paper estimates the effect that armed conflict has on exit decisions of manufacturing plants in Colombia. Having one of the longest ongoing civil conflicts in the world Colombia is a good country to analyze this subject. Moreover, the availability of a panel data set at the plant level allows us to estimate how managers' and owners' decisions are influenced by civil conflict, a topic that has not been addressed before. Under an instrumental variable methodology, which controls for possible reverse causality problems, we find that armed conflict has a significant effect in the exit decisions of the plants. Specifically, an increase in one standard deviation in the number of guerrilla and paramilitary attacks in a municipality increases the probability of plant exit in 5.2 percentage points or 0.26 standard deviations. The effect is stronger for younger manufacturing plants with a smaller number of workers and lower leveles of capital. This in turn implies that the estimated effect found in this paper is a lower bound of the effect of violence over entrepreneurial activity in Colombia, given that our sample does not include small plants. However, it is important to take into account that our results are not generalizable for all plants in the country, but only for those in the manufacturing sector.

[16] The sectors we are studying using the SIC code at the two digit level are: Manufacture of Food, Beverages and Tobacco; Textile, Wearing Apparel and Leather Industries; Manufacture of Wood and Wood Products, Including Furniture; Manufacture of Paper and Paper Products, Printing and Publishing; Manufacture of Chemicals and Chemical, Petroleum, Coal, Rubber and Plastic Products; Manufacture of Non-Metallic Mineral Products, except Products of Petroleum and Coal; Basic Metal Industries; Manufacture of Fabricated Metal Products, Machinery and Equipment and Other Manufacturing Industries.

The present research is a first step to fill an important gap in the conflict and economy literature. Contrary to previous studies that are based on cross-country information or aggregate variables such as GDP growth, we are able to understand which and how plants' decisions are influenced by armed conflict. These first results contribute to the understanding of the possible direct channels through which conflict influences economic activity. The burden that violence imposes over the economy as it increases plant exit could be measured by the cost of opportunity of the capital that leaves the manufacturing sector. Different portfolio decisions that plant owners make to reallocate their capital into safer investment alternatives could reduce domestic product and therefore growth if such investments are done in foreign assets or in less profitable alternatives. This in turn could create a vicious circle that may perpetuate armed conflicts.

The results of the paper can also enrich governments' and NGOs' knowledge in order to design suitable policies that aim to counteract the negative consequences of war and reduce its negative impact on development. The results suggest that special attention should be given to smaller manufacturing plants and in ceratin production sectors characterized by low fixed costs.

This is a very young research question and hence further research is needed to understand the effect of conflict over other important entrepreneurial decisions and the specific channels that may drive the results here found. Among them we should mention the effect on capital stock and investment decisions, number of employees hired at the plants, the proportion of male and production laborers, real wages paid by the plants and the level of productivity.

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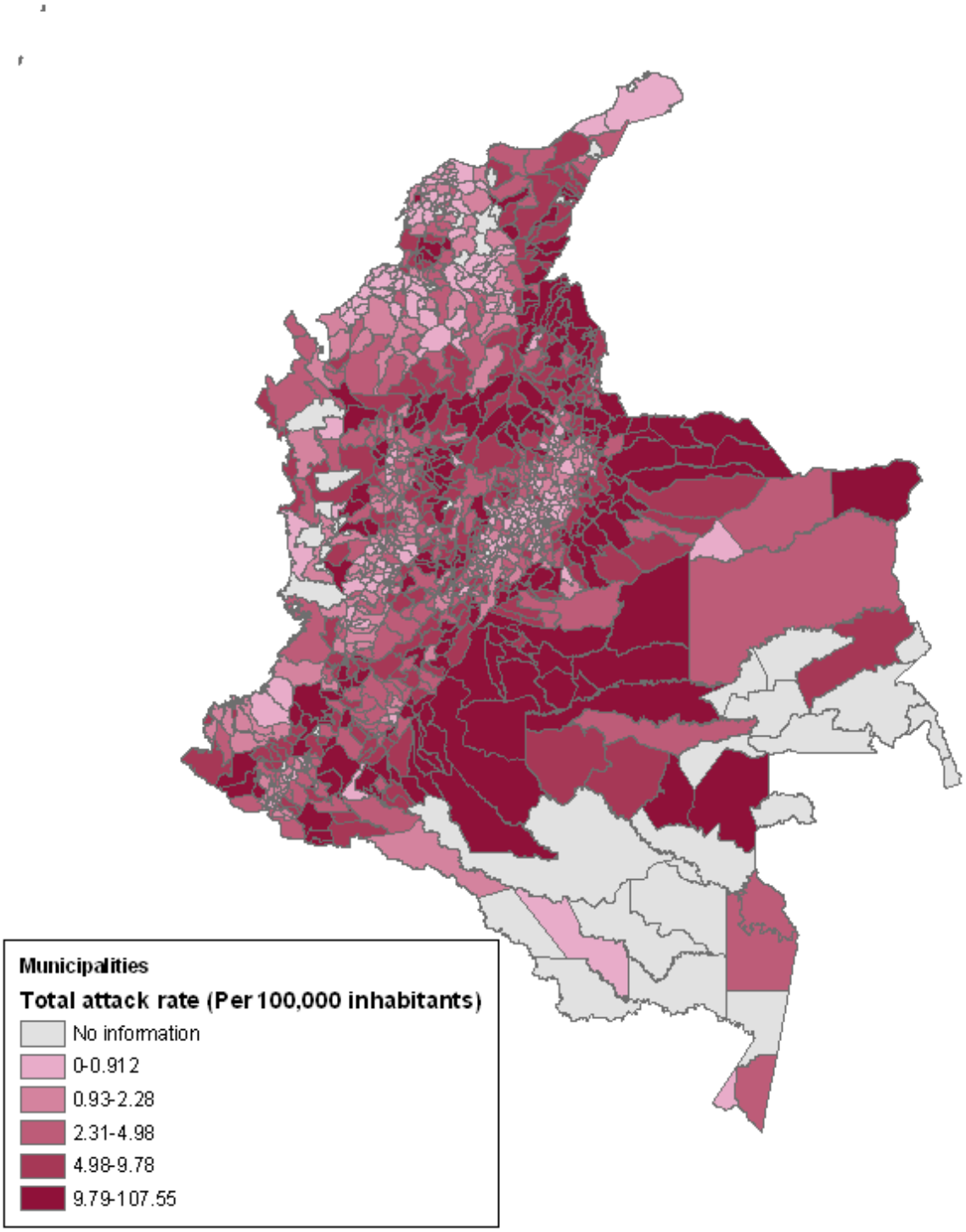
Figure 1- Total Attack Rate by Municipalities (Colombia 1993-2004)



Source: DANE, AMS1993-2004. CEDE. Authors calculations.

Figure 2 – Total Attack Rate over time (per 100,000 inhabitants)

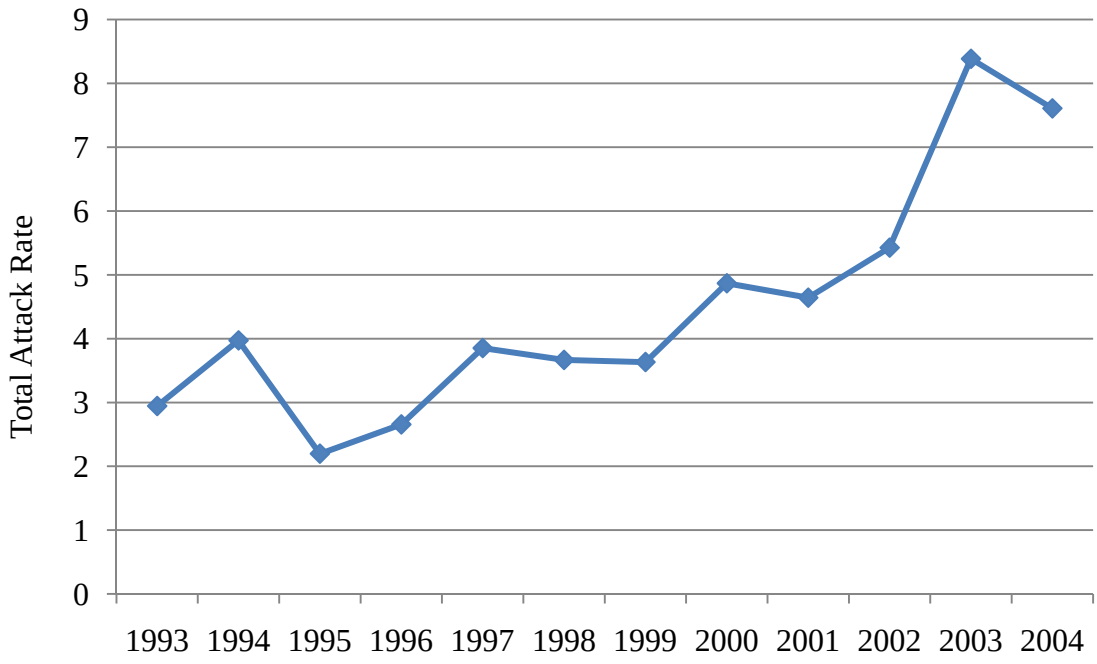
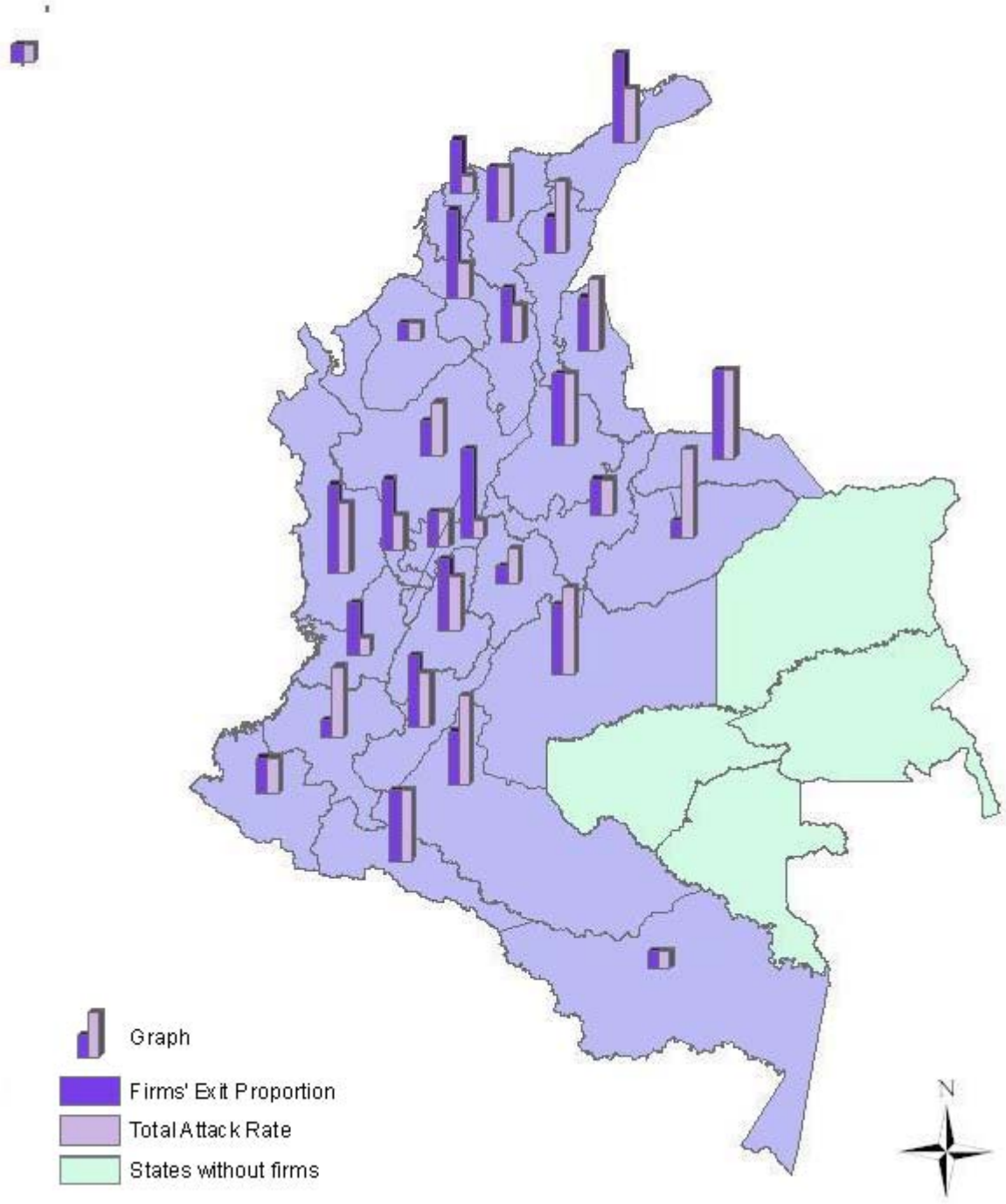


Figure 3- Total Attack Rate and Plants' Exit Proportion by State (Colombia 1993-2004)



Source: DANE, AMS1993-2004. CEDE. Authors calculations.

Table 1. Number of Plants and Plants that Exit by year.

Year	Number of plants	Plants that exit
1993	7,660	473
1994	7,487	462
1995	7,908	427
1996	8,173	452
1997	8,323	711
1998	7,863	462
1999	7,441	352
2000	7,986	485
2001	7,631	365
2002	7,543	577
2003	7,645	368
2004	7,528	296
TOTAL	**93,188**	**5,430**

Source: DANE, AMS1993-2004. Authors calculations

Table 2. Annual Manufacturing Survey, Armed Conflict, Geographic and Plant Controls -Descriptive Statistics

Total Sample	Obs.	Mean	St.Dev	Min	Max
Plant Exit proportion(%)	93,188	0.06	0.23	0.00	1.00
Total Attack Rate (per 100,000 inhabitants)	93,188	2.42	3.14	0.00	154.61
Municipality Surface (Thousands Square-km)	93,188	0.84	0.72	0.02	6.79
Average distance to largest city (Thousands Km)	93,188	0.05	0.10	0.00	1.03
State's GDP (Per capita-Real prices (1994)- Millions Colombian pesos)	93,188	2.14	0.53	0.55	7.48
Transferences (Trillions Colombian pesos)	93,188	0.16	0.25	0.00	0.96
Ln Total Nominal Wage Paid (Thousands Colombian pesos)	89,617	11.66	1.53	0.00	18.03
Ln Real Investment (Thousands Colombian pesos)	58,429	5.95	3.43	-3.45	16.65
Ln Value Added (Thousands Colombian pesos)	49,993	12.86	1.91	3.78	19.97
Productivity	54,389	0.00	2.21	-14.73	9.65
Duration	93,188	11.06	6.35	1.00	23
Firm Size	90,236	78.17	176.55	0.00	5,401
Buildings and Structures	69,100	74,543.36	544,657.10	-818,249.30	27,000,000
Machinery and Equipments	68,893	33,464.82	291,782.90	-404,300.60	13,900,000
Anti-Narcotics Operations (t-1)	93,188	6.84	9.72	0.00	44
Laboratories Dismantle (t-1)	93,188	1.21	1.70	0.00	21
Subsample					
Plant Exit proportion(%)	35,513	0.04	0.20	0.00	1.00
Total Attack Rate (per 100,000 inhabitants)	35,513	2.41	2.64	0.00	91.29
Municipality Surface (Thousands Square-km)	35,513	0.80	0.70	0.02	6.79
Average distance to largest city (Thousnads Km)	35,513	0.06	0.10	0.00	1.03
State's GDP (Per capita-Real prices (1994)- Millions Colombian pesos)	35,513	2.13	0.52	0.55	5.12
Transferences (Trillions Colombian pesos)	35,513	0.14	0.22	0.00	0.96
Ln Total Nominal Wage Paid (Thousands Colombian pesos)	35,513	11.80	1.59	0.00	17.66
Ln Nominal Investment (Thousands Colombian pesos)	35,513	6.04	3.45	-3.45	15.71
Ln Value Added (Thousands Colombian pesos)	35,513	12.96	1.92	4.37	19.97
Productivity	35,513	0.30	1.10	-5.72	7.64
Duration	35,513	12.88	5.77	2.00	23
Firm Size	35,513	96.18	200.02	1.00	4,779
Buildings and Structures	35,513	74,232.96	408,515.40	-27,182.78	14,700,000
Machinery and Equipments	35,513	32,665.62	170,404.80	-27,737.22	4,654,886
Anti-Narcotics Operations (t-1)	35,513	7.21	9.83	0.00	44
Laboratories Dismantle (t-1)	35,513	1.19	1.66	0.00	21

Source: DANE, AMS1993-2004. CEDE. Authors calculations

Table 3. Effect of Contemporaneous and Lagged Armed Conflict Measures on Exit

Dependent Variable	Exit-Duration											
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Total Attack Rate	0.00063	0.00059	0.00059	0.00032	0.00043	0.00052						
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]						
Total Attack Rate (t-1)							-0.00013	-0.00024	-0.00025	-0.00041	-0.00050	-0.00039
							[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Duration	0.00970***	0.01000***	0.00990***	0.01763***	0.01895***	0.01864***	0.00958***	0.00999***	0.00965***	0.01656***	0.01769***	0.01745***
	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]
Market distance		-0.39075	-0.38724	-0.33370	-0.28872	-0.26557		-1.04391	-1.03517	-0.98200	-0.91444	-0.88529
		[0.333]	[0.335]	[0.326]	[0.310]	[0.305]		[0.672]	[0.675]	[0.649]	[0.612]	[0.629]
Municipality Surface		-0.00508	-0.00518	-0.00916	-0.01215	-0.01662		-0.00955	-0.00947	-0.01589	-0.01827	-0.02354
		[0.017]	[0.018]	[0.017]	[0.017]	[0.017]		[0.023]	[0.023]	[0.023]	[0.023]	[0.023]
Transferences		-0.01135	-0.01144	-0.01164*	-0.01313*	-0.01136		-0.01111	-0.01119	-0.01006	-0.01203*	-0.00985
		[0.007]	[0.007]	[0.007]	[0.007]	[0.007]		[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
State's GDP		0.00820	0.00791	0.01251	0.01615	0.02003*		0.00977	0.00962	0.01623	0.01933*	0.02276**
		[0.011]	[0.011]	[0.011]	[0.011]	[0.011]		[0.012]	[0.012]	[0.012]	[0.012]	[0.012]
ln Real Investment			-0.00225***	-0.00040	-0.00010	-0.00144**			-0.00253***	-0.00080	-0.00050	-0.00180***
			[0.001]	[0.001]	[0.001]	[0.001]			[0.001]	[0.001]	[0.001]	[0.001]
ln Total Wages				-0.06688***	-0.05008***	-0.05508***				-0.06475***	-0.04835***	-0.05353***
				[0.004]	[0.004]	[0.004]				[0.004]	[0.004]	[0.004]
ln Value Added					-0.02634***	-0.01660***					-0.02613***	-0.01619***
					[0.003]	[0.003]					[0.003]	[0.003]
Productivity						-0.03089***						-0.03142***
						[0.003]						[0.004]
Plant Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Controls		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes
Observations	35,513	35,513	35,513	35,513	35,513	35,513	32,025	32,025	32,025	32,025	32,025	32,025

Source: DANE, AMS1993-2004. CEDE. Authors calculations

Clustered standard errors by firm in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. First Stage Regressions

Dependent Variable	Total attack rate					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Anti-Narcotics Operations (t-1)	-0.000	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]
Laboratories Dismantle (t-1)	0.098***	0.138***	0.138***	0.139***	0.138***	0.139***
	[0.010]	[0.014]	[0.014]	[0.015]	[0.014]	[0.014]
F-Excluded instruments	52.94	59.56	59.58	57.69	58.52	58.6
p-value	0.000	0.000	0.000	0.000	0.000	0.000
Plant Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Controls		Yes	Yes	Yes	Yes	Yes
Real Investment			Yes	Yes	Yes	Yes
Total Wage Paod				Yes	Yes	Yes
Value Added					Yes	Yes
Productivity						Yes
Observations	34,919	34,919	34,919	34,919	34,919	34,919

Source: DANE, AMS1993-2004. CEDE. Authors calculations

Clustered standard errors by firm in brackets; * significant at 10%; ** significant at 5%; ***

Table 5. IV Results of Contemporaneous Armed Conflict Measures on Exit

Instruments	Laboratories Dismantle-Anti-Narcotics Operations					
Dependent Variable	Exit-Duration					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Total attack rate	0.023***	0.017**	0.017**	0.020***	0.021***	0.020***
	[0.009]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
Duration	0.010***	0.010***	0.010***	0.017***	0.018***	0.018***
	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Market Distance		-0.226	-0.222	-0.138	-0.080	-0.062
		[0.332]	[0.334]	[0.327]	[0.312]	[0.307]
Municipality Surface		-0.019	-0.019	-0.026	-0.030	-0.034*
		[0.020]	[0.020]	[0.020]	[0.020]	[0.020]
Transferences		0.006	0.006	0.009	0.009	0.010
		[0.010]	[0.010]	[0.010]	[0.010]	[0.010]
State's GDP		0.026**	0.026**	0.034***	0.039***	0.042***
		[0.013]	[0.013]	[0.013]	[0.013]	[0.013]
ln Nominal Investment			-0.002***	-0.000	-0.000	-0.002**
			[0.001]	[0.001]	[0.001]	[0.001]
ln Total Nominal Wages				-0.065***	-0.048***	-0.053***
				[0.004]	[0.004]	[0.004]
ln Value Added					-0.027***	-0.017***
					[0.003]	[0.003]
Productivity						-0.032***
						[0.003]
Sargan Test						
Chi-sq(1)	0.104	0.01	0.023	0.13	0.105	0.177
p-value	0.75	0.9207	0.879	0.719	0.746	0.6738
Endogeneity test						
Chi-sq (1)	6.885	6.351	6.351	9.206	10.423	9.797
p-value	0.009	0.012	0.012	0.002	0.001	0.002
Plant Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Controls		Yes	Yes	Yes	Yes	Yes
Observations	34,919	34,919	34,919	34,919	34,919	34,919

Source: DANE, AMS1993-2004. CEDE. Authors calculations

Clustered standard errors by firm in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Heterogeneous Effects ofArmed Conflict Measures on Exit

Total Attack Rate	Below the median value			Above the median value		
	(1)	(2)	(3)	(1)	(2)	(3)
Number of workers	0.043**	0.030***	0.035***	0.004	0.002	0.003
	[0.018]	[0.011]	[0.011]	[0.008]	[0.007]	[0.007]
Observations	17,270	17,270	17,270	17,182	17,182	17,182
Buildings and Structures	0.043***	0.026**	0.032***	-0.000	0.003	0.004
	[0.016]	[0.011]	[0.011]	[0.009]	[0.007]	[0.007]
Observations	17,147	17,147	17,147	17428	17428	17428
Machinery and Equipments	0.035**	0.018	0.023*	0.014	0.015*	0.016**
	[0.017]	[0.012]	[0.012]	[0.010]	[0.008]	[0.008]
Observations	17,121	17,121	17,121	17,430	17,430	17,430
Age	0.011	0.035*	0.042**	0.006	0.005	0.008
	[0.033]	[0.020]	[0.020]	[0.008]	[0.008]	[0.008]
Observations	17,115	17,115	17,115	17430	17430	17430
Plant Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Controls		Yes	Yes		Yes	Yes
Firm Controls			Yes			Yes

Source: DANE, AMS1993-2004. CEDE. Authors calculations

Clustered standard errors by firm in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 7. Effects of Armed Conflict Measures on Exit by Economic Activity

Economic Activity	(1)	(2)	(3)
Food, Beverages and Tobacco	0.007	0.015	0.016
	[0.022]	[0.016]	[0.015]
Observations	8,851	8,851	8,851
Textile, Wearing Apparel and Leather	0.045*	0.017	0.026*
	[0.025]	[0.015]	[0.014]
Observations	8,468	8,468	8,468
Wood and Wood Products	0.022	0.040	0.052**
	[0.029]	[0.026]	[0.026]
Observations	1,959	1,959	1,959
Paper and Paper Products	0.023	0.045	0.048*
	[0.029]	[0.029]	[0.029]
Observations	2,259	2,259	2,259
Chemicals and Chemical, Petroleum, Coal, Rubber and Plastic Products	0.028*	0.024	0.024
	[0.017]	[0.015]	[0.015]
Observations	4,856	4,856	4,856
Non-Metallic Mineral Products, except Products of Petroleum and Coal	0.025	-0.097*	-0.091
	[0.045]	[0.058]	[0.059]
Observations	1,525	1,525	1,525
Basic Metal Products	-0.033	-0.026	-0.023
	[0.022]	[0.017]	[0.019]
Observations	338	338	338
Fabricated Metal Products, Machinery and Equipment	0.014	0.017	0.022
	[0.023]	[0.016]	[0.016]
Observations	6,061	6,061	6,061
Other Manufacturing Industries	0.032	0.002	0.014
	[0.069]	[0.061]	[0.060]
Observations	602	602	602
Plant Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Municipality Controls		Yes	Yes
Firm Controls			Yes
Productivity			Yes

Source: DANE, AMS1993-2004. CEDE. Authors calculations
Clustered standard errors by firm in brackets;
* significant at 10%; ** significant at 5%; *** significant at 1%