Guns N' Roses:

The Effect of Female Employment Opportunities on Violence in Colombia

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Abstract

What is the relationship between the creation of stable, secure employment opportunities for females and the level of violence? To shed light on this question, we use micro-level data to study the growth in a female-oriented, agro-industrial sector in Colombia, and the impact of the associated employment generation on violence, measured at the community level. Our empirical strategy exploits municipal variation in the geoclimatic suitability for floriculture, together with time variation from the sector's growth. This approach allows us to generate demand proxies for employment opportunities, with the added peculiarity that they disproportionately target females. By looking at the expansion of the fresh-cut flower industry we show that violent crime, in particular the homicide rate, decreased at the municipality level. We posit that the arrival of female jobs, and the associated income shocks might have triggered a *pacifying* process in the community dynamics. In summary, our results show that a one percent increase in the national price of flower exports translates into a differential decrease of -0.08 fewer deaths in the homicide rate per hectare cultivated in those municipalities more suitable for growing flowers. We find mixed evidence of the impact on other type of crime (personal theft, burglary and commercial theft) and on kidnaps. Finally, we analyze the impact of flower shocks on conflictual violence, and find no significant impact, a sharp contrast to previous results on coffee shocks shown by Dube and Vargas (2012). This suggests that the gender nature of different types of commodity shocks might be an important factor to consider when analyzing different types of violence. Our results on homicides suggest that facilitating the access to stable and permanent income-generating activities might contribute to curb unorganized violence in highly hostile contexts.

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1 Introduction

"To save Colombia from cocaine, buy its roses"[2] was the phrase coined by former Colombian president Cesar Gaviria in an editorial address to the US nation that appeared in The Wall Street Journal in 1990. At that time, Colombia was landswept with unregulated terror and control over drug production was considered to be a major contributor to the disintegration of public order. Almost twenty years later, by 2008, the New York Times published an editorial which opened with the following line: "Better Roses than Cocaine, no?"[3]. This article reflected the still popular sentiment that encouraging legal commerce, and strengthening international trade ties could set the path for a peaceful and steady process of socio-economic development. In fact, it asserted the fear that "blocking [Colombia's] attempts to expand legal exports maybe forcing Colombians to choose between drugs and poverty" (ibid). A question that naturally arises in this setting is whether the creation of secure, and stable employment opportunities, which are disproportionately targeting females, can indeed affect the path, and magnitude of violence, when females are not the traditional perpetrators of these crimes. We posit that their employment might have served as a "catalyst for social change and female empowerment" as it has been described in the anthropological work done by Friedemann-Sánchez (2006).

The Colombian experience is particularly poignant, for its landscape is cohabited by pervasive, violent crime and a fractionalized, armed conflict, heavily characterized by a "sense of dislocation and chaos" (Unicef, 1996). It is central to acknowledge this distinction between general violence (which includes different measures of violent crime like homicides, and robberies, but also kidnappings) and the civil conflict that has engulfed the country during its most recent history[4], and we will do so hereafter. Moreover, the distinction between these two types of violence is also aligned with the data. As Gaviria (2000) cites when considering homicide, reports find that "more than 95% of all the homicides are unrelated to the state-guerrilla confrontation", leaving "80 % of all homicides as an amorphous manifestation of violence" (ibid). The present works seeks to understand how the arrival of female employment opportunities might have affected the criminal path for this nebulous category of delinquents.

The employment opportunities that we consider can be embedded within a greater global phenomenon: the increased feminization of the labor force (Mammen and Paxson, 2000). This feminization process has been facilitated by the proliferation of low-skill manufacturing employment opportunities in an environment of increased world trade liberalization. What is more, in many of these settings where the incorporation of females has been more notorious, female earnings in the paid labor force, outside the household, were once not considered the norm (ibid). The emergence of the *maquiladoras* in the Latin American continent and the garment and textile industries in South East Asia are two of the most notorious exemplifications of such gender-biased employment. Moreover, this type of employment entails very specific characteristics: it has disproportionately targeted females, providing them with arguably a more permanent, and stable source of income, and depending on the industry, it has required them to attain a varying degree of educational skills (from the agricultural work, to the more skilled tasks performed in the business, process and outsourcing centers, BPOs). In Colombia, the fresh cut-flower, our focus of this study, has long been regarded as "a peaceful sector in an otherwise unstable political environment" (Fridemann-Sánchez, 2006).

This paper employs micro-level data to estimate the impact of this agro-processing sector, the fresh-cut flower industry, on violence in Colombia. We specifically look at the relationship between the flower growth and the homicide rate at the municipal level from 1990 to 2012. Our source of identifying variation

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[2] César Gaviria (1990). "The Americas: To Save Colombia From Cocaine, Buy Its Roses". The Wall Street Journal, opened, November 2, 1990. Retrieved from Factiva, Inc.

[3] Nicholas Kristoff (2008). "Better Roses Than Cocaine". New York Times, April 24, 2008. Accessed October 12, 2013. http://www.nytimes.com/2008/04/24/opinion/24kristof.htm

[4] Violent crime is usually composed of four types of offenses: murder, non-negligent manslaughter, forcible rape, robbery and aggravated assault. These offenses involve the use of force or threat of force. http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2012/crime-in-the-u.s.-2012/violent-crime/violent-crime

comes from the interaction between changes in the national value of flower production (scale effect) and the cross-sectional distribution of flower farms in Colombian municipalities. The novelty of our study resides on its focus on an economic sector that is believed to be female-friendly, thus offering a secure income opportunity that disproportionately targets women –who traditionally are less likely to be considered perpetrators of violent acts.

Primarily, we concentrate on violent forms of crime, where we chose the homicide rate as our main outcome of interest. Again, we want to emphasize that the general violent crime happened within the broader context of an ongoing civilian conflict. We chose to concentrate on homicides since this "form of violent crime has a broad impact on security and the perception of security" within any society (UNODC, 2013). To shed some light on the magnitude of the numbers, in the year 2012 there were a total of 14,670 homicides for an estimated population of 48 million Colombians, yielding a national homicide rate of 30.8 per 100,000 population, down from the exorbitant figures of close to 80 homicides per 100,000 inhabitants that were witnessed at the beginning of the 1990s. For the purposes of mere comparison, the corresponding rate for the USA was 4.7 homicides per 100,000 population (where the number of homicides was 14,827, roughly the same as in Colombia, but for a population of 314 million Americans).

Secondarily, we look at other forms of crime, including different types of theft (personal theft, burglary, commercial theft, and vehicle theft) and kidnaps. Finally, we extend the flower impact into the realm of illegal armed activity, thereby building on the Dube and Vargas (2013) study on commodity price shocks. This allows us to offer a novel extension to their results, using a commodity shock with a marked gender component to study the dynamics of the conflict.

We recognize that violence might certainly affect the location decision of any economic activity, including that of floriculture entrepreneurs. To deal with this potential source of endogeneity, we proceed with an instrumental variable strategy that exploits the fact that flowers necessitate of very particular climatic conditions to bloom. This presents us with a series of geo-climatic instruments to evaluate the suitability of a municipality to become a flower-producing center. We additionally address concerns about the growth in the (dollar) value of the sector, by concentrating on the exports to the US–a market that is dominated by Colombian flowers, and the interplay between Colombian producers and its main competitors within the US. Our regressions control for municipality characteristics measured at the beginning of the sample period and we allow them to have a time-varying impact -including, among others, the presence of coffee, petrol reserves, altitude, and to the capital and historical experiences of violence, as well as regional, linear time trends.

In summary, we find that a one percent increase in the national level of flower production differentially decreased the rate of homicides in flower-suitable municipalities, by –0.08 homicides per hectare of flower being cultivated. Results are robust to the inclusion of time trends and time-varying controls. We posit that the gendered nature of this modern, agro-industrial flower employment might have had a "pacifying process" on the flower communities, via income shocks that were channeled by the females of the flower households.

This paper expands the current literature on the economics of violence by proposing an alternative mechanism to influence general measures of violence at the community level. To the best of our knowledge, the hypothesis that more secure and stable employment opportunities disproportionately targeting the females of a community can impact its violence path is novel to the literature.

The remainder of the paper has the following organization: in Section 2, we provide a frame with which to think about the relationship between female employment and violence, as well as a compact introduction the Colombian institutional context, and describe the corresponding development of the agro-industrial sector. Building on these, Section 3 illustrates our empirical strategy; Section 4 describes the data for this study; Section 5 discusses the estimation results. Finally, Section 6 concludes.

2 Institutional Context and Background

This section will first discuss the impact of flower shocks on general violence, and then proceed to cover the conflictual violence.

2.1 Flower Shocks and General Violence

The traditional paradigm for the study of crime started with Becker (1968), who introduced an economic approach to understanding the intricacies between incentives and deterrence mechanisms to commit crime. He succinctly stated that the "types of legal jobs as well as law, order, and punishment are an integral part of the economic approach to crime" (Becker, 1993). Building on those premises, other models of violence reviewed by Blattman and Miguel (2010) consider poverty and lack of opportunities as fundamentally lowering individual incentives for maintaining law and order. Taking these two statements into our flower setting, we can see how the fresh-cut flower industry, a legal sector with its salient features of stability and permanence in employment, would offer a unique standpoint from which to examine the relationship between violence and female employment.

First of all, females are not traditionally considered to be perpetrators of violent crimes, and as such, their employability in the flower industry shall be interpreted as a pure income effect to themselves, their immediate circle or household, and by extension, to their communities. Thus the sector is not directly affecting the opportunity cost for the traditional perpetrator to commit crime, but it is alleviating the budgetary constraint of the flower households –and thereby possibly alleviating their need to commit crimes to make ends meet. Moreover, a richer environment is being constructed at the community level – thus arguably helping to reinforce the incentives for maintaining law and order according to the literature examined by Blattman and Miguel (2010). Not only that, the fact that more females are bringing extra "bacon" home, might reduce the number of households who lie in the sufficiently low income category to turn any of their members into potential criminals. Or as Pinker (2011) discusses, "societies in which women get a better deal tend to be societies that have less organized violence".

Secondly, the expansion of secure employment opportunities in a legal, non-traditional agricultural sector happened in a setting where females "would have otherwise been restricted to the informal sector, proscribed by peasant culture from becoming factory-workers" (Friedemann-Sánchez, 2006). This is a prominent example of how as economic development progressed, the nature of jobs available to women changed accordingly (Mammen and Paxson, 2000). It also reinforces the idea that female employability might have come as income shocks to the municipalities suitable for producing flowers (although it has a pure substitution effect for the females themselves, since initially they were not likely to be part of the paid labor force). This might have been specifically the case in peri and semi-urban low-income centers, where other salaried jobs for females were often scarce (Ferm, 2008).

This increased female empowerment, might have also served as an opposing force to the imposition of the *narco* social paradigms of behavior. In Colombia, trafficking and the "war on drugs" have been shown to be major destabilizers of the public order (Mejía and Restrepo (2013), and Angrist and Kruger (2008)). Both through the competition for the control of profits in the illicit market, but also, as remarked by Cubides, Olaya and Ortiz (1998) though the cultivation of a *machismo* and *honor* culture, where the extensive use of violence became "a banal resource".

Thus we hypothesize that the advancement of the flower sector generated higher economic resources channeled through females, and that the resultant prosperity in these municipalities might have had an immediate pacifying and civilizing impact on crime. Females might be more empowered within the household, and might also exert a greater pacifying force over those agents who might have been more prone to commit crimes.

At the same time, if potential criminals are alien to community dynamics and networks, it could also be the case that richer communities attract criminals (the demand to commit crimes is shifted with the value of the *expected loot*), thereby fostering crime. For instance, extortion, theft, and burglary could go up if flower

communities become crime havens for potential criminals. Thus, the overall impact of female employment could be thought to be ambiguous.

Furthermore, the flower jobs could have second order effects (transmission channel) if the additional income translates into a better upbringing for the offspring of the flower households. For instance, as a result of the shift in the budget constraint we could expect increased human capital investments –where increased educational attainment could directly affect their future employability, and also contemporaneously keep the children enrolled at school. This is central for it is thought that when not at school, many of these adolescents risk being recruited into organized criminal groups and gangs while socializing (Gaviria and Medina, 2010). As a result, we could expect to see a lagged impact of flower shocks on violence (where the lag could happen in 15-25 years, ages that would correspond to the initiation and prime criminal behavior for males).

As sated, our primary outcome of interest is the homicide rate, but we also extend our analysis to other types of crime (including theft, burglary, and kidnaps). These secondary criminal activities can be thought as additional means available to criminals to extract resources. Ideally we could learn whether we observe a substitution between different types of crimes –but this last regression would be highly problematic, since it is likely that a substantial number of homicides began as another type of crime that ended in the most tragic possible way.

Other remarkable pieces of work include Mejía and Restrepo (2013), who focus on shocks to the value of coca cultivation to unravel the causal impact of illicit drug markets on systemic violence. The authors use exogenous external demand shocks to Colombian coca and find that increases in the value of coca cultivation differentially raise violence in coca-suitable municipalities. Angrist and Kruger (2008) first studied the impact of demand shocks for the illicit coca market on rural economic conditions and civil conflict, and find that rent-seeking behavior by combatants translates into more violence.

2.2 Flower Shocks and Conflictual Violence

Setting aside the study of general violence, we now proceed to the realm of armed conflict. Here, a growing academic literature has tried to understand the economic incentives of civilians to actively participate on conflict. Among the most notable recent studies, Dube and Vargas (2013) disclose how in a Beckerian sphere incentives to participate in violent revolts might subside in response to positive income shocks, in labor-intensive employment sectors –through an *opportunity cost* mechanism. By contrast, the same authors also note another important, counteracting channel: in the presence of value shocks appropriation becomes more salient, distinctly so in sectors dealing with natural resources. This second force incites a *rapacity effect*, in a contest over the control of resources.

In relation to our flower study, female employment shocks are interesting per se because females are not taking as active a combatant role as males in the conflict. Although female participation in the uprising and territorial domination of the illegal armed groups has been acknowledged, this only applies to one of the three parties involved in the conflict, the Revolutionary Armed Forces of Colombia (FARC in its Spanish acronym), with reports citing varying degrees of involvement[5]. In addition to that, they "they receive no regular salary" (BBC, 2002), and are extremely limited in their conjugal relationships and maternal roles, thus further weakening the case for active female involvement. In the other two important guerilla organizations "women do not seem to have participated in any great numbers […] in the Army of National Liberation (ELN), and the People's Liberation Army (EPL)" (Reif, 1986).

Thus, because females are less likely to join the illegal armed struggle, the opportunity cost mechanism that operates in the coffee results of Dube and Vargas (2013) should not apply for the fresh-cut flower shocks.

[5] Jeremy McDermott. "Colombia's female fighting force". BBC News, January 4, 2002. Accessed on October 9, 2013. http://news.bbc.co.uk/2/hi/americas/1742217.stm

Dube and Vargas do not incorporate the female-friendly fresh-cut flower industry in their analysis of agricultural shocks on conflict, which is the task that we further take on this paper[6].

Moreover, like much of the illegal armed struggles, the bastions for recruitment are thought to be found in more rural regions, where dispossessed peasants first started arising in the 1920s and 1930s against the harsh working conditions on large coffee-producing states (Meza, 1998). Anecdotal evidence tells us that the floriculture industry took off in more peri-urban areas as opposed to extremely rural regions, and its success was directly triggered by a burgeoning US demand for cheap, fresh-cut flowers. We thus argue that the opportunity cost mechanism inciting conflictual participation that operates in the Dube-Vargas coffee results is absent in the more female-oriented flower industry.

Even though the flower municipalities are not considered to be havens for the recruitment into illegal armed groups, they may have been the recipients of their illegal armed struggle in their quest to cause terror and havoc in order to exert pressure during the many initiated-but-broken peace negotiations and truces with the ruling government.

Our work is very similar in its methodology to Dube and Naidu (2012), who examine how US Military Aid affects political conflict in Colombia. The authors find that US military assistance lead to differential increases in paramilitary attacks and homicides in military-base municipalities. They conclude that for Colombia, foreign military assistance helped to sustain conflict, by strengthening the armed, non-state actors. The authors address the endogeneity of the aid component, not the locale of the military bases; by contrast, our analysis endogenizes the location of the flower municipalities, as well as the temporal variation in the value of the sector. Our work looks at how dollars generated by a legal, thriving sector impact violence –as opposed to dollars that are coming from international military aid. Moreover, expropriation of flower rents by the illegal armed groups has not been documented, and as such, should not spur the *rapacity effect* that operates in the Dube and Vargas mechanism.

The present analysis elaborates on the aforementioned studies by looking at the expansion of secure employment opportunities in a non-traditional agricultural sector that represented a more fundamental shock to the economic environment of women. We conjecture that the employment features of stability and permanency, as well as the gender component within the sector, might be an important determinant behind the results.

2.3 A Brief History of Conflictual Violence in Colombia

Colombia is an Andean republic whose political stability in the twentieth century was undermined by internal dissent, creating a societal schism that perdures to this day. Its modern history has been marked by political strife, arising from a three-way conflict between the two leftist *guerrilla* groups, the Fuerzas Revolucionarias de Colombia (FARC, in its Spanish acronym) and Ejército de Liberación Nacional (ELN); the military -representing the government; and paramilitary groups historically funded by wealthy landowners. The long-lasting legacy of the conflict is very much felt still: as the 2014 presidential elections unfold, the conflict, and in particular the post-conflict management and peace negotiations, continue to be a major element of the political agenda, alienating to the extreme the two major contending parties in the runoff –where curiously enough, the two candidates in the second round have been chosen at different points in time by the same person, former president Álvaro Uribe.

The emergence of the conflict is believed to have its roots in the extremely unequal distribution of the land (Sánchez-Friedemann, 2006). In particular, peasant struggles in the 1920s and 1930s over labor conditions on large coffee-producing estates, property rights, and broader political concerns lead to organized peasant movements, which would later set the foundations of the leftist revolutionists (Meza, 1998). In 1948

[6] The authors exclude the flower sector from their study because the flower market does not have a defined international price, needed for their empirical specification. We circumvent this constraint by looking at the aggregate value growth of the flower sector (scale effect).

violence spilled over to the two main political parties. This episode, called *La Violencia*, generated a rupture between Liberals and Conservatives, claiming more than 200,000 lives over the course of a decade. To repress the upheavals, repeated government attacks were launched on peasant self-defense organizations. This tactic, together with the resulting forced displacement of *campesinos*, is believed to have further triggered the emergence and establishment of the leftist guerrillas (Encyclopaedia Britannica, 2013)[7]. We will later incorporate this incident into our analysis to account for historical levels of violence, with an indicator variable that captures if the municipality actively participated in the violent confrontations during *La Violencia*.

Our work will look at the Colombian state of affairs from the year 1990 until 2012, analyzing both the evolution of general measures of violence and conflictual violence.

2.4 The Floricultural Sector

In spite of the geography of terror, successive government administrations directed their efforts to promote economic growth as a means of achieving a more peaceful society. Since the 1960's attention was concentrated to diversifying Colombian exports, which were highly dominated by coffee. These initiatives were concomitant with the "Alliance for Progress" program for Latin America, initiated by the Kennedy administration in 1961 with the intention of maintaining stability in the broader Andean region.

In the year 1964, the publication of a graduate thesis study at Colorado State University identified Colombian farmland as highly substitutable with American farmland (Colombian Ministry of Agriculture and Rural Development, 2008). The country had favorable climatic conditions, soil quality, and labor availability, as well as lower production costs. Given its proximity to the US market (through the Miami port of entry), Colombia constituted an attractive investment destination for flower entrepreneurs, who were quick to take advantage of the opportunity to relocate. By the early '80s, fifteen year after the first flower farms were established, Colombia had already become the second largest world exporter of cut flowers (Méndez, 1991), and the industry was a major employer of low-skill female labor from the low-income areas in the regions surrounding the Sabana de Bogotá and Antioquia areas.

The major sources of production costs for the sector were and remain non-skilled labor, the availability of specialized transportation, and cold storage technologies. Urrutia (1985) calculated that the low, average, daily wage for production workers in 1966 and the less capital-intensive production process gave Colombia cost advantages that were instrumental for the establishment and successful development of the sector[8].

It is interesting to note that employment in the flower sector has traditionally been predominantly female. Women constitute between 60 to 80 percent of the floricultural workforce (Census, 2005), a number that is similar to figures from other female-oriented global assembly lines -in Bangladesh 80 percent of the 3 million garment workers nationwide are female (Khatun et al 2007). The floriculture sector is giving them access to a permanent source of employment with a steady income. Furthermore, the work schedule on the flower farms is compatible with the managing of the household chores for many female household heads (Friedemann-Sánchez, 2006), making it a covetable employment sector.

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[7] Encyclopædia Britannica Online. Colombia. Retrieved 25 November, 2013, http://www.britannica.com/EBchecked/topic/126016/Colombia

[8] In Colombia, greenhouses can be constructed of relatively cheaper materials like wood and plastic. In many instances, no heating or cooling mechanisms are needed given the natural growing conditions, thereby reducing production costs and increasing the profitability margin.

The tasks at the flower farms vary from unskilled to skilled, depending on the position the worker holds within the flower factory (Fern, 2008). As mentioned earlier, the process is highly labor-intensive, requiring labor at every stage of the cut flower production and leaving "little room for mechanization" (Friedemann-Sánchez, 2006). The entry-level workers, *operarias*, get permanent contracts, earn the government-specified minimum salary, and enjoy other legally mandated employment benefits, including contributions to the Social Security pension funds and to the National Health Insurance Plans. Two other types of workers can be found at the farms: monitors of plant diseases and supervisors. Both of them are paid above the minimum salary in compensation for the higher required skills and derived responsibilities.

It is critical to acknowledge the stability of the employment, for "jobs in the industry are so stable that working in the fresh cut-flower industry is becoming a métier" (ibid). The alternatives for females outside the flower farms are scarce and of the informal type, which often entail lower wages and lack the added legal and social security benefits.

In terms of the gender component, anthropologists have accentuated the fragility and perishability of flower production as a rationale behind the industry being female oriented. Fine motor skills and meticulousness become an essential requirement for the sector, attributes that have traditionally been associated with females. Friedemann-Sánchez (2006) notes that this is grounded on the assumptions that "equate production imperatives of quality, consistency, and speed with ostensibly feminine traits of dexterity, conscientiousness, and aversion to unrest". Other authors have focused their emphasis on women's "supposed greater dexterity and patience with delicate and repetitive tasks", "having nimble fingers, and exerting good visual acuity" (Safa, 1986). Anecdotal evidence from field research conducted by Friedemann-Sánchez reveals that plantation managers also favor the employment of females, for they are believed to be more skilled at intricate tasks such as "pruning, harvesting, sorting, selecting, and packaging". Women tend to remain employed within a given flower farm for an average of 5 years and an average of 15 years within the sector –rotation of workers among flower farms being a common phenomenon[9].

2.5 Flower Production 101

Flowers necessitate of very particular climatic requirements to bloom. Within Colombia, certain regions benefit from natural year-round conditions to grow flowers, due to their geographical location, topography and climate. This need for very special climatic conditions presents us with a series of instruments reflecting the suitability of a particular municipality to become a flower-producing center. We will use these climatic requirements to construct a suitability index, measured at the municipality level.

Optimal growth conditions have been identified with regions that feature mountain plateaus, low-lying plains, and valleys located at relatively high altitudes above sea level (Ministry of Agriculture and Rural Development, 2008). Sunlight, humidity, temperature and soil fertility are also crucial to sustain a robust flower-growing sector. Historically, the first region to cultivate flowers was the southern section of the Sabana de Bogotá. The industry was able to expand in a seemingly rapid and sustained manner, partly due to the lack of barriers to entry -the major constraint being land ownership and the high initial capital investment. The first operative farms where established by the privileged class who possessed former *haciendas* and large estates that could be converted into flower farms (Friedemann-Sánchez, 2006). A graphical display of the distribution of flower farms is presented in Figure 1. This graph identifies the distribution across a total of 142 municipalities that were in operation as of the year 2007[10].

[9] Based on information gathered by the Colombian Association of Flower Producers (Asocolflores) from its members. Private correspondence with Asocolflores.

[10] Data on the timeline of municipalities becoming flower-producing centers, and the evolution of hectares cultivated per municipality is unfortunately unavailable.

As of 2007, there were 142 municipalities growing flowers (out of the 1119 that are found in Colombia), 2113 flower-producing farms (*fincas*), cultivating a total of 7,849 hectares. The average number of hectares cultivated in the flower-municipalities was 65.7, with a standard deviation of 141.6.

Estimates from the 2005 Census report that each hectare generated direct employment for approximately 17-20 people. As such, the average flower-municipality in our sample would employ nearly 65*20 =1300 people. This is in sharp contrast with other main export sectors, like coffee, whose production employs around 0.8 people/hectare.

As discussed, flowers are a very sensitive and highly perishable commodity, and as such, their cultivation requires very finely tuned techniques. In particular, we will concentrate on the temperature requirement for their growth and actual sprouting: the optimal range of temperatures for which a given flower can grow ranges from 14 to 24 Celsius centigrade. For high temperatures above this upper limit the flowers stop their metabolic process; at the same time, very low temperatures severely affect the shrub or vine, causing a permanent damage to its structure (even if for very brief periods of time, lasting an hour or fewer)[11]. Flower farms are equipped to deal with sudden changes in temperatures for short period of time (hours), that are not very prolonged in time (at most 4 to 5 days) through irrigation techniques.

3 Empirical Strategy

Our empirical strategy uses the growth in the national value of flower production and the geographical distribution of flower farms to proxy for the generation of agro-industrial employment over time. Using a difference-in-difference specification, we assess whether changes in the value growth of the flower sector affect violence outcomes differentially in the municipalities that meet suitability criteria for growing flowers.

We estimate the impact of the growing sector on a host of general violence outcomes from 1990 to 2013, including: the rate of homicides (measured per 100,000 inhabitants), different types of theft (personal theft, burglary, commercial property, and vehicle theft) and kidnaps. In terms of armed conflict, we analyze the impact on guerrilla attacks, paramilitary attacks, clashes, and casualties (thereby replicating all the outcomes that Dube and Vargas (2013) pursue in their study), for a restricted sample from 1988 to 2005[12].

As stated, the employment generation can be proxied with either the national value, or volume of production. Moreover, given the high degree of exclusivity that Colombian farmers enjoy in the US market (because of proximity, but also due to the perishability of the good being traded), we choose to concentrate on the evolution of Colombian exports to the US. We measure the change in exposure to the floriculture sector in each municipality using the growth rate in the national value of production (measured in dollars, adjsuted by an export price index). This interpretation is equivalent to assuming that the number of flower jobs in each flower municipality grew at the nationwide rate. Given that data is not available to measure the growth of hectares disaggregated at the municipality level, the proxy for the national expansion of the sector presents itself as a reasonable, if not sole, alternative.

In order to test the hypothesis that more stable and secure jobs in a community can impact its path for violence, we run the following regression:

$$(1) violence_{mt} = \alpha + flower_m \times \log(\$NationalValue)_t \, \beta + \gamma_m + \psi_t + \gamma_r \times t + X_{mt}' \varrho + \epsilon_{mt}$$

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[11] Optimal growing conditions for flowers as indicated by members of the Colombian Flower Growers Association (Asocolflores).

[12] These years are the years covered in the Dube and Vargas (2013) sample.

where $violence_{m,}$ identifies the relevant violence outcome in municipality m, and year t; $flower_m$ is an indicator variable that captures the production status of a municipality and is interacted with the (log) dollar value of the Colombian flower exports to the US; γ_m and ϕ_t are municipality and year fixed effects; and X_{mt} is a host of time-varying controls, explained below. The regression always incorporates municipality and year fixed effects, as well as a regional linear time trend. When the outcome variable is a count, the (log) of the population is also included to account for population scale effects. In equation (1), the coefficient of interest is β, which captures the differential effect of the national flower growth in municipalities that cultivate flowers. Importantly, we will be running regression (1) with a set of general violent crimes (including homicides, theft, and kidnaps), but we will also extend the analysis into the realm of conflictual violence (guerilla attacks, paramilitary attacks, clashes and casualties).

We generate time-varying controls, by interacting year categorical variables with a host of municipal-level characteristics. These vary depending on the specification, and they might include: the presence of coffee plantations, oil reserves, distance to the capital of the department[13], distance to main market center, altitude, and temperature of the municipality. To control for the violence levels that were prevalent before the beginning of our sample (and account for the notion that "violence begets violence"), we use an indicator variable to denote whether a municipality participated in the aforementioned historical, internal war episode called *La Violencia* (1948 to 1964). Throughout the specifications we include regional, linear, time trends.

Because of the potential endogeneity of the location of flower farms, we instrument the extensive margin of flower production cross-sectionally. We exploit the differential suitability of flower cultivation using the aforementioned temperature requirement. The non-linearity that we consider is *coolness* (measured by temperatures that are in the range of 13 to 24 Celsius). This allows us to generate a suitability index that determines the likelihood that a municipality meets the optimal conditions to grow flowers:

(2) $flower_m = \gamma_0 + \gamma_1 \times coolness_m + \epsilon_m$

where *flower* can either represent the flower status of a municipality or the number of hectares that it cultivates.

Finally, because of the endogeneity concerns, we proceed with an instrumental variable strategy, where the first stage in our 2SLS strategy is given by:

(3a) $Flower_m \times \log(\$NationalValue)_t = coolness_m \times \log(TopQ_{US})_t \gamma_m + \delta_m + \psi_t + \gamma_r \times t + X_{mt}' \varrho + \epsilon_{mt}$

The first-stage incorporates in a compact manner the (log) export volume of the top competitors faced by Colombia in the US market for each year, interacted with the suitability criteria for each municipality. Alternatively, we can also instrument the location of flowers with the suitability criteria interacted with the value of the sector:

(3a) $Flower_m \times \log(\$NationalValue)_t = coolness_m \times \log(\$NationalValue)_t \gamma_m + \delta_m + \psi_t + \gamma_r \times t + X_{mt}' \varrho + \epsilon_{mt}$

[13] The Colombian territory is comprised of 32 administrative divisions, each grouping a certain number of municipalities.

From the Dube and Vargas results, we know that coffee shocks affect conflictual violence. We thus incorporate the shocks to the coffee sector into our study. The flower-coffee shock combined regression of interest will look like the following one:

(4)

$$violence_{mt} = \alpha + flower_m \times \log(FlowerNationalValue)_t \beta + coffee_m \times \log(CoffeeNationalValue)_t + \gamma_m + \psi_t + \gamma_r \times t + X_{mt}' \varrho + \epsilon_{mt}$$

where *flower* represents the flower status and *coffee* the coffee status of a municipality. The coffee shocks are now instrumented following the Dube-Vargas fashion:

(5)

$$Coffee_m \times \log(\$NationalValue)_t = \sum_{c=0}^{1} \sum_{a=0}^{1} Temperature^c \times Rainfall^a \times Log(TopWorldVolume)_{\gamma ca} \gamma_m + \gamma_m + \psi_t + \gamma_r \times t + X_{mt}' \varrho + \epsilon_{mt}$$

4 Data

4.1 Data Sources

The data for violence outcomes and municipality covariates comes from a panel put together by the Center for the Study of Economic Development (CEDE). It incorporates all of the municipalities in Colombia (1119)[14], from 1990 to 2012. The panel contains data from both the Colombian Security Agency (DAS in its Spanish acronym) and the Office of the Vice-President with detailed information about municipality characteristics as well as violence measures.

Data to identify the geographic distribution of flower farms comes from a 2007 governmental registry list, publicly released by the Agriculture and Rural Development Ministry[15]. This is a cross-section snapshot from a year in the middle of the sample (2007) that allows us to identify the entire universe of flower producers. The public registry identifies the geographic location (municipality) of the farms as well as the size in hectares of the land cultivated. The size variable is further broken into hectares dedicated into flowers and foliage; for the purpose of the current analysis the total hectares will be used.

We categorize a municipality as having flower status if it has at least one flower farm, cultivating a positive number of hectares as of the year 2007. Unfortunately, as mentioned earlier, we do not have access to a panel of data with the evolution of hectares over time across municipalities.

Data on the level and value of production comes from three sources. First, the UN ComTrade portal has data available for the aggregate volume and value of Colombian exports to the world. Secondly, the US Food and Agricultural Service (FAS), also has detailed volume and value information for Colombian exports coming into the US market, expanding a few more years than its UN counterpart[16]. In addition, there is the work put together by Marín and Rangel (2000), "International Commercialization of Flowers", which combines the yearly bulletins published by the Colombian Association of Flower Growers (Asocolflores) on several production aggregates. From all sources, we retrieve the level and value of production whenever available, and this happens to be always measured at the national level.

From all sources, we prefer the data retrieved from the Food and Agricultural Service (FAS) administration. It allows us to have very detailed information on the entry of the number of flower stems, and their value. It also offers information on Colombia's main competitors within the US market (the UN ComTrade data doesn't have a complete volume for all years and main competitors, and the relevant competitors seem to be within the region, given the perishability and importance of geographical proximity for flower cultivation). Because of the high degree of exclusivity that Colombian flowers seem to enjoy in the US, we conduct our analysis using the growth in value of Colombian exports to the US. Anecdotal reports also suggest that US market conditions and trade policy greatly affected Colombian growers.

[14] The political administration of Colombia consists of 32 distinct Departments. Each Department has several municipalities, totalling 1119 over the entire territory.

[15] Flower farms had to be registered for an agricultural program: *Incentivo sanitario a las flores y follaje (ISFF)*.

[16] Retrieved from the Foreign Agriculture Service, through its Global Agricultural Trade System (GATS), code 0795AT – fresh cut flowers.

4.2 Descriptive Statistics

Table (1) presents us with the summary statistics of cross-sectional differences between flower and non-flower municipalities. We have panel level data (time-variant) and municipal level (time-invariant) characteristics for a sample of 1066 municipalities for which we have complete information on all relevant measures to the analysis.

Panel A presents us with the measures of general violence broken by flower versus non-flower municipalities. Noticeably, the average level of unorganized crime and violence is higher in flower-municipalities. They average for the sample is 73 homicides per 100,000 population in flower municipalities, whereas non-flowers stand at 50 homicides per 100,000. Flower municipalities also suffer from higher personal theft, burglary, vehicle theft and commercial theft. The kidnapping rates seem to be more balanced, but non-flower municipalities have a higher rate of kidnaps by illegal armed groups –illegal armed groups make an intensive use of kidnaps as a means to extract resources, and they tend to concentrate their activities in the more rural areas.

Panel B offers us some insights into the conflictual violence across flower and non-flower municipalities. The conflictual violence outcomes (including the number of guerrilla attacks, paramilitary attacks, clashes and casualties) seem to be lower for the flower municipalities. This is in line with the explanation mentioned earlier that the flower municipalities might not overlap with the rural conflictual bastions.

In Panel C we focus on the municipal level covariates, to gauge the heterogeneity existing between flower and non-flower municipalities –we will be controlling for these characteristics interacted with year fixed effects in our specifications. Both flower and non-flower municipalities cultivate coffee –which is a widespread agricultural activity across the nation, covering approximately 813,696 hectares, or near 100 times more land than flowers. Flower municipalities seem to be cultivating coffee more intensively.

It is also worth noting that flower-intensive locations do not overlap with the coca cultivating regions. This was already acknowledged back in 1989, when the American Commerce accused Colombian growers of dumping practices and it was captured by a New York Times article: "Colombian farmers, driven from the legal markets for coffee and cut flowers, are not likely to turn to cultivating coca. Indeed, they could not: the soil and weather conditions in coffee and flower-growing regions are not right for coca" (Passell, 1989)[17]. We further look into the historical experiences of violence, depicted by an indicator for *La Violencia* episode. It seems that flower municipalities were less likely to have been affected by the hostilities that erupted in the early 1950s. Thus municipalities that later turned into flower-producing centers were on average less affected by our measure of historical insurgence. This last point is particularly important for flower entrepreneurs may have chosen to establish the flower farms in suitable regions with low levels of past violence. However, we should keep in mind that at the beginning of our sample period, 1990, the homicide rates in flower municipalities were higher than the non-flower ones.

Flower municipalities tend to be closer to the capital of the department, and to the main urban markets. This is aligned with the flower logistics: the perishability of the goods requires access to infrastructure, and proximity to the main ports and gates of exit becomes important.

In terms of geo-climatic characteristics, flower municipalities are at a relatively higher altitude above sea level, receive medium levels of rainfall and have, on average, cooler temperatures, in line with temperate climates. As mentioned earlier, all these three geo-climatic attributes will be later used to assess the suitability for growing flowers.

[17] Peter Passell. "Economic Scene: Fighting Cocaine, Coffee, Flowers". New York Times, September 20, 1989. Accessed March 17, 2013. http://www.nytimes.com/1989/09/20/business/economic-scene-fighting-cocaine-coffee- flowers.html

Last, Panel D provides figures on the evolution of the volume and value of the flower sector. The value series are measured in dollars, deflated by a price index for exports. The volume figures can either be measured in tones of flowers exported, or in millions of stems.

5 Results

5.1 Suitability Index Results

We begin our analysis with the results from the suitability index regression, which was meant to study whether a municipality meets the geo-climatic requirements to become a flower-producing center. Table (2) shows the suitability results. Column (1) and (2) show the extensive margin of flower cultivation and Column (3) and (4) looks at the intensive margin –number of hectares.

We can see that as expected the temperature requirement (*coolness*) does seem to positively affect the likelihood and production intensity for flowers. This suggests that meeting the criterion for the temperature is indeed what most affects the likelihood that a municipality will become a flower producing center as well as the number of hectares it will grow. The specification that uses the flower hectares as the dependent variable shows that our geoclimatic requirement is highly significant.

We consider alternative temperature requirements: *hot* (for temperatures above 25 Celsius) and *cold* (for temperatures that are below 12 Celsius). These requirements do not affect the number of hectares under cultivation, and the flower status of a municipality is negatively affected by meeting the *hot* criteria. In Figure (4) we can see the average temperature and the number of hectares they cultivate for the sample of flower-producing municipalities (hectares > 0). For the remaining of the paper, we will concentrate on generating the suitability index (our instrument) from the regression specified in Table (2), column (3).

5.2 Flower-sector Growth and General Violence in Flower Municipalities

Next, we turn to the core of our empirical strategy. We first proceed to run an OLS regression of the homicide rate on the interaction of a municipality's flower status and year categorical variables, while controlling for municipality and year fixed effects. Figure (3a) plots the coefficients of these flower-year interactions. We also overlap the evolution of the price of flower exports to the USA (dollars, deflated by the pertinent price index). Figure 3b plots the coefficients from the flower-year interactions and overlaps the total value of Colombian exports. As it can be seen from the second figure, the growth in the flower sector was concomitant to a differential decline in the homicide rates in flower producing municipalities versus non-producing ones. From the beginning of the period, 1990 to 1995, the value of Colombian exports entering into the US market grew persistently and this is associated with the greatest reduction in the homicide rate observed. As the sector stagnated from the years 1996 to 2002, so did the decrease in the homicide rates.

The OLS is likely to result in a biased picture if highly suitable municipalities did not become flower-producing centers because of violence concerns, or if badly suitable municipalities decided to start growing flowers because they were relatively peaceful. We must therefore proceed with an instrumentation strategy that will address the ability of a municipality to become a flower-producing center based on geo-climatic constraints. In addition to that, we will also proceed to instrument the value of the flower exports (the temporal ingredient of our regression specification) with the volume of Colombian main competitors in the US market[18]. As mentioned earlier, given the high degree of exclusivity enjoyed by Colombian producers

[18] The volumen of production can be measured as the tones of fresh-cut flowers exported to the United States, according to the Harmonized Tariff Schedule (H), code 0603; alternatively, the FAS Department also keeps through the GATS dataset, records of the number of stems (0795AT).Competitors can be

in the US market, and the perishability of the product being traded –which limits the destination options that Colombian producers can ship to, we chose to concentrate on the value of Colombian exports to the US. The evolution of volume and value is highly correlated, and the flower sector was vastly shaped by US market conditions –with the share of value of Colombian flowers from the US closely tied to the exchange rate dynamics.

5.3 Instrumental Variables

The non-random location of flower farms constitutes a major concern that could be biasing our OLS results. To deal with this potential source of endogeneity, we proceed with an instrumental variable strategy.

Table (3) Panel A reports the 2SLS results for the second-stage regression. The first column of Table (3), Column (1), shows the OLS for comparison purposes. Column (2) reports the base specification for the instrumentation –where the base specification only includes controls for municipality and year fixed effects. The IV results are negative, and significant: a one percent increase in the national price of production lead to -0.0715 fewer deaths per hectare in the rate of homicides in flower-suitable municipalities relative to non-flower regions. The IV estimates are negative, significant and larger in magnitude than the OLS.

In columns (3) to (5) we address potential concerns about the characteristics that distinguish flower from non-flower municipalities. Column (3) controls for the distance to the closest market center, and the distance to Bogotá interacted with year FE, and results remain highly significant. Column (4) controls for the presence of other export sectors (including coffee) interacted with year FE –this is particularly important since coffee has been shown to affect the path of conflictual violence. Last, to alleviate concerns about the altitude of a municipality affecting its violence levels (as it could be the case if higher places become safe havens for illegal uprising), Column (5) interacts the altitude and year fixed effects, and results remain stable. Column (5) also explores the idea that historically violent municipalities might have been on a different violent trend, and we do so interacting the exposure to La Violencia episode with year FE. It also incorporates all other export-oriented commodities interacted with year FE and a regional linear time trend. Last Column (6) and Column (7) explore the impact of the flower shocks on the rate of homicide by gender (female victims vs male victims). Results suggest that the flower shocks are significantly affecting the male homicide rate.

Table (3) Panel B reports the corresponding first-stage estimates, in which the dependent variable is the flower hectares of a municipality interacted with the growth in the national price of flowers (as they enter the US). We use as an instrument the interaction of the temperature requirement with the (log) volume of Colombia's top Latin American competitors in the US market. The first-stage results show that our instrument is highly significant. It seems that the US was a buoyant market, and that conditions there affected the development and profitability of the flowers exported by Colombian growers and its other Latin American competitors.

Table (4) incorporates coffee shocks to understand how a less female-biased sector might affect the path for violence. For coffee we use the instrumentation strategy described by Dube-and-Vargas, incorporating non-linear requirements for the cultivation of coffee. As discussed previously, this involves incorporating the cross-sectional distribution of coffee presence and instrumenting the internal price for Colombian farmers with the volume of its main world competitors (including Vietnam, Indonesia and Brazil). Because coffee is a less female-friendly activity (and the resources generated from it might be channeled by the male of the household as opposed to being control by the females), we want to compare the impact of coffee shocks on general violence (i.e. homicides). Surprisingly, we find that the rate of homicides is positively affected by coffee shocks –in clear contrast to what was found for flower shocks. The result that emerges from this

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categorized as regional (Latin-American and Caribbean-basin countries) and non-regional (rest of the world).

regression is interesting in so far as positive coffee shocks were shown to decrease other forms of conflictual violence through an opportunity cost mechanism (Dube and Vargas, 2013), and yet, when considering general violent crime we find a positive impact.

Table (5) analyzes other crimes. These include: property theft, burglary (residential theft), vehicle theft, commercial theft and kidnappings. The IV results present some mixed evidence on the impact of flowers on these other crimes but none of them seems to be statistically significant.

5.4 Conflictual Violence

This section studies the impact of the flower sector on measures of conflictual violence. From the Dube-Vargas results we know that conflictual violence was affected by coffee and oil shocks via an opportunity cost mechanism and rapacity effect, respectively. We are now interested in understanding the correspondence between the female-friendly arrival of employment opportunities and the level of armed conflict experienced in their communities.

As it has been said, females were not as likely as men to participate actively in the conflict, but their bringing an income home might have affected the need of the males in their communities to engage in armed conflict. Moreover, even though they were not considered traditional nuclei for guerrilla recruitment, we suspect that the booming flower municipalities might have become targets of illegal armed attacks in an attempt to spread terror among the population, and eventually force the military and government forces to concede and negotiate.

In Table (6) we apply our empirical strategy to the study of these conflictual outcomes. We show the IV results for each of the conflictual outcomes. These include the number of guerrilla attacks, paramilitary attacks, clashes, and casualties.

In Panel A we can see the flower shocks do not seem to have affected any of the conflictual outcomes. The flower shocks, which happen in a female-friendly sector, are not affecting the opportunity cost for males to join the illegal armed struggle, and thus it is not surprising that we do not observe any occupational shift (combatants giving up on the armed struggle).

In Panel B we replicate the Dube and Vargas results: coffee shocks significantly altered the course of the conflict. Last, Panel C proceeds to instrument both shocks simultaneously.

Notice further that the conflictual violence analysis can only be performed for a sample of municipalities that is considered to be non-urban (average population throughout the sample had to be less than 250,000 inhabitants)[19] and for a limited number of years (1990-2005).

5.5 Robustness Checks

In this section, we proceed to construct different samples for the control municipalities (non-flower). Table (7) reports the estimates from this exercise. Column (1) maintains the entire sample (1046 municipalities) to ease the comparisons. In Column (2) we limit the sample to those municipalities that are found within a flower Department (where a flower Department is defined as a Department that has at least one flower

[19] In contrast to this, the unorganized crime outcomes are defined for the entire universe of Colombian municipalities.

muncipality). This leaves us with a final sample of 615 municipalities. Although results are no longer significant, the magnitude of the IV estimates remains very close. In Column (3) the sample is restricted to control municipalities matched to flower municipalities using a 10-nearest neighbor match. In Column (4) the sample is restricted to control municipalities that meet the common support in the propensity score. Results with these different control samples remain consistent and quite robust.

Last, Table (8) explores the idea that the flower shocks might have affected the violence outcomes beyond the municipal-level. This would be a plausible scenario if local labor markets are quite integrated, and thus we should expect positive spill-overs to neighboring municipalities. For that reason in Column (1) and (2) we include a regressor that captures if a non-flower municipality happens to be the bordering neighbor of a flower municipality. In Columns (3) and (4) we allow for non-flower municipalities within a flower Department to be affected by the flower sector too. Both sets of results indicate that the flower sector might have affected violence beyond the local municipal level. Notice that the coefficients reported are of a higher magnitude for we are using the flower-status (extensive margin) and not the flower hectares (intensive margin).

6 Conclusions

This paper has examined how employment shocks in a legal, thriving sector can affect the path for violence in a very hostile context. We used a unique dataset on violent crime and civil conflict in Colombia to understand the distinct role that gender can play on different forms of violence (general violence versus conflictual violence).

Using geo-climatic requirements, we are able to proceed with a strategy that captures if a municipality meets the conditions to grow flowers. This arguably exogenous suitability measure serves as an instrument to perform a 2SLS procedure that address the endogeneity in the location of flower farms.

Results suggest that the growth in the national level of flower production lead to a differential decrease in the rate of homicides of -0.08 fewer homicides per hectare per one percentage growth in the price of flowers, in municipalities that are flower-producing centers. At the same time, the flower sector did not affect outcomes related to the civilian conflict. The findings of this paper show that the increased availability of employment opportunities served as a catalyst to curb general violence, but did not affect as much the path of civilian conflict.

These results might contribute to the debate on trade reforms. In particular, as of 2006, when the Bush administration was entering into the last stages of negotiating a new trade agreement with Colombia, human rights groups and labor leaders in the US "urged Congress to put the deal off"[20], while proponents claimed that "failing to approve this trade agreement would do nothing to improve Colombia's human-right record"[21]. A lot of pressure was put on the US government to put and end to the impunity of the assassination of union leaders.

Results published here show that if fostering trade agreements results in increased employment opportunities, then they would certainly help to deter criminal acts. Anecdotal evidence encountered in the media was arguing in favor of fostering trade agreements as a way to "provide jobs for some of those now recruited into the kind of paramilitary organizations suspected in many of the labor murders"[22]. What we

[20] Eric Lipton and Steven Weisman. "Wide Net Cast by Lobby for Colombia Trade Pact". New York Times, April 8, 2008. Accessed January 17, 2014. http://www.nytimes.com/2008/04/08/washington/08lobby.html

[21] Editorial. "Pass the Colombian Trade Pact". New York Times, November 18, 2008. Accessed January 17, 2014.

[22] Editorial. "Getting to a Colombia Trade Deal". New York Times, May 29, 2007. Accessed January 17,

have seen in this study, is that jobs directed to females of a community may not have prevented the males from joining the illegal armed conflict, but did contribute to curb other general measures of violence.

From an international policy perspective, it seems restricting trade or deterring a legal sector from flourishing may be counter-productive in the quest to bring violence down in such a hostile context. Given how prevalent the manufacturing and agro-industrial sectors are in many developing settings, the relationships reported are of particular relevance for the bleak, violence-shaken regions of the world. It seems that one way to affect the trajectory of violence at the community level might reside on advancing female-friendly employment opportunities in a legal sector.

2014. http://www.nytimes.com/2007/05/29/opinion/29tue2.html

References

. [1] Angrist, Joshua D., and Adriana Kugler. 2008. "Rural Windfall or a New Resource Curse? Coca, Income, and Civil Conflict in Colombia". The Review of Economics and Statistics. MIT Press, Vol 90 (2), pages 191-215.

. [2] Blattman, Christopher, and Edward Miguel. 2010. "Civil War". Journal of Economic Literature, 48:1, 3-57.

. [3] Editorial. "Getting to a Colombia Trade Deal". New York Times, May 29, 2007. Accessed January 17, 2014. http://www.nytimes.com/2007/05/29/opinion/29tue2.html

. [4]Editorial. "Pass the Colombian Trade Pact". New York Times, November 18, 2008. Accessed January 17, 2014. http://www.nytimes.com/2008/11/18/opinion/18tue1.html

. [5] Eric Lipton and Steven Weisman. "Wide Net Cast by Lobby for Colombia Trade Pact". New York Times, April 8, 2008. Accessed January 17, 2014. http://www.nytimes.com/2008/04/08/washington/08lobby.html

. [6] Dube, Oeindrila, and Suresh Naidu. 2012. "Bases, Bullets and Ballots: The Effect of US Military Aid on Political Conflict in Colombia".

. [7] Dube, Oeindrila, and Juan Vargas. 2013. "Commodity Price Shocks and Civil Conflict: Evidence from Colombia". The Review of Economic Studies, 80:4, 1384-1421.

. [8] Encyclopædia Britannica Online. Colombia. Retrieved 25 November, 2013, http://www.britannica.com/EBchecked/topic/126016/Colombia

. [9] Friedemann-Sánchez, Greta. Assembling Flowers and Cultivating Homes: Labor and Gender in Colombia. Lanham: Lexington Books, 2006.

. [10] United Nations Office on Drugs and Crime (UNODC). 2011 Gobal Study on Homicide: Trends, Contexts, Data.

. [11] Heath, Rachel, and A. Mushfiq Mobarak. 2012. "Does Demand or Sup- ply Constrain Investments in Education? Evidence from Garment Sec- tor Jobs in Bangladesh".

. [12] Khatun, Fahmida, Rahman, Mustafizur, Bhattacharya, Debapriya, Moazzem, Khondker G. & Afifa Shahrin. 2007. "Gender and Trade Liberalization in Bangladesh: The Case of the Ready-made Garments". USAID. 22

. [13] Kristof, Nicholas D. "Better Roses Than Cocaine". New York Times, April 24, 2008. Accessed October 12, 2013. http://www.nytimes.com/2008/04/24/opinion/24kristof.htm

. [14] Mammen, Kristin, and Christina Paxon. 2000. "Women's Work and Economic Development". The Journal of Economic Perspectives, 14:4, 141-164.

. [15] Marín Ángel, Marta Jannie, and Julián Enrique Rangel Aceros. "Comercialización Internacional de Flores: Antecedentes y Evolución 1990- 1999". Dissertation, Universidad Nacional de Colombia, 2000.

. [16] Mejía, Daniel, and Pascual Restrepo. "Bushes and Bullets: Illegal Cocaine Markets and Violence in Colombia". 2013. Working Paper.

. [17] Méndez, José. 1991. “The Development of the Colombian Cut Flower Industry”. Working Papers on Trade Policy, WPS 660. The World Bank.

. [18] Ministry of Agriculture and Rural Development and Asocolflores. “Colombian Grown: The Finest Quality Cut Flowers in the World”. Diseño Editorial, 2008.

. [19] Passell, Peter. “Economic Scene: Fighting Cocaine, Coffee, Flowers”. New York Times, September 20, 1989. Accessed March 17, 2013. http://www.nytimes.com/1989/09/20/business/economic-scene- fighting-cocaine-coffee-flowers.html

. [20] Safa, Helen and Eleanor Leacock, editors. 1986. “Development and the Division of Labor by Gender”. Bergin and Garvey Publishers.

. [21] United Nations Department for Policy Coordination and Sustainable Development (DPCSD). Promotion and Protection of the Rights of Children: Impact of Armed Conflict on Children. 1996.

. [22] Urrutia, Miguel. 1985. “Winners and Losers in Colombia’s Economic Growth of the 1970s”. New York: Oxford University.

. [23] Vargas Meza, Ricardo. 1998. “The FARC, the War and the Crisis of the State”. NACLA Report on the Americas, 31:5, 22-28. 23

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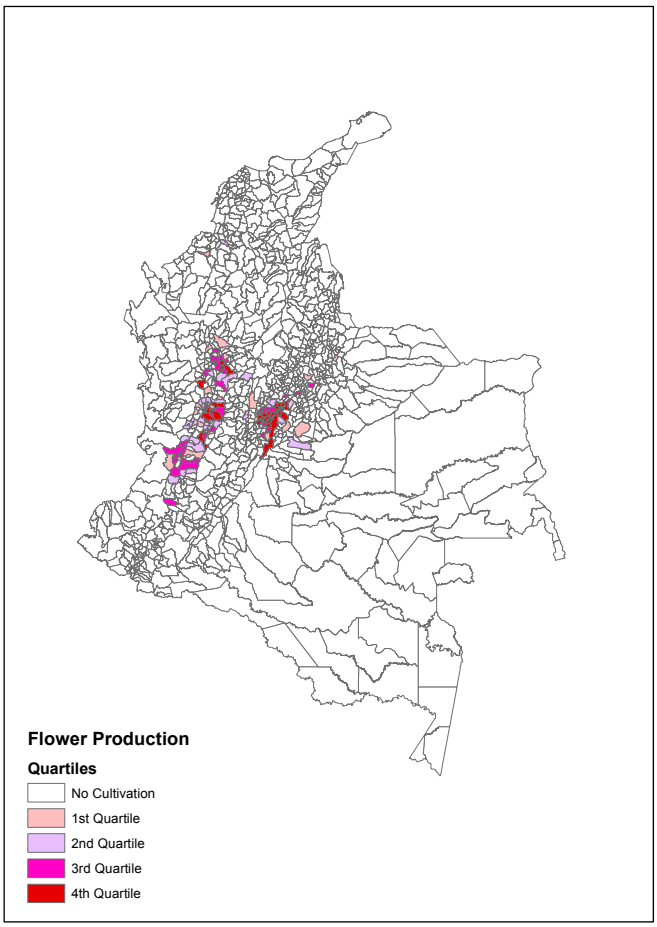
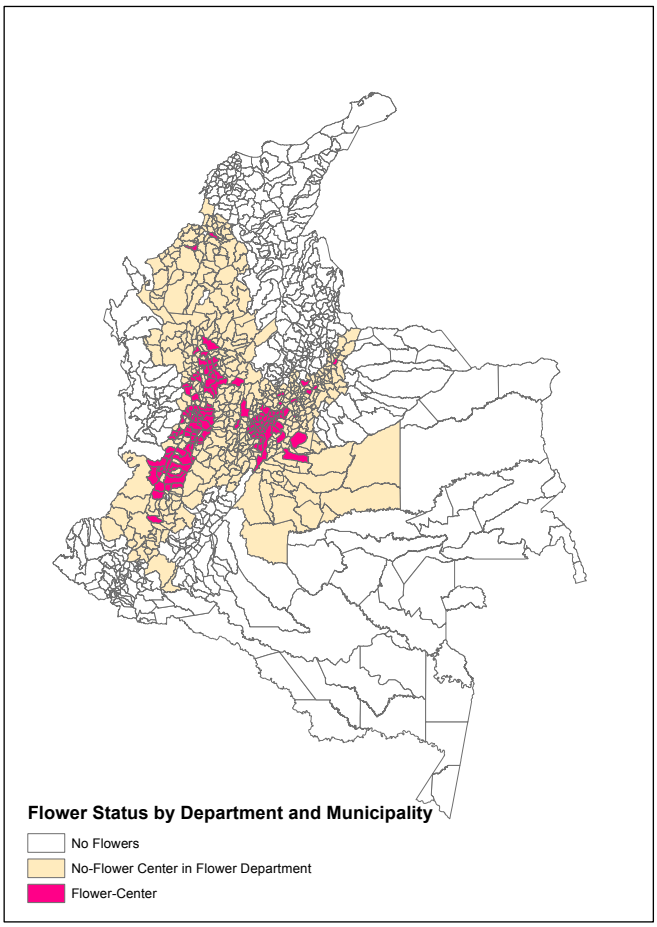
Figure 1: Flower Hectares Distribution



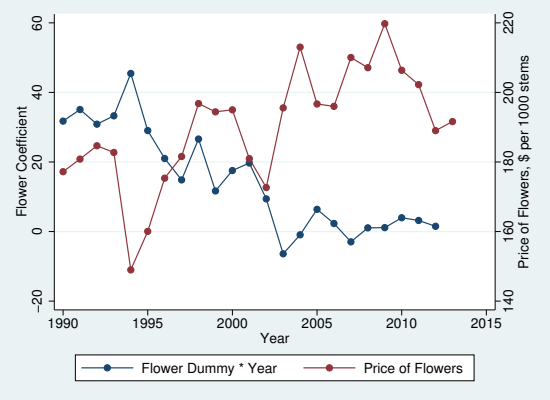
This figure shows the distribution of flower farms at the municipality level across the Colombian territory for the year 2007. Flower municipalities are identified as those municipalities that have at least one flower farm (flower hectares>0). Sources: Shape-file from DANE; flower hectare distribution from the Ministry of Agriculture and Rural Development.

Figure 2: Flower Hectare Distribution by Status of Department



This figure shows the distribution of flower farms at the municipality level for the sample of Departments that have flower presence. Flower municipalities are identified as those municipalities that have at least one flower farm. At the Department level, we consider that a Department has flower presence if at least one municipality within the Department that is a flower-producing centre. Sources: Shape-file from DANE; flower hectares distribution from the Ministry of Agriculture and Rural Development.

Figure 3: A: Price of Colombian Flower Exports and Differential Homicide Rates in Flower Municipalities. B: Value of Colombian Flower Exports and Differential Homicide Rates.



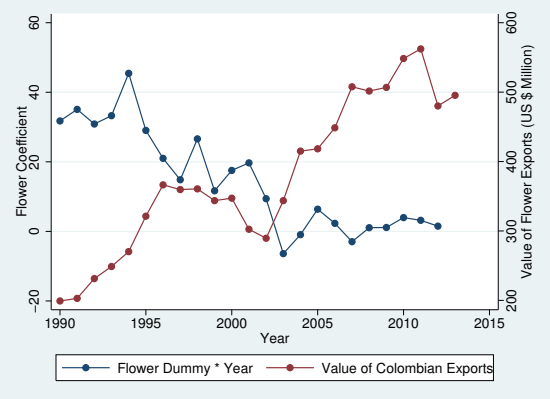
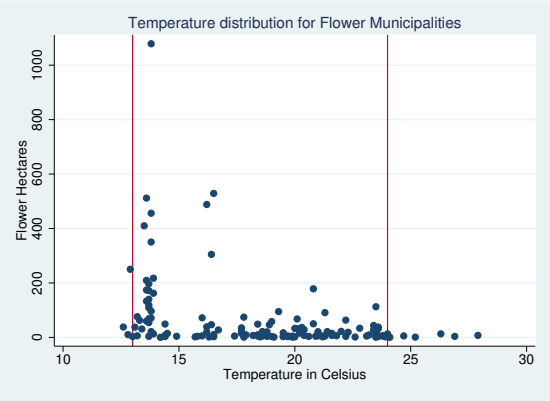


Figure 4: Temperature Distribution for Flower Municipalities



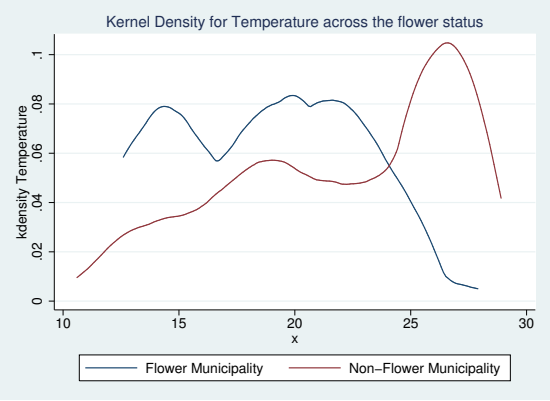


Table 1: Summary of Descriptive Statistics

	Non-Flower			Flower		
	Mean	SD	Count	Mean	SD	Count
Panel A: Violence Variables						
Homicides						
Homicide Rate	49.25	71.28	21744	70.80	80.40	3360
Homicide Rate - Males	45.22	65.30	17195	62.16	54.64	2660
Homicide Rate - Females	4.38	10.09	17195	4.96	6.74	2660
Number of Homicides	12.59	35.52	21744	75.67	338.10	3360
Homicides - Male Victim	12.12	35.97	19910	78.12	373.63	3080
Homicides - Female Victim	1.08	3.11	19910	6.27	29.68	3080
Non-Conflictual Homicide Rate	51.31	113.61	17093	66.50	68.52	2652
Conflict-Related Homicide Rate	1.34	5.68	14496	0.46	2.45	2240
Other Violent Crimes						
Robbery Rate	33.98	65.50	9060	75.17	94.37	1400
Burglary Rate	18.10	36.32	9060	35.62	49.76	1400
Auto/Vehicle Theft Rate	3.92	9.75	9060	10.31	16.40	1400
Commercial Theft Rate	11.73	22.13	9060	23.18	27.10	1400
Kidnap Rate	2.53	9.78	9060	1.82	6.17	1400
Panel B: Conflictual Violence						
Guerrilla Attacks	0.53	1.59	15462	0.21	0.68	2358
Paramilitary Attacks	0.08	0.41	15462	0.06	0.32	2358
Clashes	0.51	1.41	15462	0.23	0.75	2358
Casualties	2.00	7.18	15462	0.99	3.57	2358
Panel C: Municipal-Level Characteristics						
Hectares (2007)	0	0	906	62.41	133.85	140
Number of Flower Firms in Municipality	0	0	906	14.76	34.76	140
Number of Flower Firms in Depto	0	0	906	496.04	428.82	140
Hectares of Coffee	610.55	1277.30	906	1467.77	2003.79	140
Altitude (1000s of meters)	1.10	0.91	906	1.72	0.65	140
Temperature	21.90	4.98	906	18.69	3.89	140
Rainfall (1000s cm3)	1.95	1.11	906	1.62	0.77	140
Distance to market centre (km)	135.08	105.53	906	52.96	39.92	140
Distance to Bogotá (km)	331.48	187.45	906	166.93	94.56	140
Oil Presence	0.08	0.27	906	0.01	0.12	140
Gold Presence	0.14	0.35	906	0.16	0.37	140
Emerald Presence	0.02	0.14	906	0.00	0.00	140
Coal Presence	0.10	0.30	906	0.11	0.31	140
Hectares of Coca (1999)	158.09	1019.61	906	0.05	0.61	131
Historical Land Conflicts (exposure)	0.05	0.22	906	0.06	0.25	140
La Violencia episode (exposure)	0.15	0.35	906	0.08	0.27	140
Panel D: Annual-Level Characteristics						
Flower Price (US $ per 1000 stems)	178	29	24			
Value Flower Exports from Colombia to US (Million US $)	378	110	24			
Value of Total Flower Imports by US (Million US $)	608	165	24			
Flower Stems exported by Colombia (Millions)	2090	351	24			
Flower Stems imported by US (Millions)	2600	485	24			
Tones of Flower Exports to the World	178309	37951	23			
Tones of Flower Exports to the World	174151	42048	24			
Flower Stems exported by LATAM competitors (Millions)	440	144	24			
Flower Stems Exported by Non-Latam competitors (Millions)	57	23	24			
Internal Price of Colombian Coffee (Colombian Pesos)	1345	820	24			
Bags of 60kgs (1000s)	11498	2272	24			

Notes: The homicides sample data covers the period 1990 - 2013. The other violent crimes cover 2003-2013. Conflictual violence outcomes cover the period 1988-2005.

Table 2: Temperature Requirements for Flower Growth

	(1) Flower Status	(2) Flower Status	(3) Flower Hectares	(4) Flower Hectares
Coolness	0.194***	0.141***	13.66***	14.03***
	(0.019)	(0.038)	(2.955)	(2.915)
Hot		-0.0680**		-0.308
		(0.035)		(0.231)
Cold		-0.0169		5.845
		(0.049)		(5.217)
Constant	0.0259***	0.0794**	0.750	0.380*
	(0.007)	(0.034)	(0.547)	(0.227)
Observations	1046	1046	1046	1046
R-Squared	0.0802	0.0828	0.0163	0.0168
F-Stat	107.7	45.13	21.39	9.159

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1]Note: robust standard errors reported in parentheses. OLS results for the Flower Suitability index. The outcome variables reflect both the extensive margin, flower status, as well as the intensive margin of cultivation, flower hectares; both are measured at the municipality level. Flower Status identifies whether a municipality is a flower-producing center or not. Hectares corresponds to the number of hectares under flower cultivation. Our suitability requirement is a non-linear temperature condition: coolness. It captures whether the average annual temperature lies between 13-24 degree Celsius (55-75 F), which are deemed to be optimal for flower growth. We add a dummy 'Hot' for temperatures that exceed 25 Celsius and a dummy 'Cold' for temperatures that are below 12 Celsius.

Table 3: IV Results for Flower Shocks on Homicides

Panel A: OLS and Second-Stage Results

	(OLS)	(IV)	(IV)	(IV)	(IV)	(IV)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
						Males	Females
	Homicide Rate						
Flower Hectares	-0.108**	-7.115***	-8.613*	-2.593*	-8.249*	-7.298*	-0.421
× (Log) Flower Price	(0.049)	(2.485)	(5.046)	(1.566)	(4.692)	(3.756)	(0.383)

Panel B: First-Stage Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Flower Hectares × (Log) Flower Price						
Coolness		-2.253***	-1.102***	-3.506***	-1.558***	-2.237***	-2.237***
× (Log) Export Volume Competitors		(0.487)	(0.331)	(0.856)	(0.526)	(2.477)	(0.753)
Observations		25104	25104	25104	25104	19855	19855
Municipalities		1046	1046	1046	1046	1045	1045
	Time-Varying Controls						
Distance × FE			Yes		Yes	Yes	Yes
Other Exports × FE				Yes	Yes	Yes	Yes
Altitude × FE					Yes	Yes	Yes
La Violencia × FE					Yes	Yes	Yes
Regional * t					Yes	Yes	Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[2] Note: Standard errors clustered at the municipality level are shown in parentheses. All specifications include municipality and year fixed effects. The outcome of interest is the homicide rate, defined as the number of homicides per 100,000 inhabitants for the sample period 1990 to 2013. Our regressor consists of the interaction between the number of flower hectares and the (log) price of Colombian flower exports. The price is computed as the value of Colombian flower exports to the US divided by the number of flower stems (US dollars per 1000 stems). Our instrument is made of the interaction of the volume (tones) of flower exports of the main Latin-American and Caribbean basin competitors faced by Colombia in the US market, and the coolness requirement for flower suitability (temperature criterion). All specifications include year and municipality fixed effects (FE). In Column (1) we report the OLS results for the base specification, which always incorporates year and municipality fixed effects. Column (2) provides the IV base specification. We build upon this base specification by including time-varying controls. Column (3) accounts for remoteness of the municipality, incorporating separately distance to Bogotá and distance to the main market centre interacted with year FE. Column (4) accounts for the presence of other export commodities (coffee, gold, petrol, and coal) and allows them to have a time-varying impact. Finally, Column (5) puts together all the municipal characteristics described in Columns (3)-(4), as well as a time-varying measure of historical violence, the war episode of La Violencia, and altitude FE. It also adds to it a regional linear time trend. Column (6) and Column (7) disaggregate the homicide rate by gender of the victim. Panel B reports the corresponding first-stage results.

Table 4: IV Estimates for Flower and Coffee Shocks on Homicides

	(1)	(2)	(3)
	Homicide Rate		
Flower Hectares	-8.249*		-7.177
× (Log) Price Colombian Flowers	(4.692)		(5.509)
Coffee Hectares		0.362***	0.611**
× (Log) Internal Coffee Price		(0.122)	(0.284)
Observations	25104	24058	24058
Municipalities	1046	1046	1046

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1]Notes: Standard errors clustered at the municipality level are shown in parentheses. Our two regressors of interest are the (log) price of flowers interacted with flower intensity and the (log) internal price of coffee interacted with coffee intensity. The number of flower and coffee hectares is measured at the municipality level. Our sample period covers the years 1990 - 2013. All specifications include year and municipality fixed effects (FE). In Column (1) we report our IV estimates where we instrument the flower intensity and (log) flower prices with a coolness requirement and the export volume of other Latin-American and Caribbean basin competitors that Colombia faces in the US market. In Column (2) we proceed to instrument the coffee regressor as in Dube-Vargas, but we use non-linear temperature and rainfall geoclimatic requirements for coffee and the volume produced by worldwide competitors: Indonesia, Vietnam and Brazil. Column (3) reports the results of instrumenting both regressors simultaneously. All specifications include municipality and year fixed effects. We also incorporate time-varying controls that account for the remoteness of a municipality, altitude, presence of other main export commodities, historical experiences of violence and a regional linear time trend. All monetary value time series are deflated by the relevant price index.

Table 5: IV Estimates for Flower Shocks on Other Types of Violent Crimes

	(1)	(2)	(3)	(4)	(5)
	Rate of Other Types of Violent Crimes				
	Robbery (Personal)	Burglary (Residential)	Vehicle Theft	Commercial Theft	Kidnap
Flower Hectares x (Log) Price Colombian Flowers	-3.798	9.062	0.801	8.992	-2.783
	(13.913)	(10.542)	(1.943)	(7.052)	(1.784)
Observations	10460	10460	10460	10460	10460
Municipalities	1046	1046	1046	1046	1046

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1]Note: Standard errors clustered at the municipality level are shown in parentheses. All specifications include municipality and year fixed effects. Due to data availability the time horizon spans from 2003 to 2012. The other types of violent crimes that we consider include: the rate of personal theft (robberies committed and denounced to the relevant police authority per 100,000 inhabitants); the rate of residential theft (burglaries); the rate of auto vehicles; the rate of commercial theft (illegal entry into a commercial building with intent to commit a crime); and last, the rate of kidnapping (number of reported kidnaps). Our regressor of interest consists of the interaction between the number of flower hectares and the (log) price of Colombian flower exports. The price is computed as the value of Colombian flower exports to the US divided by the number of flower stems (US dollars per 1000 stems). All monetary time series are deflated. Our instrument is made of the interaction of the volume (tones) of flower exports of the main Latin-American basin competitors faced by Colombia in the US market, and the coolness requirement for flower suitability (temperature criterion). All specifications include year and municipality fixed effects (FE).

Table 6: IV Flower Shocks on Conflictual Violence

	Panel A: Flower Instrumentation			
	(1) Guerrilla Attacks	(2) Paramilitary Attacks	(3) Clashes	(4) Casualties
Flower Hectares	-0.00615	0.0182	0.0837	0.0776
× (Log) Flower Price	(0.067)	(0.018)	(0.068)	(0.321)
	Panel B: Coffee Instrumentation			
	(1) Guerrilla Attacks	(2) Paramilitary Attacks	(3) Clashes	(4) Casualties
Coffee Hectares	-0.785***	-0.201***	-0.891***	-2.474***
× (Log) Internal Coffee Price	(0.136)	(0.038)	(0.179)	(0.814)
	Panel C: Simultaneous Instrumentation			
	(1) Guerrilla Attacks	(2) Paramilitary Attacks	(3) Clashes	(4) Casualties
Flower Hectares × (Log) Flower Price	-0.007	-0.008	0.003	0.029
	(0.029)	(0.006)	(0.028)	(0.117)
Coffee Hectares × (Log) Internal Coffee Price	-0.270	-0.176***	-0.546**	-2.202**
	(0.201)	(0.052)	(0.232)	(1.062)
Observations	17348	17348	17348	17348
Municipalities	964	964	964	964

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1]Notes: Standard errors clustered at the municipality level are shown in parentheses. The conflictual violence outcomes include: number of guerrilla attacks, number of paramilitary attacks, clashes and casualties. The sample spans the years 1988 to 2005. All specifications include year and municipality fixed effects. In Panel A we provide the 2SLS estimates the interaction of flower prices and flower intensity; in Panel B we do so for the interaction of coffee hectares (in 1000s) and the (log) internal price of Colombian coffee. The interaction of flower price with flower intensity is instrumented with a coolness requirement and the export volume of othe Latin-American and Caribbean basin competitors that Colombia faces in the US market. We replicate Dube-Vargas instrumentation strategy for coffee using temperature and rainfall and interacting the geoclimatic variables with the volume produced by worldwide competitors: Indonesia, Vietnam and Brazil. In Panel (C) we proceed to instrument both endogenous regressors simultaneously. We always include the level of oil production at the municipality level interacted with the (log) of oil price, linear trends by region and municipalities cultivating coca in 1994, and the log of the population.

Table 7: IV Results for Different Control Municipalities

	(1)	(2)	(3)	(4)
	Rate of Homicides			
Flower Hectares x (Log) Price Colombian Flowers	-8.249*	-5.512	-7.116*	-8.092*
	(4.692)	(3.850)	(2.812)	(2.516)
Observations	25104	14760	9072	14904
Municipalities	1046	615	378	621
	Control Municipalities			
All Departments	Yes			
Department Hectares > 0		Yes		
10-Nearest Neighbor			Yes	
Common Support				Yes

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1]Standard errors clustered at the municipality level are shown in parentheses. In Column (1) we report the IV results for all the municipalities of Colombia. In Column (2) we restrict the sample to those municipalities (flower or non-flower) who lie in Departments where the total departmental number of hectares is greater than 0. In Column (3) the sample is restricted to control municipalities matched to flower municipalities using a 10-nearest neighbor match. In Column (4)the matching is done by imposing the common support in the propensity score. All specifications include year and municipality fixed effects (FE). We also incorporate time-varying controls that account for the remoteness of a municipality, altitude, presence of other main export commodities, historical experiences of violence and a regional linear time trend.

Table 8: IV Estimates Allowing for Externalities (?)

	(1)	(2)	(3)	(4)
	Homicide Rate			
Flower Status × (Log) Price	-427.635***	-625.539**	-442.430***	-695.737**
	(123.058)	(291.901)	(124.028)	(327.922)
Neighbor × (Log) Price	-112.319***	-213.606**		
	(28.745)	(93.830)		
No Flower but In Flower Department × (Log) Price			-123.709***	-276.530**
			(32.328)	(131.221)
Observations	25104	25104	25104	25104
Municipalities	1046	1046	1046	1046

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1]Notes: Standard errors clustered at the municipality level are shown in parentheses. Column (1) instruments the flower status × (Log) Price; we add the variable 'neighbor' that identifies a non-flower producing municipality that borders a flower center. Column (2) includes the set of time-varying controls and a regional linear time trend. In Column (3) we instrument the flower status × (Log) Price; we add to this regression the variable 'No Flower but in Flower Department' which identifies the non-flower producing municipalities that are found within the Flower Departments. In Column (4) we add the additional set of time-varying controls and a regional linear time trend. The additional time-varying controls in Columns (2) and (4) include altitude, remoteness of the municipality, presence of other export commodities (gold, petrol, and coal), and exposure to a historical measure of violence, the war episode of La Violencia.