Drugs, Conflict and Early Motherhood in Colombia

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WORK IN PROGRESS
Preliminary and Incomplete †

Abstract

Does armed violence affect the incentives of young women regarding the timing of first pregnancy? This paper aims to understand the behavioral rationale underlying differential teen pregnancy profiles in conflict areas. Firstly, this work proposes a simple model of choice under uncertainty to point out the different channels in which the exposure to the armed violent environment can affect the pregnancy decision of young women changing the cost-benefit of postponing motherhood.

Furthermore, using the Demography and Health Survey (DHS) and criminal records at municipality level in Colombia over the period 2002 to 2009 the paper aims to show that increases in conflict exposure, measured by municipality violence rate, increase the probability of becoming a young mother. What is more, estimated optimal drug dealers trafficking routes are used as an instrument of the regional violence in order to take into account the possible endogeneity of the household armed violence exposure.

Finally, initial results suggest that the homicide rates of municipalities involve in the internal traffic of cocaine response differentially to changes in the international price of cocaine depending on markets which each region should be supplying. What is more, after correcting for possible endogeneity, among women from 13 to 20 years old, the probability of being a younger mother increases by 0.002 points when the homicide rate increases in one unit.

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"I was 15 when I became a widow, ... Hi died on my legs. In my heart he left me a great sadness and a reminder I will never forget, which is my son." Cielo (17 years old)[1]

Cielo is one of the main characters of La Sierra - (Dalton et al. (2005)), a documentary about 3 young who lived in La Sierra during the conflict between extreme right wing paramilitary forces (AUC) and extreme left wing guerrillas (FARC). Cielo, who was 17 at the time of the documentary was already the mother of a 2 years old baby. But she was only one too many of the teenage girls who were already mothers under the war between the two illegal armies with influence on that neighborhood.

Colombia is no stranger to the worldwide interest on understating the causes and consequences of teenage pregnancy. Firstly, is important to point out the 17% drop of the Teenage Fertility Rate (*TFR*) from 2000 to 2011 - see table 1. Even though the fall in the world average is important the problem of early motherhood still significant. For example, even after falling 34% the TFR in low income countries (91.8 babies born from 1000 women from 15 to 19 years old) still 1.7 time the world average and 3.5 time the rate in the OECD countries. Even though the teenage pregnancy problem is higher in poor and developing countries high income countries are not away from it. For example, against the worldwide decreasing tendency countries like Spain and the United Kingdom showed increases of 18% and 4% in the TFR from 2000 to 2002.[2].

There is an extended literature on the analysis of the causes of early childbearing the cost it has over mothers, fathers and children. The theoretical analysis of the timing of motherhood builds up in the initial idea of Becker et al. (1960) and the later developments of Blackburn et al. (1993) where the choice of time of motherhood is a function of relative wages and human capital accumulation of women. On the other hand, it has been showed that young mothers face reductions in the accumulation of human capital, labor opportunities, income and even on their health conditions. (Klepinger et al. (1999); Miller (2011); Fletcher (2011); Buckles (2008)). Furthermore, the outcomes in education, health and labor opportunities for the offsprings for young mothers decreases significantly as well, (Klepinger et al. (1999); Miller (2009, 2011); Buckles (2008); Chevalier and Viitanen (2003); Francesconi (2008)).

On the other hand, the analysis of indirect cost civil war, conflict and violence on the households. Reductions in educational and labor market outcomes and assets losses are usually associated with populations affected by civil wars or sharp increases in the violence the suffer. Authors like Bozzoli et al. (2011); Barrera and Ibáñez (2004); Rodríguez and Sánchez (2009) and Ibáñez and Moya (2009) have found the latest results in the case of Colombia.

This paper contributes to both fields, the analysis of indirect cost of conflict and the causes of early motherhood. Hence, the paper builds up on the puzzle

[1] Translation from Dalton et al. (2005)

[2] According the UN the TFR grows in Spain from 9.4 to 11.1 and from 28.6 to 29.7 in the United Kingdom between 2000 and 2011.

propose by Flórez et al. (2004) when analyzing the behavior of the teenage fertility in Colombia. The author said:

> *"The increasing tendency in the teenage fertility rate was not expected given the positive changes in socioeconomic factors at individual level (education, labor participation) and in the context (urbanization, ..."*[3].

Furthermore, and complementing the latest statement, figure 1 compares the GDP per capita and the TFR of Colombia and its surrounding countries[4]. As we can see in the panel *a* the behavior of Colombians GDP does not differ significantly from the evolution of the GDP per capita region from 1997 to 2009. Although, the fertility rate of Colombia is the only one in the region with a positive slope before 2002 (see panel *b* on the same figure). As Flórez argues, the increase in babies born from adolescent mothers was not expected and therefore Colombia should have been reducing the levels of teenage fertility as the other countries in the region did. However, differently to the other countries of the region the homicide rate in Colombia was about 3 times the average of the developing countries in the region at 2002. Figure 2 shows the homicide rates of the same countries in the analysis of figure 1, in this case it is easy to pick up that Colombia was having a complete different profile in terms of violence and security.

Colombia differently from other countries in the region has suffered a long lasting violent internal conflict (see Echeverry et al. (2001); Sánchez et al. (2003)). The internal conflict has shape Colombian institutions differently to other countries. For that reason this paper claims that the violent conflict explains part of the increases of the rate of teenage fertility in Colombia. Specifically, we argue when the household is exposed to increases in local violence the cost-benefit relationship of postponing motherhood changes increasing the incentives to be a young mother. Similar analysis are not new in the literature of household welfare and armed conflict. The papers from Abramitzky et al. (2010); Shemyakina (2009); Valente (2011) have found interesting relation ships between the violence of the civil war and the marriage markets and the fertility decisions. These authors take advantage of sharp and localize increases in violence to identify the effect conflict over the households. Unfortunately this is not the case when analyzing a long lasting conflict like the case of Colombia. For that reason this paper builds up a network of internal cocaine traffic as an instrument in order to identify changes in violence and changes in the fertility profiles at municipality level in Colombia. The construction of such instrument follows the ideas of Dell (2011); Angrist and Kugler (2008); Dube and Vargas (2013) among other authors.

[3] Flórez et al. (2004) *Page 10. This is my translation from the following quote in Spanish.* "*La tendencia creciente en la fecundidad adolescente en el pais no era esperada dado los cambios positivos que observamos en algunos determinantes socioeconomicos al nivel individual (educacion, participacion laboral) y contextual (urbanizacion ..."*

[4] Colombia has borders with Panama, Venezuela, Brazil, Peru and Ecuador.

This paper has the following structure. After this introduction section 1 develops a model of women fertility choice and the way how exposure to conflict violence changes the cost-benefit relationship of postponing motherhood. The section 2 picks up on the results for the previous sections and motivates an empirical strategy to estimate the effect of municipality violence on the probability that a woman become pregnant while teenage. What is more, this section discusses the endogeneity problem when analyzing the municipality level violence and households decisions in the context of a survival set up following Bijwaard (2008). Section 2 finishes motivating the use of the role of internal cocaine traffic networks as an instrument for municipality violence. After introducing the empirical strategy section 3 describes the data used for the estimations and section 4 shows and discuss the results. Section 5 concludes.

1 A model of motherhood timing choice

The aim of this section is to introduce a model of women fertility choice which helps to understand the different way in which the local violence could affect the probability of becoming and young mother. There are some important features of this model. Firstly, the paper and therefore the model developed in this section will focus in the decision of getting pregnant for the first time only. For that reason similar decisions like time of marriage and number of children are not part of this analysis. Secondly, this model only takes into account the women decision and ignores men decision functions and matching equilibriums. However, the assumptions and shape conditions are similar to the necessary conditions of equilibriums with positive assortative matching - *(PAM)*

Assume women only live two periods, $t = \{1, 2\}$ and have a discount factor β_i. Each period women get utility from consumption and she gets utility from motherhood only the period that she gives birth. Firstly, her utility from consumption - c_t - is represented by a non decreasing and concave function $u_i(c_t)$. On the other hand, each women has a "*attractiveness endowment*" μ_i, which can be understood as the set of her personal characteristics that are valuable by men [5]. Depending on μ_i in period 1 she gets a random couple j from the set of men Ω, this man j has some characteristics x_j. Call $G(x_j \mid \mu_i) = P(x \leq x_j \mid \mu_i)$ the commutative probability distribution that a woman i gets a couple with characteristics x_j from set Ω[6]. Moreover, If she has a baby with man j she gets the intrinsic utility for motherhood α_i but also she has an extra utility from what I will call the *"attractiveness surplus"* $d_{ij} = (x_j - \mu_i)$. Then her final utility for motherhood is $v_i(x_j) = \alpha_i + b_i d_{ij}$.

Once she gets a worthy man j such that $v_i(x_j) > 0$, she has to decide whether to use or not use contraception. Define $a_i \in A = \{C, N\}$ the action taken by girl i where $a_i = C$ if she decide to use contraception methods and $a_i = N$ when

[5] for example education, income, race, physical characteristics

[6] The density probability distribution is $g(x_j \mid \mu_i) = \frac{\partial G(x_j \mid \mu_i)}{\partial x_j}$

she does not use any contraceptive method. The cost of contraceptive methods is ϕ. If she does not use contraception she gets pregnant with probability 1 and becomes a mother from period 1. If she does use contraception she does not get pregnant with probability 1, what is more, with probability q_{ij} she keeps the same couple j in period 2 and then she will get a pregnant and will have a baby with him. With probability $(1 - q_{ij})$ the link with j breaks and she gets another couple f from the same Ω. Giving that, this is a model of first child pregnancy and it is not a model to explain the family size I assume that every woman has maximum one child. Finally, childbearing implies an investment of $k_{ij} = k_i + k_j$ where k_i is her investment and k_j is the fathers investment in child good. Total child investment k_{ij} represents future transfers for the mother $\gamma_i(k_{ij})$ when her son grows up.

On the other hand, every woman can only study during period 1 in order to get returns in period 2. Declare $s_i = \left\{\underline{s_i}, \bar{s_i}\right\}$ the possible levels of schooling for a girl with and without a baby in period 1 respectively, assume $\underline{s_i} < \bar{s_i}$ for any i. Furthermore, in period 1 each girl receives an initial endowment y_i and in period 2 each woman earns $w_i(s_i)$ with $w_i'(s_i) > 0$. Declare $\Delta s_i = \left(w_i(\bar{s_i}) - w_i\left(\underline{s_i}\right)\right) - \left(\bar{s_i} - \underline{s_i}\right)$ the net return from the education that the woman will get if she postpones pregnancy.

The decision

If a woman i gets a worthy man j she will choose an action a_i, given her action she will choose a level of childhood investment k_i^a and consumption each period c_1^a, c_2^a to maximize her expected lifetime utility. To make the analysis simpler lets make some simplifications. Initially assume childcare expenditure is given by the father and the mother does not need to do further investment, then $k_i = 0$, furthermore the child will not give any transfer to his mother, then $\gamma_i(k_j) = 0$. What is more, women are risk neutral - $u(c) = c$, and $\beta = 1$.

Figure 3 summarizes the decision problem for a woman i once she gets a partner j. The figure that a girl i will face 3 possible endings after receiving a random couple j. If she decides to become a mother from period 1 her final utility is M_{ij}. If she decides to wait and keeps the link with j she gets utility V_{ij}, on the other hand, if the link with j is broken she gets utility V_{if} when f is a random partner from set Ω. Under the latest assumptions the final utilities can be written as $M_{ij} = y_i - \underline{s_i} + \alpha_i + b_i d_{ij} + w_i\left(\underline{s_i}\right)$, $V_{ij} = y_i - \bar{s_i} - \phi + w_i(\bar{s_i}) + \alpha_i + b_i d_{ij}$ and $V_{if} = y_i - \bar{s_i} - \phi + w_i(\bar{s_i}) + \max[0,\, \alpha_i + b_i d_{if}]$. Hence, at period $t = 1$ women i knows the value of M_{ij} and V_{ij} but she has no certainty about V_{if} because she only knows the probability distribution of couples G. Then, the expected utility of using contraception at period 1 is: $W_{ij} = q_{ij}V_{ij} + (1 - q_{ij})\,EV_i = y_i - \bar{s}_i - \phi + w_i(\bar{s}_i) + q_{ij}v_i(x_j) + (1 - q_{ij})\,Ev_i(x)$ where $Ev_i(x) = \left(1 - G\left(\underline{\varepsilon_i} \mid \mu_i\right)\right)\left(\alpha + b\left(\int_{\underline{\varepsilon_i}} x g(x \mid \mu_i)\, dx - \mu_i\right)\right)$. $Ev_i(x)$ is the expected motherhood utility giving the probability distribution G. Moreover, $\underline{\varepsilon_i} = \mu_i - \frac{\alpha_i}{b_i}$ is the minimum offer that the women is likely to accept. Then $a_i(x_j) = N$ if $M_{ij} \geq W_{ij}$, which happen when:

$$(1 - q_{ij})\left(v_i\left(x_j\right) - Ev_i\left(x\right)\right) + \phi \geq \Delta s_i \tag{1}$$

The decision condition in equation1 is easy to read. A women i will have a baby with man j at period $t = 1$ if the net expected utility of early motherhood is larger that the total return of postpone motherhood which is measure as the net returns of education.

The role of men and the turning offer

So far men were only represented by an offer x. But who is likely to send an offer to a woman with *"attractiveness endowment"* μ_i. Imagine that a men j who can offer x_j gets an utility $\pi_j\left(\mu_i\right)$ of being with woman i and has a reservation utility of being single $\hat{\pi}\left(x_j\right)$. Both functions are non-decreasing and continuous in their own controls with $\frac{\partial \pi_j(\mu_i)}{\partial \mu_i} \geq 0$ and $\frac{\partial \hat{\pi}(x_j)}{\partial x_j} \geq 0$. Then a man with the offer x_j will only send the offer to a woman i such that $\pi_j\left(\mu_i\right) - \hat{\pi}\left(x_j\right) \geq 0$. Then the maximum offer that a women i is likely to get with positive probability is $\bar{\varepsilon_i} = \hat{\pi}^{-1}\left(\pi_j\left(\mu_i\right)\right)$. Then we can rewrite the expected motherhood utility of the girl i $Ev_i\left(x\right) = \left(G\left(\bar{\varepsilon_i} \mid \mu_i\right) - G_i\left(\underline{\varepsilon_i} \mid \mu_i\right)\right)\left(\alpha_i + b_i\left(\int_{\underline{\varepsilon_i}}^{\bar{\varepsilon_i}} xg\left(x \mid \mu_i\right)dx - \mu_i\right)\right)$. Lets call $G\left(\varepsilon_i \mid \mu_i\right) = G\left(\bar{\varepsilon_i} \mid \mu_i\right) - G\left(\underline{\varepsilon_i} \mid \mu_i\right)$ and $E_i x = \int_{\underline{\varepsilon_i}}^{\bar{\varepsilon_i}} xg\left(x \mid \mu_i\right)dx$. Now we can find a turning signal - $\tilde{x_i}$ - such that the woman i is indifferent between having or not a baby in period 1[7].

$$\tilde{x_i} = \frac{\Delta s_i - \phi}{1 - \tilde{q_i}} - \left(1 - G\left(\varepsilon_i \mid \mu_i\right)\right)\left(\alpha_i - b_i\mu_i\right) + b_i G\left(\varepsilon_i \mid \mu_i\right) E_i x \tag{2}$$

Then, a woman i will decide to choose $a_i = N$ in order to become a young mother if the offer (couple) that she gets the first period is better than her turning offer - $x_j \geq \tilde{x}_i$. Given that the offers that a woman i receive are ruling by the probability $G\left(x_j \mid \mu_i\right) = P\left(x \leq x_j \mid \mu_i\right)$, therefore, the probability that a woman i gets pregnant when young is:

$$P\left(a_i = N \mid \mu_i\right) = P\left(x > \tilde{x}_i \mid \mu_i\right) = 1 - G\left(\tilde{x}_i \mid \mu_i\right) \tag{3}$$

If $G\left(x \mid \mu_i\right)$ is and monotonic function in x for any μ_i we can analyze the effect of the different variables on the probability of early pregnancy through the analysis of the turning offer $\tilde{x}_i$.

How does conflict affect women's decision?

As I said before the way to analyze changes in the probability of early child-bearing decision is through the analysis of $\tilde{x}_i$. Firstly declare Vio_i the level of conflict that women i is exposed to. But, how does σ_i could affect $\tilde{x}_i$?

1. Sex Ratio - $sr = \frac{women}{men}$.

[7] Call $\tilde{q_i}$the probability of keeping the link with the turning couple $\tilde{x}_i$

(a) The sex ratio can be affected in two different ways:

i. Recruitment: Decrease the number of men of certain age/education level.

ii. Homicides: Conflict casualties are usually higher in young males than in other gender-age categories. The increasing in homicides decrease the number of men and increases the sex ratio.

(b) Increases in sex ratio could affect the decision in the following ways:

i. When the sex ratio increase (less men) the final probability of find a couple decrease and the marriage rate decrease. See Shemyakina (2009), Angrist (2002). The effect can be ambiguous. Initially this can be a decrease in the expected value of the couple quality on period 2 inducing more girls to choose early motherhood once the got a good offer - they will have lower $\tilde{x_j}$. But in terms of pregnancy rates there would be less girls who get signals and the final rate might decrease.

ii. When the sex ratio increase each woman has less bargaining power and the the expected quality of the offer decrease (men could choose better girls). For example Abramitzky et al. (2010), Chiappori et al. (2002). Then, an increase in the sex ratio via an increase in conflict could increase the incentives for girls to become young mothers once they get a worthy couple. What is more, loosing bargaining power reduce the capability of the woman to decide on her own fertility. Men in conflict aim to have a kid in order to have someone who will be their legacy if they die in war . Moreover some men do not like women to use protection, this reduce the women who are effectively taking the motherhood decision but they are not part of my theoretical model.

2. Conflict reduces the benefits from education - Rodríguez and Sánchez (2009). Lower $\triangle s_i$ will induce early pregnancy for women who receives a lower signal. Kearney and Levine (2011) have a similar idea and they call what I call benefits from waiting to the subjective probability of have economical success if the woman postpone motherhood. Then $\frac{\partial \triangle s_i}{\partial \sigma_i} < 0$.

3. Conflict could affect the probability of keeping the actual couple. If there is an increasing risk of loosing the couple women might like to assure this baby and increases the incentives to get pregnancy. Then $\frac{\partial \tilde{q_i}}{\partial \sigma_i} < 0$

4. Life Expectancy: Increases in conflict reduces life expectancy.

2 Estimation Strategy

From the latest section the equation 3shows how the probability of being a young mother depend on the turning offer $\tilde{x_i}$. What is more, the las part of section 1

closes discusses how the level of exposure to armed violence σ_i affects the turning offer and the pregnancy decision. Hence, we can write again 3 as the probability of being a young mother as $P_{im\tau}\left(young\,mother\right) = f\left(violence_{m\tau},\, X_i\right)$

In order to get more accurate estimations this paper proposes to follow a survival analysis where the variable of interest will be the hazard function $h_{ij} = P(T_i = j \mid T_i \geq j)$, the probability of a woman i get pregnant at period $T_i = j$ given that she has not been pregnant in any period before j. For this estimation this paper follows the strategy of discrete duration estimations of Jenkins (2005)[8], therefore, in discrete time $hij = P\left(j-1 < T \leq j \mid T > j-1\right)$. Then, the hazard function can be written as $h_{ij} = h\left(j,\, X_i,\, Vio_{ij}\right)$ where X_i are the individual variables that affect the pregnancy hazard and Vio_{ij} is the level of violence an individual i suffered at when she was age j. Then, the first model to estimate would be a discrete time proportional hazard model

$$h_{ijmt} = h\left(j,\, \beta X_i,\, \gamma Vio_{jmt}\right) \tag{4}$$

Then, according to the model developed in section 1 we are expecting that $\frac{\partial h}{\partial Vio} = \gamma h' > 0$. With this model and under the assumption that violence shocks are predictable[9] and Vio_t and $h_0\left(Vio_y\right)$ are bounded it possible to identify $\hat{\gamma}$ and the underline hazard function $h_0\left(j\right)$ using standard regression methods, see Van.den.Berg (2000). However, the orthogonality condition may no be credible when the variable of analysis is the violence a household is expose to at certain period. In the sense of duration models the endogeneity refers to unobservable variables that affect the level of exposure to the conflict violence and the underlying hazard function of first pregnancy - Bijwaard (2008). In other words, there is an unobservable force that make some women more likely to be affected by the local violence of the conflict and at the same time affects the probability that she becomes pregnant at certain age.

As we explain in the introduction of this paper, the violent process of Colombia does not have the characteristics of the strong exogenous shock found by previous authors when they analyzed the link between conflict, marriage and motherhood. In our case, the differential effect of the long lasting violent process could be with different institutions, low presence of the state and risk aversion profiles of the community. The latest factor can be part of the variables that explain the differences in the fertility profiles as well.

Hence, this paper proposes an instrumental variable strategy using switches in international cocaine prices and its interaction with the network of roads which could be being use to traffic cocaine from the cultivation regions to the international borders. The identification relies on the following statement. Drug dealers react to changes on the relative profits that they could achieve on different international markets, in our case the we only use the markets of Europe and

[8]The choice of a discrete model is given that the variables of violence are observed yearly which implies that the dependent variable will group all the observations in a yearly interval. See further discussions in Jenkins (2005) chapter 3.

[9]Predictability is associated with weak exogeneity in time series models.

United States. What is more, we assume that the violence is the main force use by traffickers in order to get control over the network. Then, the usage of a fix network varies in time as a response of the relative profitability. Furthermore, the latest reaction implies different violent forcers over some regions at different times.

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3 The Data

See table 2
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4 Results[10]

- Baseline survival function and hazard rates by homicide intensity - see figure 4
- Discrete Logistic Duration Model - Age of first pregnancy on homicide rates - see table 3
- Description of the cocaine traffic network - see table 4
- The municipalities in the traffic network - see figure 5
- Homicide rate on cocaine traffic - Including all the municipalities - see table 5
- First stage - Homicide rate on cocaine internal traffic - 6
- Second Stage - Discrete Logistic Duration Model - Age of first pregnancy on homicide rates (instrumented by cocaine traffic) - see table 7

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5 Conclusions

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[10]The results of this draft dated on (April 15, 2013) only include the analysis on total homicides at municipality level. The analysis of other indicators of violence will be include in following versions

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Nomenclature

AUC From the name in spanish - Autodefensa Unidas de Colombia (United Self-Defence Forces of Colombia). AUC was the biggest paramilitary army in Colombia.

CEDE Centro de Estudios sobre Desarrollo Económico, Los Andes University

DHS Demographic and Health Surveys (DHS) are nationally-representative household surveys that provide data for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition (source: http://legacy.measuredhs.com/aboutsurveys/dhs/start.cfm)

FARC From the name in spanish - Fuerza Armadas Revolocionarias de Colombia (Colombian Revolutionary Armed Forces). They are the biggest marxist guerrilla army in Colombia

SIMCI Sistema Integrado de Monitoreo de Cultivos Ilícitos - (Integrated Illicit Crop Monitoring System)

TFR Teenage Fertility Rate or Adolescent fertility rate is the number of births per 1,000 women ages 15-19.

UNODC United Nations Office on Drugs and Crime

A Tables

Table 1: Teenage Fertility Rates 2002 - 2011

	2002	2011	%Change
World	64.72	52.67	-17%
Low Income Countries	120.23	91.81	-24%
Middle Income Countries	60.35	50.21	-17%
OECD Countries	31.76	25.76	-19%

Source: UN Population Division, World Population Prospects. Teenage Pregnancy Rate (TFR) is the number of births per 1,000 women ages 15-19.

Table 2: Main Data Sources

Variable	**Period**	**Source**
Demographic and Health Survey (DHS)	1986 - 2010	Demographic and Health Surveys - Profamilia
Homicides at municipality level	1990 - 2009	CEDE - Human Rights Observatory - Vice-presidency of Colombia
Wholesale cocaine price - Europe and United States	1990 - 2010	UNODC - World Market Reports
Coca crops in Colombia	2001 - 2010	UNODC - SIMCI

Table 3: Discrete Logistic Duration Model: Age of first pregnancy on Homicides per 100000 hb

Age Spell	13 to 17			15 to 19			20 to 25		
γ	0.001***	0.001**	0.000	0.001***	0.001***	0.000*	0.000**	0.001***	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
α	1.867***	1.892***	2.007***	1.358***	1.408***	1.563***	-0.270***	-0.137*	-0.025
	(0.041)	(0.042)	(0.047)	(0.042)	(0.043)	(0.047)	(0.080)	(0.082)	(0.084)
$YearFE$	No	No	Yes	No	No	Yes	No	No	Yes
$MpioFE$	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
r2_p	0.10	0.11	0.12	0.05	0.06	0.06	0.01	0.02	0.03
Ind.	46649	46471	46471	42357	42329	42329	25407	25405	25405
N	180601	179910	179910	145404	145318	145318	85592	85589	85589

Standard errors in parentheses

All regression control for municipalities with coca fields and Log of total population

All individual level regressions control for ethnicity, household income, living in urban areas and birth cohort

Regressions with Fiscal controls include only information from 2000

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Cocaine Traffic Network Features

Main Features				
Origin Nodes	224			
End Nodes	51			
Total Routes	12403			
Statistics	Mean	S. d.	Min	Max
Total Length (Km)	1550.5	830.3	23.2	4065.1
Main Road Proportion	0.36	0.12	0	0.94
Number of Departments	5.31	2.95	1	15

Table 5: Homicides per 100000 hb on cocaine traffic network

$P_M Brd_b$					
US	Pacific	0.978***	0.768***	0.532***	-0.116
		(0.187)	(0.197)	(0.179)	(0.188)
	Atlantic	0.729***	0.492**	1.642***	0.913***
		(0.242)	(0.250)	(0.218)	(0.226)
	VenSouth	-0.077	-0.312	-1.882***	-2.604***
		(0.409)	(0.428)	(0.522)	(0.535)
	VenCnt	0.269	0.032	1.039***	0.319*
		(0.196)	(0.207)	(0.176)	(0.187)
	Ecuador	0.586	0.380	0.391	-0.244
		(0.470)	(0.468)	(0.404)	(0.403)
EU	Pacific	-0.253	-0.098	-0.259**	-0.110
		(0.159)	(0.169)	(0.128)	(0.136)
	Atlantic	-0.249	-0.076	-0.236	-0.077
		(0.207)	(0.215)	(0.173)	(0.179)
	VenSouth	0.800**	0.967**	0.695**	0.827**
		(0.363)	(0.379)	(0.330)	(0.343)
	VenCnt	-0.181	-0.009	-0.151	0.018
		(0.162)	(0.172)	(0.139)	(0.147)
	Ecuador	-0.607	-0.458	-0.640**	-0.512
		(0.377)	(0.375)	(0.324)	(0.322)
Year FE		No	Yes	No	Yes
Mpio FE		No	No	Yes	Yes
F_Prices		55.55	49.76	19.17	10.52
r2		0.03	0.05	0.36	0.38
N		21920	21920	21920	21920

Standard errors in parentheses clustered by municipality - 1096 Municipalities.

The instrument uses only the network with the shorter route from a municipality with coca cropping to the closest international border. All regression control for municipalities with coca fields and Log of total population. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Instrumental Variable Results - First Stage: *Homicides per 100000 hb on Drug Traffic Network (1990 - 2009)*

$P_M Brd_b$		Age Spell								
		13 to 17			15 to 19			20 to 25		
US	Pacific	1.219***	0.504**	0.447*	1.039***	1.105***	0.379*	1.218***	1.505***	0.285
		(0.280)	(0.233)	(0.239)	(0.280)	(0.297)	(0.221)	(0.269)	(0.278)	(0.202)
	Atlantic	0.237	1.883***	1.828**	0.325	0.405	1.904**	0.139	0.497	2.121***
		(0.592)	(0.686)	(0.744)	(0.509)	(0.516)	(0.762)	(0.424)	(0.453)	(0.763)
	VenSouth	1.016	-0.433	-0.487	1.379	1.433	-0.198	1.924*	2.239**	-0.099
		(1.413)	(0.957)	(0.955)	(1.265)	(1.259)	(0.895)	(1.129)	(1.122)	(0.860)
	VenCnt	1.474*	1.093**	1.047**	1.461*	1.571*	1.082*	1.784	2.160*	1.325**
		(0.873)	(0.503)	(0.517)	(0.874)	(0.887)	(0.556)	(1.159)	(1.164)	(0.672)
	Ecuador	0.025	-0.574**	-0.596**	0.139	0.178	-0.506**	-0.010	0.121	-0.273
		(0.297)	(0.236)	(0.233)	(0.296)	(0.312)	(0.217)	(0.287)	(0.320)	(0.203)
EU	Pacific	-0.534**	-0.545**	-0.494*	-0.364	-0.428	-0.442*	-0.477**	-0.753***	-0.497**
		(0.265)	(0.245)	(0.255)	(0.271)	(0.286)	(0.249)	(0.240)	(0.267)	(0.215)
	Atlantic	0.503*	0.354	0.430*	0.438**	0.358	0.325	0.716***	0.369	0.291
		(0.276)	(0.234)	(0.254)	(0.203)	(0.246)	(0.236)	(0.257)	(0.300)	(0.298)
	VenSouth	0.195	-0.338	-0.242	-0.190	-0.248	-0.599	-0.633	-0.942	-0.901
		(1.397)	(1.507)	(1.508)	(1.243)	(1.242)	(1.277)	(1.122)	(1.119)	(1.186)
	VenCnt	-1.102	-1.077	-1.025	-1.085	-1.189*	-1.063	-1.363	-1.732*	-1.242*
		(0.683)	(0.660)	(0.675)	(0.694)	(0.709)	(0.674)	(0.931)	(0.946)	(0.688)
	Ecuador	-0.245	-0.258	-0.217	-0.344	-0.389	-0.282	-0.209	-0.364	-0.373*
		(0.253)	(0.239)	(0.244)	(0.250)	(0.268)	(0.238)	(0.228)	(0.266)	(0.219)
Year FE		No	No	Yes	No	No	Yes	No	No	Yes
Mpio FE		No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
F_Prices		7.74	4.22	4.52	7.36	7.46	4.25	7.79	9.31	4.62

Standard errors in parentheses clustered by municipality - 354 Municipalities in the sample.

The instrument uses only the network with the shorter route from a municipality with coca cropping to the closest international border.

All regression control for ethnicity, household income, living in urban areas birth cohort, municipalities with coca fields and Log of total population

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Instrumental Variable Results - Second Stage: *Discrete Logistic Duration Model of Age of first pregnancy on Homicides per 100000 hb instrumented by the cocaine traffic network*

Age Spell	13 to 17			15 to 19			20 to 25		
$homRate$	0.003**	0.003**	0.002	0.001	0.003***	0.002**	-0.001*	0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
$ln\,(age)$	1.862***	1.901***	2.007***	1.360***	1.419***	1.564***	-0.248***	-0.100	0.023
	(0.041)	(0.048)	(0.053)	(0.050)	(0.055)	(0.058)	(0.066)	(0.065)	(0.068)
$YearFE$	No	No	Yes	No	No	Yes	No	No	Yes
$MpioFE$	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
r2_p	0.10	0.11	0.12	0.04	0.06	0.06	0.01	0.02	0.03
Ind.	46649	46471	46471	42357	42329	42329	25407	25405	25405
N	180601	179910	179910	145404	145318	145318	85592	85589	85589

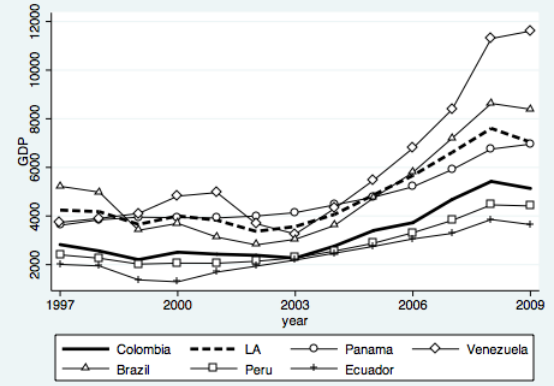
Standard errors in parentheses clustered by individuals. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Excluded Variables: $\sum_M \sum_b P_M B_b$ where $M = \{US,\ EU\}$ and b is the cluster of traffic. The instrument uses only the network with the shorter route from a municipality with coca cropping to the closest international border. All regression control for ethnicity, household income, living in urban areas birth cohort, municipalities with coca fields and Log of total population

B Figures and Maps

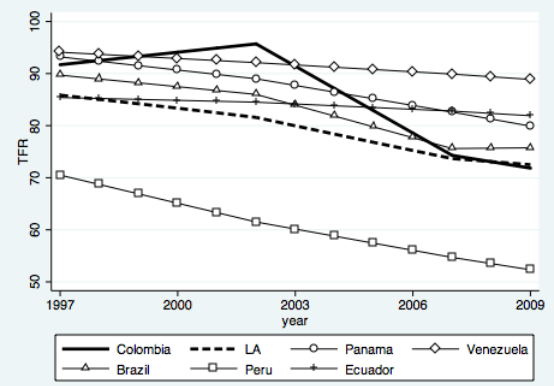
Figure 1: Teenage Fertility Rate and GDP per capita
Colombia and some countries in Latin America and Caribbean 1997 - 2009

(a) GDP per capita



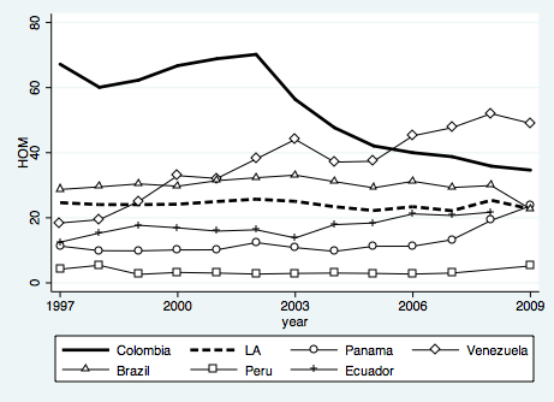
Source: World Bank national accounts data, and OECD National Accounts data files. GDP per capita (current US$)
LA is for Latin America and the Caribbean developing countries

(b) Teenage Fertility Rate



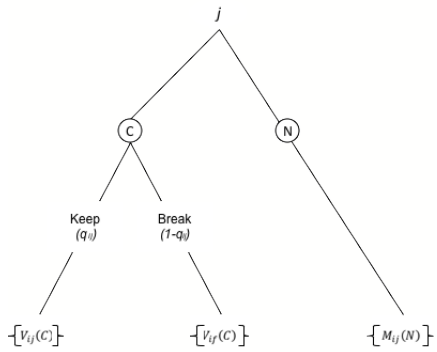
Source: UN Population Division, World Population Prospects. Teenage Pregnancy Rate (TFR) is the number of births per 1,000 women ages 15-19.
LA is for Latin America and the Caribbean developing countries

Figure 2: Homicides per 100.000 habitants
Colombia and some countries in Latin America and Caribbean 1997 - 2009



Source: UN Office on Drugs and Crime's International Homicide Statistics database. Homicide rate (HOM) is Intentional homicides per 100,000 people

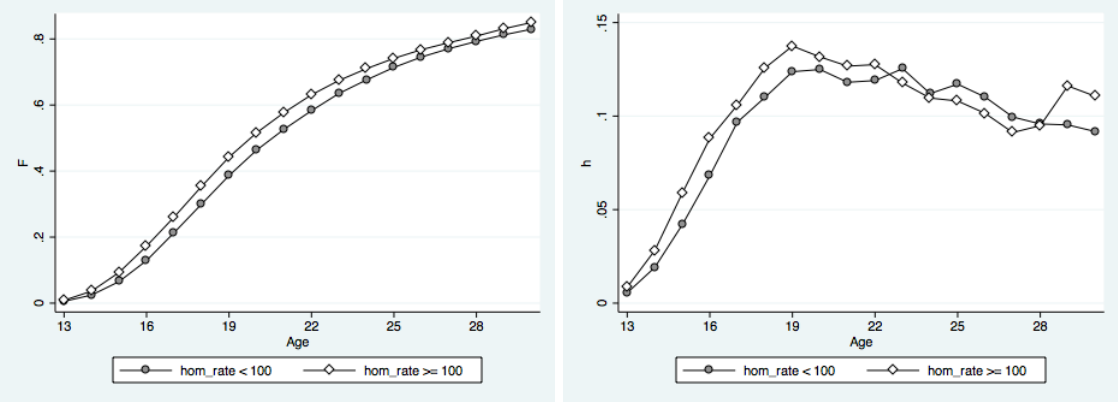
Figure 3: Fertility Decision Scheme



The figure shows the strategic game for a woman i who gets the couple j. The options are in circles, C for use of contraception and N when she decides not to use contraception. Without contraception she get pregnant and have a baby; if she uses contraception there are 2 possible states in period 2, either *keep* or *break* the link. There are 3 final states: In $V_{ij}(C)$ and $M_{ij}(N)$ she keeps the baby for couple j. In $V_{if}(C)$ she gets a baby for couple f who she does not know at period 1.

Figure 4: Discrete Survival Functions by Homicide Rate Category

(a) Probability of Failure $F(j) = 1 - P(T > j)$ (b) Age hazard rate $h(j) = P(j - 1 < T \leq j \mid T > j - 1)$



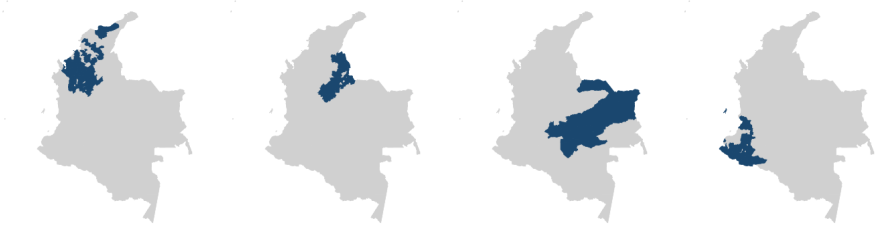
The survival is related with the event of being pregnant for the first time.

The estimation does not include individuals who migrate town at some point after turning 13 years old.

Figure 5: Municipalities in the Drug Traffic Network by Cluster

Only using the shortest route from each Municipality with Coca Fields

(a) Atlantic (b) Venezuela - Center (c) Venezuela - South (d) Atlantic



(e) Pacific