Family Feuds: The Effect of Income Shocks on Domestic Violence Against Women

AUTHOR: MARÍA PAULA MEDINA PULIDO

ADVISORS: STANISLAO MALDONADO & JUAN F. VARGAS

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María Paula Medina Pulido[†]

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Abstract

This paper studies the relationship between family income and domestic violence in a developing country. To do so, I focus on municipalities of Colombia with high levels of coffee production. Using negative shocks to coffee prices as an exogenous source of variation that impacts coffee-producing household income, I find that municipalities with more intensive coffee production experience an increase in domestic violence against women as a consequence of a negative income shock. In order to test the potential mechanisms, I estimate different heterogeneous effects that depict under which situations the shock intensifies. Using data at the individual level, I find analogous effects of a negative income shock for rural women who live in a municipality marked by intensive coffee production. Also, I find that a woman who has decision-making power within the household has a lower probability of being a victim of domestic violence when her household faced this type of shocks. This last result suggests that female empowerment is a mechanism to reduce violence targeted against women.

Keywords: domestic violence, income shocks, rural women, coffee production

JEL codes: D13, J12, J16, Q02

Disputas familiares: El efecto de choques al ingreso en la violencia doméstica contra las mujeres[1]

María Paula Medina Pulido[2]

Abstract

Este documento estudia la relación entre ingresos familiares y violencia doméstica en un país en desarrollo. Para ello, me enfoco en los municipios de Colombia con altos niveles de producción de café. Utilizando choques negativos en los precios del café como una fuente de variación exógena que afecta los ingresos de hogares cafeteros, encuentro que los municipios con producción intensiva de café experimentan un aumento en los casos de violencia doméstica contra la mujer como consecuencia de un choque negativo en sus ingresos. Para analizar los mecanismos de este choque, estimo diferentes efectos heterogéneos que describen bajo qué situaciones se intensifica el choque. Utilizando datos a nivel individual, encuentro que el efecto se mueve en la misma dirección para el caso de las mujeres rurales que viven en un municipio con producción intensiva de café. Además, encuentro que una mujer que tiene poder de decisión dentro del hogar tiene una menor probabilidad de ser víctima de violencia doméstica cuando su hogar se enfrenta a este tipo de choques. Este último resultado sugiere que el empoderamiento de la mujer es un factor relevante para reducir la violencia dirigida contra las mujeres.

Palabras clave: violencia doméstica, choques al ingreso, mujer rural, producción de café

Códigos JEL: D13, J12, J16, Q02

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[2]Facultad de Economía, Universidad del Rosario. email: mariap.medina@urosario.edu.co

1 Introduction

Violence against women is currently a topic of great relevance and global interest due to alarming rates and its strong implications for women's personal development. Women who are victims of violence are likely to be immersed in an environment of gender-based discrimination and social norms that, together with gender stereotypes, perpetuate and drive such violence.[1] Much of women's exposure to violence is caused by conflicts that arise with their intimate partners. According to the World Health Organization (WHO), approximately one in three women who have been in an intimate partner relationship report that they have experienced some form of physical and/or sexual violence by an intimate partner during their lifetime. Similarly, 38% of murder cases where the victim was a woman were committed by her partner (WHO, 2013). On the other hand, men can also be victims of domestic violence (Randle and Graham, 2011). However, research suggests that men are much less likely to be physically harmed by women and less likely to report any case of violence (WHO, 2010; Williams et al., 2008).

This unfavorable situation for women makes the study of the main determinants of the violence that they face relevant when designing policies that aim to eradicating this behavior. To understand these determinants, the most widely used model of violence against women is the ecological model, which proposes that violence is a result of factors operating at four levels: individual, intimate partner relationship, community, and societal (Heise, 1998; WHO, 2012). In order to characterize the environments and determinants that increase the probability of facing an act of domestic violence, I focus on the designated levels. First, in the interest of analyzing the case of a vulnerable population, I concentrate on rural households in a developing country. Rural households are characterized by living with reduced economic opportunities. Second, I analyze income shocks faced by these households over a certain period as one of the determinants of domestic violence. Third, I emphasize the possible heterogeneous effects that would occur in places with unfavorable labor conditions for women, and in households where women do not have decision-making power.

This paper focuses on Colombia, where the rate of domestic violence is one of the highest in Latin America.[2] Also, it focuses on income shocks faced by the Colombian coffee-producing population since coffee price fluctuations have a direct effect on the income of these households (FNC, 2014).[3] I examine the coffee sector since in Colombia, coffee cultivation is not confined to a particular region and approximately 58% of Colombian municipalities produce coffee (Ministry of Agriculture, 2007). In other words, Colombia has sufficient variation in coffee production levels across municipalities (See Figure 3, Appendix). As the labor force participation in the Colombian coffee sector is mainly supplied by men (Figure 2), I focus on the effect of an income shock faced more by men.

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[1] *UN Women.* Focusing on prevention to stop the violence. www.unwomen.org/en/what-we-do/ending-violence-against-women/prevention

[2] According to the Gender Equality Observatory of the Economic Commission for Latin America and the Caribbean, Colombia has the fifth highest number of femicides in the region, behind Honduras, Guatemala, the Dominican Republic, and El Salvador.

[3] The Colombian coffee-producing population is mostly poor, has become old, has few years of education, and moves in a predominantly informal labor market (Echavarría et al., 2015).

In my empirical strategy, I use coffee price shocks as an exogenous source of variation concerning household income in coffee-intensive areas.[4] I interact the internal coffee price with a coffee production variable in order to differentiate the effect of an income shock on domestic violence in households located in coffee producing municipalities of different production intensities. For robustness, I also estimate an Instrumental Variables approach in order to address the possible endogeneity of the internal coffee price paid to growers. Using this specification, I instrument the internal coffee price with the total coffee exports of the three worldwide coffee producers without Colombia. Moreover, taking advantage of two sources of domestic violence data, I analyze both municipality and individual- level cases. Using municipality-level data, I find that municipalities with more intensive coffee production experience an increase in domestic violence as a consequence of a decrease in the coffee price paid to growers. Using individual-level data, I find analogous effects of a negative income shock for rural women who live in a municipality marked by intensive coffee production.

What is the mechanism that causes household income to increase or decrease levels of domestic violence? I link the transmission channel with the direct effect that coffee price fluctuations have on household income in the case of coffee-producing households (FNC, 2014). On the one hand, a positive income shock could lead to favorable household conditions and, as a consequence, the likelihood of facing an act of domestic violence decreases (Abiona and Foureaux K., 2019; Cools et al., 2015; among others). On the other, if a positive income shock increases the within-household bargaining power of a woman, the incidence of domestic violence increase if her partner wants to maintain control over his household by inflicting violence (Bobonis et al., 2013; Flake and Forste, 2006; Heath, 2014). For the case of Colombia, Iregui et al. (2019) explore the role of women's labor income in domestic violence against rural women. They found that a higher women's income in rural areas in most economic activities decreases domestic violence. The latter suggests that labor income increases rural women bargaining power within the household and thus reduces violence. This paper contributes to this understanding finding the effect of shocks to household income on domestic violence against women in Colombia. My analysis differs from this paper because as I previously mentioned, I focus on the effect of an income shock faced predominantly by men since they represent over 80% of the coffee sector labor participation (See Table 2). In addition, using data at the individual level, my study also contributes to this understanding exploring how women can mitigate negative shocks to household income through bargaining power within the household.

In addition, this paper builds on the literature that provides evidence of the direct effect of income shocks on the incidence of domestic violence. The studies that analyze this relationship focus on two sources of household income variation: on the one hand, some authors explain how income shocks caused by climatic factors can have major implications on domestic violence. Cools et al. (2015) finds negative effects for drastic changes in rainfall levels on physical violence against women in Sub-Saharan Africa. Even though, rainfall shocks may be affecting other things, such as the routine or the mood of people. This means that interpreting

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[4]Hence, I use coffee price variations as a proxy for income shocks.

a rainfall shock effect solely as an income shock may generate some doubts. Through my empirical strategy, I seek to contribute to this literature by measuring a more direct income shock, the one that is caused by coffee price fluctuations for the case of coffee-producing households. Also, to the best of my knowledge, the literature that supports the relationship between unexpected income shocks and domestic violence is quite limited for developing countries. This paper contributes to these examinations by studying the case of Colombia in an attempt to characterize the mechanisms of the effect of an income shock produced by commodity price fluctuations on physical, sexual, and psychological domestic violence. Likewise, Cools et al. (2015) argues that intimate partner relationships are more likely to turn violent when a woman's relative economic power within her household is reduced. My results are consistent with this insight, measuring a woman's economic bargaining power with decision-making power within her household. I find that a woman who mainly decides household expenditure decisions has a lower probability of becoming a victim of domestic violence in the case of a negative income shock. The latter suggests that female empowerment is a mechanism to reduce violence perpetrated against women.

The other source of household income variation that is frequently mentioned in the literature, and that has larger implications for domestic violence, is the one that studies transfer programs granted by the government. Bobonis et al. (2013) find that, although women beneficiaries of the program *Oportunidades*[5] are less likely to be physically abused, they are more likely to receive violent threats without associated physical abuse. Hidrobo and Fernald (2013)[6] reinforce this finding and argue that the transfer effect depends not only on a woman's educational level but also on her education relative to that of her partner. The authors show that for women with levels of education above primary school, the cash transfer significantly decreases their exposure to psychological domestic violence. However, for women with primary school education or less, the cash transfer significantly increases the exposure to psychological domestic violence in households where the woman's educational level is equal to or higher than the educational level of her partner. For the Colombian case, Rodríguez (2015) finds that the rate of domestic violence at the municipality-level is reduced in those municipalities with a greater percentage of women who are beneficiaries of the program *Familias en Acción*. She argues that the magnitude of this effect varies across regions and poverty levels, evidence that the effect of a positive income shock may also depend on the context in which woman lives. This paper contributes to the literature in the latter since I analyze not only what characteristics increase the probability a woman will face an act of domestic violence, but also characterizing in which environments it is more likely to find greater rates of domestic violence. Also, I highlight the importance of women's bargaining power within the household to handle this issue.

Furthermore, this paper relates to a large body of literature that studies economic shocks as a determinant of internal conflict within a country (Dube and Vargas, 2013; Hull and Imai, 2013; Abidoye and Cali, 2015; McGuirk and Burke, 2016; among others). For instance, Dube and Vargas (2013) use the exogenous source that I employ to estimate the effect of commodity price shocks on Colombian armed conflict . This study

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[5]Conditional cash program implemented in Mexico.
[6]For this study, the cash transfer *Bono de Desarrollo Humano* implemented in Ecuador is analyzed.

contributes to the analysis of income shocks produced by commodity price fluctuations by focusing on their impact on domestic violence. Moreover, it has been documented that one of the determinants of domestic violence is prior exposure to conflict (La Mattina, 2017; Noe and Rieckmann, 2013; Calderón et al., 2011; Gallegos and Gutierrez, 2011). Calderón et al. (2011) links forced displacement, a consequence of internal conflict, with substantial income losses that affect women's bargaining power in their homes and the domestic violence they face. In my empirical strategy, I control for the presence of internal conflict since the previous literature identifies its important effects on domestic violence.

Regarding the contexts in which women live, gender-based inequality plays an important role in understanding the determinants of domestic violence. Some studies address the effect of the gender wage gap on domestic violence. Aizer (2010) find that reductions in the gender wage gap reduce domestic violence (a result consistent with a model of household negotiation). Also, introducing the concept of *sexism*[7] to this body of literature, Charles et al. (2018) show that in places where *sexism* prevails, women perform worse at work, and this causes a decrease in their wages as compared to men. Based on these findings, the literature demonstrates how domestic violence and women's labor participation depends on the characteristics of the environment in which women live. Accordingly, this paper has a special interest in analyzing the differential effect of income shocks in places where gender-based inequality prevails. I find that in the case of a negative income shock, municipalities in departments with higher rates of women's unemployment and lower women's income have more cases of domestic violence than municipalities in departments with lower women's unemployment rates and higher women's income. Therefore, I show that negative income shocks have a greater impact on domestic violence in an environment where women find less success in the labor market.

The remainder of the paper is structured as follows. In Section 2, I provide a brief description of the context of the study. Section 3 outlines the administrative data and that at the individual-level. Section 4 discusses the empirical strategy. Section 5 presents the principal results and heterogeneous effects, and Section 6 concludes.

2 Colombian Context

Women in Latin America have been subjected to various types of gender-based violence (Flake and Forste, 2006). In examining domestic violence, most countries share two characteristics: a legacy of social violence and rigid gender scripts linked to machismo (Flake and Forste, 2006). Machismo is the belief that women should be subordinate to the needs and desires of their male partners (Wilson, 2014). Analyzing the Colombian case, domestic activities are apportioned to women by more than 80% (ENDS, 2015). During the years 2005, 2010, and 2015 on average, activities like cleaning the bathroom, washing clothes and meal preparation were mostly attributed to women alone, with higher rates for rural women (Figure 1). Likewise

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[7] *Sexism definition: prejudice, stereotypes, or discrimination, typically against women (New Oxford American Dictionary); thought or practice that assumes the inferiority of women to men (The Oxford Companion to Philosophy).*

in 2015[8], 36% of women in rural households agreed that men have the last word on household decisions, compared to a 15% in urban households; 66% agreed with men being the household head compared to 42% in urban households. Regarding men in rural households, 57% agreed that true men can control their partners, and 79% believed that a good wife always obeys her spouse. In urban households, these percentages were 42 and 52, respectively (Table 3, Appendix).

Figure 1: Share of Household Chores
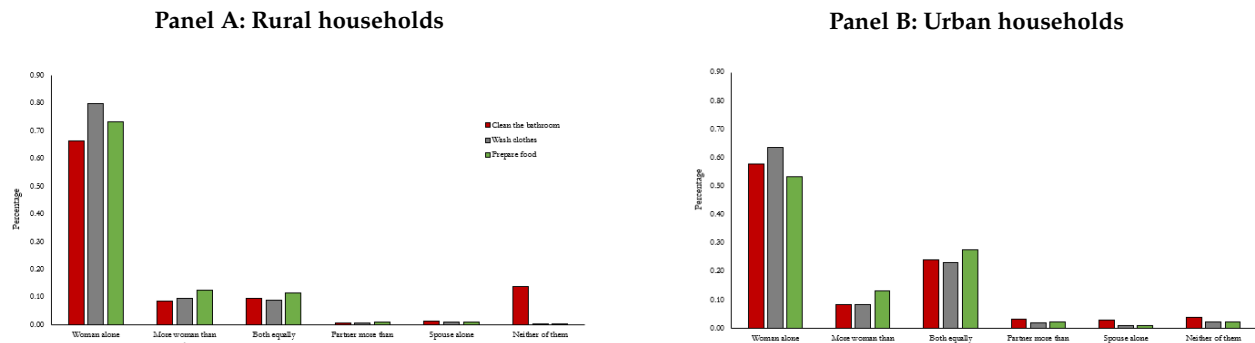
Panel A: Rural households   **Panel B: Urban households**

Source: Author's calculations using the domestic violence module from the 2005, 2010, and 2015 DHS surveys. Note: Description of the DHS data survey included in Section 3. The sum by colors for each panel adds to one.

The above illustrates that perceptions of gender roles in which women are undervalued are more concentrated in rural than in urban households. This situation could be explained by the difference in socioeconomic and educational characteristics of both types of households. On average, during the analyzed period, only 5% of rural women reported that their educational level was undergraduate (compared to 27% of urban women). Moreover, almost all rural women considered themselves poor (95%), in contrast with urban women, where this percentage falls to 23%.[9]

What about domestic violence rates? At the national level, Colombia presents high rates of domestic violence against women, with more than half of the cases committed by an intimate partner (ENDS, 2015). According to a 12-country study on Latin America and the Caribbean[10], Colombia is one of the three countries in the region with higher percentages of physical and sexual violence committed against women by an intimate partner (See Figure 4, Appendix). However, apart from violence caused by physical contact, there are more cases of psychological violence in Colombia that affect women's emotional stability and self-esteem (Table 1). This type of violence can cause long-term damage to a victim's mental health (Pico-Alfonso et al., 2006; Dutton et al., 2006), and is strongly related to the issues discussed at the beginning of this section: the undervaluation of women and their partners' need for control and superiority.

Other relevant characteristic for an analysis of domestic violence is women's labor participation. In the coffee sector during the period 2010–2017, on average 82% of the labor participation was supplied by men (Table 2). This leaves women with meager labor participation in the coffee sector compared with that for

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[8]The DHS survey has a Gender Roles Section available only from 2015.

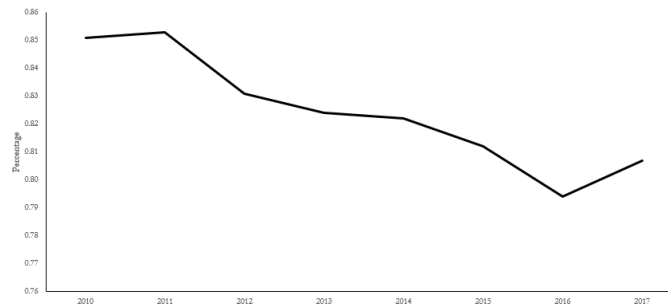[9]Source: Author's calculations based on 2005, 2010, and 2015 DHS surveys.

[10]*Pan American Health Organization, 2012.* Violence Against Women in Latin America and the Caribbean: A Comparative Analysis of Population-Based Data from 12 Countries.

Table 1: Share of Women Experiencing Any Type of Violence

	Physical violence		Sexual violence		Psychological violence	
	Rural	Urban	Rural	Urban	Rural	Urban
2005	0.324	0.305	0.091	0.079	0.644	0.627
2010	0.274	0.304	0.068	0.059	0.649	0.686
2015	0.270	0.275	0.055	0.050	0.570	0.606

Source: Author's calculations using the domestic violence module from the 2005, 2010, and 2015 DHS surveys. Note: Description of the DHS data included in Section 3. Each category represents the share of women that experienced the corresponding kind of violence. These classification are not exclusive and thus the sum of columns does not need to add up to one.

men, evidencing how an income shock caused by coffee price fluctuations would be faced more significantly by men. Also, in the coffee sector women receive a lower hourly wage than men (Figure 5, Appendix). This gender wage gap is statistically significant and cannot be explained by differences in education. According to the National Agricultural Census of 2014[11], on average, women and men who are head of household or partners of the head of household have very similar levels of education: 3.74 and 4.24 years for men and women, respectively. Based on the educational levels reported in Table 4 of the Appendix, the vast majority of the coffee producing population only achieve basic primary education (around 60%–65%), and a lack of education characterizes around 15%–16% of the population.

Figure 2: Coffee Sector Men's Labor Participation

Source: Author's calculations based on the rural component of GEIH.

Furthermore, among coffee producers, I demonstrate that men are heads of their household in most cases. The 78% of individuals who serve as head of household are men (See Figure 3, Panel A), and of all women who live in a coffee-producing household, only 16% of them are household heads (See Figure 3, Panel B). Therefore, I argue that in the vast majority of cases, men provide the household income (playing the role of household head) and this leaves them with greater household bargaining power.

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[11]National Census implemented by the *National Administrative Department of Statistics (DANE)*. This census had an operational coverage of 98.9%, covering 1,101 municipalities of Colombia.

Figure 3: Composition of Coffee Producing Households

Panel A: Household head by gender	Panel B: Household head category by gender
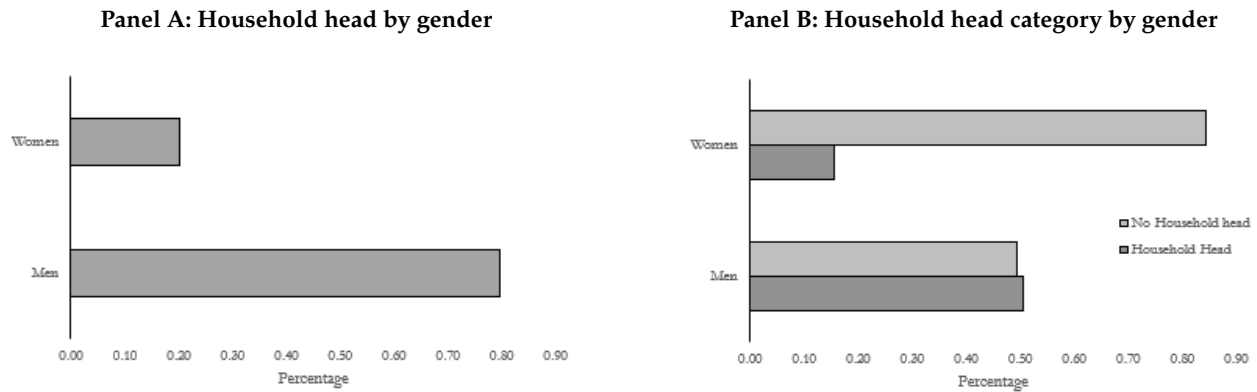
Source: Author's calculations based on the National Agricultural Census, 2014.

3 Data

The data on domestic violence that I use is divided between two principal databases: administrative data and individual-level data. The first is provided by the National Institute of Legal Medicine and Forensic Sciences (INMLCF) of Colombia, which records information about reported cases of domestic violence at the municipality-level. As this paper focuses primarily on rural areas[12] and coffee-producing municipalities, I eliminate from the analysis the 31 departmental[13] capitals and Bogotá, the capital city of Colombia.[14] I further restrict the sample to those municipalities that experienced any case of domestic violence in the period 2010–2017. The INMLCF databases document domestic violence against children and adolescents, the elderly, intimate partners, or other relatives. If a municipality does not report cases of any type of violence in the analyzed period, I excluded it from the final sample because the institute's coverage may not reach those municipalities. This ensures that women, the focus of the study, had somewhere to report a case of domestic violence. Following the latter criteria, I eliminate 25 municipalities, leaving a final sample of 1,065 municipalities per year.[15]

Based on my research questions, I work with reported cases of domestic violence against women committed by an intimate partner. Specifically, using administrative data, my dependent variable is the rate of domestic violence against women per 100,000 inhabitants at the municipality-level. Figures 1 and 2 in the Appendix show that domestic violence against women is present in all regions of Colombia. However, the departments of Vichada, Caquetá, Putumayo, La Guajira, and several from the Andean region have higher rates. Moreover, the maps clarify that the number of municipalities with higher rates of domestic violence was reduced by 41% between 2010 (See Figure 1, Appendix) and 2017 (See Figure 2, Appendix). In

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[12]On average, rural population in coffee-producing municipalities represents the 60% of the total population (author's calculations based on the CEDE panel).

[13]Colombia is divided into 32 departments and their respective municipalities. Each department has a capital city.

[14]The results are robust to the sample of municipalities including the departmental capitals. See Table 15 in the Appendix.

[15]Table 5 in the Appendix shows the 25 municipalities that have been excluded following this criteria. The results are robust to the sample of municipalities including those that do not experienced any case of domestic violence during the period 2010-2017 (See Table 16).

2010, 267 municipalities were in the category implying a high rate of domestic violence (this appears in red in the maps); in 2017 this number was reduced to 157.

Using administrative data leads to concerns of under-reporting because there may be cases in which a woman does not want to share her experience, and others in which a woman wants to report a case, but she has nowhere to go or she is not allowed to do so. To address these concerns and to be able to characterize the woman in my sample, I use in the second part of the methodology individual-level data on women provided by the Demographic and Health Survey (DHS) of Colombia. The DHS survey is representative at the national level and covers urban and rural areas in all regions and departments of Colombia. It has a specific module concerning domestic violence for the female population aged 15 to 49 years who are currently married or living in a consensual union. I use the domestic violence modules from 2010 and 2015 to create a cross-repeated panel at the individual-level in some of the years that are studied also in the analysis at the municipality-level. An important difference between the administrative and individual data is that the first one only reports cases of physical, and sexual violence. Therefore, using the DHS survey allows me to explore also the effect on psychological abuse.

As in the domestic violence module, all women have been interviewed in private[16], and several questions were posed to detect exposure to domestic violence, the use of data on individual women mitigates some of the under-reporting concerns for the following reasons.[17] First, the woman is able to report her domestic violence case using the survey. Second, it avoids the scenario in which a woman is unaware that her case is defined as domestic violence, and for that reason does not report it. However, an important disadvantage of the DHS survey is that it has low coverage at the municipality-level because the survey does not reach all Colombian municipalities. Specifically, the 2010, and 2015 surveys interviewed households in 258, and 295 municipalities, respectively. Thus, the cross-repeated panel that I construct using the DHS surveys of the previous year's results in a sample of 23,107 households. Of this total, 50.20% are in non-coffee producing municipalities and 49.80% in coffee producing municipalities.

For municipality-level data on coffee production and general characteristics, I use a municipal panel administered by the Center for Economic Development Studies (CEDE) at the Universidad de los Andes from Colombia. This panel compiles information about the area of coffee production, measured in thousands of hectares and provided by the Ministry of Agriculture of Colombia, and it includes numerous municipality-specific characteristics that I use as controls in my specifications. Likewise, to create income variations for coffee-producing households, I consider internal and international coffee prices administered by the National Federation of Coffee Growers (FNC) of Colombia and the International Coffee Organization (ICO). With these coffee time series, I create negative and positive coffee price shocks that cause sharp declines in income for coffee growers.[18] Figure 4 shows the evolution of the coffee price paid to growers (internal price) and the

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[16]Women who could not be interviewed in private were excluded from the domestic violence module.

[17]However, the literature also discussed that data from victims' surveys could lead to an underestimation of the prevalence of domestic violence, since it has self-reported information (Iregui et al., 2019; Aizer, 2010). Therefore, under-reporting concerns are still a limitation for my analysis.

[18]These shocks are explained in greater detail in Section 4.

Arabica coffee price (international price) between 1990 and 2017. As is highlighted in the figure, there have been two significant coffee price drops: one in 1997 and another in 2011. Indeed, the fall in coffee prices between 2011 and 2013, affected the income of thousands of coffee-growing families (FNC, 2014). Also, as the internal coffee price is a function of the international coffee price, Figure 4 illustrates how the internal price perfectly maps the international price. Lastly, the source for the total coffee exports of the three worldwide coffee producers without Colombia is also the ICO.

Figure 4: Colombian Coffee Prices in 2013 (Colombian pesos)
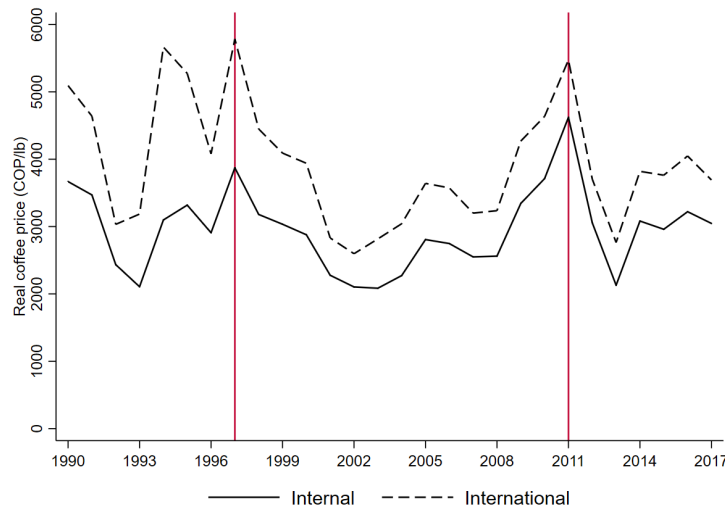
Source: Author's calculations based on ICO. Note: The graph depicts the series of coffee prices. Internal coffee prices refers to the price paid to coffee growers. International coffee price is the international market value for Arabic coffee. The time series has annual periodicity and prices reflects the mean value of the corresponding year.

When exploring some of the heterogeneous effects of my main results, I use the Colombian Great Integrated Household Survey (GEIH) carried out by the National Administrative Department of Statistics (DANE). The GEIH survey includes labor market data at the individual-level. From this survey, I use wage and general labor participation data to analyze the role of gender inequality in my main findings. As the GEIH is representative at the departmental-level, I create departmental indicators of the gender wage gap and women's labor participation fixed in 2010 values. The main goal of creating these indicators is to explore whether the effects I find are higher in places where women find less success in the labor market. I argue that municipalities located in departments where women find less success in the labor market experience worse effects of a negative income shock on domestic violence.

The final database using administrative data consists of a municipal panel between 2010 and 2017. The final database using individual-level data consists of a cross-repeated panel in the years 2010, and 2015. Table 1 in the Appendix shows some descriptive statistics from the two final databases.

4   Empirical Strategy

My empirical strategy uses shocks to the internal coffee price as an exogenous source of variation that impacts household income. Based on this, I focus on rural households that produce coffee intensively since they are the principal affected population. I estimate two principal specifications depending on the type of data used:

4.1   Municipality-Level

Using administrative data, my first specification estimates the following equation:

$$Y_{m,t} = \delta_m + \gamma_t + \beta(P_t * Q_m) + \rho \sum_{t=2010}^{2017} D_t * X_m + v_{m,t} \tag{1}$$

where δ_m are municipality fixed effects, γ_t are year fixed effects, P_t is the internal coffee price, and β measures the differential effect of coffee price shocks on domestic violence in coffee-intensive producers' municipalities. In the baseline analysis, Q_m is the coffee production average in the years 2007–2009[19], a period preceding the beginning of my analysis sample. I maintain production as fixed to alleviate potential concerns about a change in the coffee production area in response to the 2011 coffee price drop. For robustness checks, I also estimate specification (1) fixing coffee production at 1997[20] and 2010 levels (Table 17, Appendix). With these results, I discard that my results are driven by a specific yearly level of coffee production.

$Y_{m,t}$ represents domestic violence against women per 100,000 inhabitants. This $Y_{m,t}$ measurement controls for population size since it is expected that larger municipalities have more cases of domestic violence due to their higher population. Finally, ρ measures municipality differential trends across years parameterized with the control variables, X_m. In this vector, I include the total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development (See Appendix Section 7.1 for variables definition). The control variables are also fixed at values prior to the beginning of the analysis to avoid endogeneity concerns with the coffee price. A key point regarding specification (1), is that I am assuming that household choices do not influence world prices nor the determination of internal prices (Miller and Urdinola, 2010). Thus, in my model, coffee producers are price-takers.[21] [22]

In my baseline analysis, I use three different measurements of coffee price shocks. Model 1 estimates equation (1) with the natural log of the internal coffee price series. Model 2 measures P_t as the deviation of the coffee price from its trend component, and Model 3 measures P_t as a dummy variable equal to one in

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[19]I take the average production in the years 2007–2009 because before 2007 there is no available data for coffee production in the CEDE panel.

[20]Data on coffee production based on the 1997 coffee census that records the amount of land used for growing coffee in each municipality in 1997.

[21]The internal coffee price in Colombia is established by the FNC based on the following criteria: 1. market price of coffee in the New York Stock Exchange; 2. quality premium of Colombian coffee; 3. peso-dollar exchange rate and; 4. marketing costs and expenses.

[22]Following Miller and Urdinola (2010), Figure 6 in the Appendix, shows the internal coffee price and the difference in mean residual domestic violence rates (net of municipality fixed effects) between municipalities with above- and below-median coffee intensity. The figure exhibits a counter-cyclical pattern between domestic violence and coffee price.

two different scenarios. The first scenario represents a negative shock when the coffee price in year t is in the percentile 25 of its distribution; the second scenario involves a positive shock when the coffee price in year t is in the percentile 90 of its distribution.

In order to create the coffee price shocks in Models 2 and 3, I work with the internal coffee price time series during the period 1990–2017. For Model 2, the trend component of the coffee price series is obtained estimating a regression in which the time period is used as the explanatory variable that predicts the seasonally adjusted series of the coffee price. Then, the resulting regression equation represent the long-term trend of the coffee price (Siegel, 2017). For Model 3, I define a positive and a negative shock based on percentiles to compare the coffee price in period t with respect to its historical behavior. I tried to perform an equivalent analysis using the 10th and 90th percentiles for the negative and positive income shock measures. However, any value of the yearly coffee price during the period 2010–2017 was smaller than the 10th percentile of the coffee price time series during the period 1990-2017. Therefore, I created a negative shock dummy variable for prices below the 25th percentile.

The main identification risk with the previous approach is that unobserved municipality-level shocks in Colombia could impact the internal coffee price. Specifically, my identification would be threatened by within-municipality shocks that influence domestic violence as well as the internal coffee price (Bernstein et al., 2018). To address this possible concern:

1. I obtain the municipal share of coffee production over the total coffee production in Colombia. I find that no municipality within my sample has more than a 2.3% share of the total internal coffee production. However, for the robustness of my results and to ensure that no unobserved municipality characteristic impacts the internal coffee price imposition, I re-estimate my main specification, dropping those municipalities that constitute more than 1% of total coffee production (Bernstein et al., 2018). Table 18 in the Appendix shows that my results are maintained without the 13 dropped municipalities.

2. I estimate equation (1) with a modification in the interaction variable. I take the interaction between the international coffee price[23] and average coffee production between the years 2007–2009. I analyze this case because movements in the international coffee price are more plausibly exogenous to Colombia's production (Dube and Vargas, 2013).

3. I estimate an Instrumental Variables approach in order to address possible endogeneity of the internal coffee price paid to growers (Section 4.1.1).

4.1.1 Instrumental Variables Approach

Following Dube and Vargas (2013), I instrument the internal coffee price with the total coffee exports of the three principal coffee producers worldwide without Colombia (*CETOP3*).[24] My complete instrumental variable is an interaction between *CETOP3* and the coffee production average between 2007-2009.

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[23]International price of Colombian Milds (Arabica).
[24]The three principal coffee producers worldwide without Colombia are Brazil, Vietnam, and Indonesia.

I argue that my Instrumental Variables (IV) specification does not suffer from endogeneity because my instrument, $Z_{m,t}$, has no correlation with unobserved municipality level shocks that could possibly affect the incidence of domestic violence. Equation (2) shows the first stage and equation (3) the second stage of my IV specification:

$$P_t * Q_m = \delta_m + \gamma_t + \beta Z_{m,t} + \rho \sum_{t=2010}^{2017} D_t * X_m + e_{m,t} \tag{2}$$

$$Y_{m,t} = \delta_m + \gamma_t + \theta(\widehat{P_t * Q_m}) + \phi \sum_{t=2010}^{2017} D_t * X_m + v_{m,t} \tag{3}$$

For the $Z_{m,t}$ instrument to be a good instrument, it must be correlated with the endogenous variable (*relevance condition*) and not correlated with the error term of equation (1) (*exclusion restriction*). The *relevance condition* should be fulfilled since the number of exports from the major coffee producers reflect the current conditions of the coffee market, and are correlated with coffee prices.[25] Therefore, *CETOP3* is also correlated with the internal coffee price since the international coffee price is one of the factors that determine its imposition. Using the results of the IV first stage, I empirically demonstrate that the *relevance condition* is fulfilled in my model. Regarding the *exclusion restriction*, I argue that $Z_{m,t}$ is exogenous to unobserved municipality characteristics that affect domestic violence, since it involves production levels that are exogenous to Colombia.

4.2   Individual-Level

Using individual-level data, I measure women's exposure to domestic violence as a dummy variable equal to 1 if a woman suffers one of the following types of violence:

- Psychological violence: any type of involuntary isolation or coercive impediment employed by a woman's intimate partner that affects her emotional stability and self-esteem.

- Minor physical violence: any act committed by a woman's intimate partner that affects her physical stability with minor consequences as stipulated in the legal system.

- Serious physical violence: any act committed by a woman's intimate partner that affects her physical stability with serious consequences as stipulated in the legal system.

- Sexual violence: incidental sexual abuse and forced performance of sexual acts in order to obtain economic benefits for the benefit of a woman's intimate partner.[26]

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[25]In the classic supply and demand model, if the coffee supply increases or decreases and the demand remains constant, the price decreases or increases accordingly.

[26]I create all these variables with the questions that the DHS survey use to define psychological, physical and sexual violence (See Appendix 7.1 for a complete list of the questions used).

Analogous with the municipality-level analysis, I estimate the differential effect of an income shock in coffee-intensive producers' municipalities. As I integrate this methodology with data at the individual-level, the analysis focuses on women who live in coffee growing municipalities. Equation (4) captures the linear probability model (LPM) that I estimate using the binary domestic violence variable.

$$DV_{i,h,m,t} = \delta_m + \gamma_t + \beta(P_t * Q_m) + \rho_1 X_h + \rho_2 X_i + v_{m,t} \tag{4}$$

In equation (4), X_h is a vector of control variables at the household-level, including the number of family members within the household, and the age and level of education of the woman's intimate partner; X_i control for women's characteristics including age, level of education, and participation in household decisions (See Appendix Section 7.1 for a further definition of control variables); and δ_m, γ_t and β are defined identically to the municipality-level case.

To differentiate the effect of a coffee price shock on the households of rural and urban women, I estimate equation (4) for rural and urban sectors separately. The expected results of these two specifications are based on finding an effect only for rural households as they are the population affected by the shock. Likewise, I focus on women who are the head of household or the wife of the head of household[27] to validate the argument that intimate partner violence against women arises as a result of household tensions driven by changes in the total household income.

Additionally, I estimate a LPM instead of a logit or a probit model for the following reasons. First, LPM does not rely on any distribution assumption in the error term; and second, LPM performs better than probit models when handling a large number of fixed effects (Fajardo, 2017). I address some concerns of using a LPM estimating equation (4) with errors clustered at the municipality-level.

4.3 Heterogeneous Effects

In order to characterize the environment where the effect of a negative income shock is greatest and to analyze the importance of women's bargaining power in the home, I estimate variations to specifications (1) and (4) using triple interaction variables. Under these specifications, I interact the price and coffee production variables with a set of baseline indicators. Specifically, I interact the price and coffee production variables with:

1. **Gender wage gap:** dummy variable indicating whether a municipality is in a department where the gender wage gap is higher than the median of all Colombian departments. With this variable, I show whether shocks to coffee growers' income have a greater effect on the incidence of domestic violence in municipalities located in departments where gender-based inequality is greater.

2. **Women's unemployment rate and income:** dummy variables indicating whether a municipality is in

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[27]In the domestic violence module, a woman has one of the following relationships with the head of household: household head, wife, daughter, daughter-in-law, granddaughter, mother, mother-in-law, sister, niece, sister-in-law, other relative, house-reared, or tenant.

a department where the unemployment rate or labor income for women is higher or lower than the value of its median for all Colombian departments. With these variables, I explore the case of a woman who lives in a region where the labor conditions for women (participation and income) are worse than the median case. Then, I analyze if women's labor conditions are causes and/or consequences of being victims of domestic violence.

3. **Women's household expenditure decision:** dummy variable at the individual-level, indicating whether a woman mainly decides household expenditures. With this variable, I test whether bargaining power in the household makes women less likely to be victims of domestic violence.

To analyze the heterogeneous effects previously mentioned, I estimate equations (5) and (6),[28] where H represents each of the variables described in points 1, 2, and 3, individually. For the case of variables 1 and 2, I work with heterogeneous effects at the departmental-level estimating equation (5). Then, in equation (5) the j subscript represents the department. For the case of variable 3, I estimate heterogeneous effects at the individual-level using equation (6).

$$Y_{m,j,t} = \delta_m + \gamma_t + \beta_1(P_t * Q_m * \mathbf{H_j}) + \beta_2(P_t * Q_m) + \rho_1(P_t * \mathbf{H_j}) + \rho_2 \sum_{t=2010}^{2017} D_t * X_m + v_{m,t} \tag{5}$$

$$DV_{i,h,m,t} = \delta_m + \gamma_t + \beta_1(P_t * Q_m * \mathbf{H_i}) + \beta_2(P_t * Q_m) + \rho_1(P_t * \mathbf{H_i}) + \rho_1 X_h + \rho_2 X_i + v_{m,t} \tag{6}$$

5 Results

5.1 Municipality-Level Analysis

According to the results of specification (1) (Table 2), income shocks have a negative relationship with domestic violence. When the coffee price increases, the rate of domestic violence against women decreases differentially in coffee-intensive producers' municipalities. For the average municipality, in which coffee production is 0.676 thousands of hectares, a 1% increase in the internal coffee price is associated with a decrease of 0.026 cases of domestic violence per 100,000 inhabitants. For the average coffee producing municipality, in which coffee production is 1.213 thousands of hectares, the effect is approximately twice as big: a decrease of 0.047 cases per 100,000 inhabitants. Now, consider the fall in coffee prices from 2011 to 2013, when the internal coffee price fell by 0.77 log points.[29] The rise in domestic violence for the average coffee municipality associated with this fall in coffee prices, was about 1.218 more reported cases of domestic violence each year, relative to the non-coffee producers' municipalities. The latter means an increase of 1.8% in reported cases of domestic violence against women with respect to the average domestic violence level.[30] The magnitude and statistical significance of the analyzed effect are stable with and without control

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[28]For equation (5), I use administrative data. For equation (6), I use individual data.
[29]The fall in coffee prices was about the 9.18%.
[30]The mean rate of domestic violence against women per 100,000 inhabitants for the coffee producers' municipalities is 67.577.

variables (column 1 and column 2, respectively).

My results are consistent with those found in Iregui et al. (2019) in that a positive income variation reduces domestic violence in coffee-producing municipalities. However, when I estimate the effect of a 60% increase in income following their analysis, I find a greater reduction in domestic violence than the one they found (a 32% decrease vs a 41% decrease). This difference could be driven by the labor participation in the coffee sector. As this sector is dominated by men, focusing on the effect of women's labor income alone may be underestimating the real effect of an income variation within the household since women represent less than 20% of the labor participation in this sector. Although, my results also represent an underestimation of the real effect due to under-reporting, and self-reporting concerns.[31]

Table 2: Baseline Results

Variables	(1) Domestic violence against women x 100,000h	(2) Domestic violence against women x 100,000h
Model 1 (baseline case)		
Internal coffee price*Mean production 2007–2009	-3.390***	-3.915***
	(1.301)	(1.394)
Mean outcome	50.691	51.005
SD outcome	67.832	67.913
Observations	8,520	8,416
Number of municipalities	1,065	1,052
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: Domestic violence against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. Internal coffee price is the yearly mean coffee price paid to coffee growers. In column 2, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Furthermore, when analyzing the effects of the two income shock measures proposed in Section 4, I find also a negative relationship between income shocks and domestic violence. According to these results, the difference in reported cases of domestic violence against women between periods of positive and negative shocks to the internal coffee price widens as coffee production increases. In the case of a negative shock, there are more cases of domestic violence relative to the case of a positive shock (Table 3, columns 1 and 2).[32] Likewise, in the case of a positive shock, reported cases of domestic violence are less than in the case of a negative shock (Table 3, columns 5 and 6).

As discussed in Section 4, to alleviate concerns about possible endogeneity in the internal coffee price, I estimate two additional specifications that reinforce the results of the baseline analysis. First, I estimate

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[31]Iregui et al. (2019) used administrative data from women's medical records of suspected domestic violence, eliminating the bias of self-reported cases.

[32]As for the second measure of negative income shock (Table 3, columns 3 and 4), the coefficient is not statistically significant, I ignore its magnitude and direction.

equation (1) using the interaction between the international coffee price and average coffee production between the years 2007–2009. The result with this modification have a similar magnitude (β = -4.3) as the one of the baseline case, as well as its statistical significance (Table 6, Appendix). Second, I estimate equation (3) using a 2SLS approach. According to the results of the first stage (Table 7, Appendix), I find that the relevance condition is fulfilled in my model because the instrument has a statistically significant effect on the instrumented variable and the Kleibergen-Paap F-statistic exceeds the Stock-Yogo critical values. Based on the results of the second stage (Table 4), I find that an increase in the internal coffee price decreases the rate of domestic violence in those municipalities that produce more coffee. Hence, using administrative data at the municipality-level, I show that variations in coffee price have a statistically-significant effect on domestic violence and that this effect is robust to different specifications. I argue that the effect is small in magnitude because my results represent an underestimation due to under-reporting cases. Then, I find at least a lower bound of the real effect.

Table 3: Baseline Results Differentiated by Type of Shock

Variables	DV against women X 100,000h					
	(1)	(2)	(3)	(4)	(5)	(6)
Model 2						
Negative shock dummy*Mean production 2007–2009	1.186**	1.554***				
	(0.491)	(0.529)				
Model 3						
Shock percentile 25*Mean production 2007–2009			-0.016	-0.102		
			(0.653)	(0.681)		
Shock percentile 90*Mean production 2007–2009					-2.795***	-3.201***
					(0.719)	(0.782)
Observations	8,520	8,416	8,520	8,416	8,520	8,416
Number of municipalities	1,065	1,052	1,065	1,052	1,065	1,052
Cluster	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mun FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Notes: DV against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. Negative shock dummy measures P_t as the deviation of the coffee price from its trend component. Shock percentile 25 represents a negative shock when P_t lays in the percentile 25 of its distribution during the period 1990-2017. Shock percentile 90 represents a positive shock when P_t lays in the percentile 90 of its distribution during the period 1990-2017. In columns 2, 4, and 6, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

To understand the mechanisms by which coffee price variation affects domestic violence, via income, I estimate the correlation between the wage of people working in the coffee sector and the price of coffee. Table 9 in the Appendix shows that a percentage increase in the internal coffee price raises the real wage of coffee producers in coffee-intensive municipalities. This positive correlation demonstrates that the income of coffee-producing households is affected by variations in the price of the good that they produce. Thus, when facing a positive shock to the internal coffee price, the wages of coffee producers increase. This wage growth produces an increase in their total income as well. And, given an increase in the total income of

coffee sector workers (a sector in which almost all workers are men as shown in Table 2), tensions in their households could be reduced as a consequence of less economic instability. I build this finding on the current literature as it has been shown that having insufficient income to meet the needs of one's family is stressful, and stress is thought to influence the degree of domestic violence (Haushofer and Shapiro, 2013; Cools et al., 2015). Further, according to one of the most popular sociological theories of domestic violence, the resource theory, men with few other resources (in this case, lower income) may use violence to maintain dominance within the family (Goode, 1971; Vyas and Watts, 2009).

5.2 Individual-Level Analysis

To explore the importance of rural women's characteristics on driving the income shock effects that I find, and to analyze my main argument using data with less under-reporting concerns, I discuss the results at the individual-level in this Section. According to the LPM results of specification (4), I find that an increase in the internal coffee price decreases the probability of a woman becoming a victim of domestic violence if she lives in a rural coffee-intensive producing municipality. The results of the main specification are mainly driven by psychological abuse (See Figure 7, Appendix). This suggest that negative income shocks mostly affect women's emotional stability for the group of women between 15 and 49 years old.

As for the municipality-level analysis, I also estimate equation (4) using a 2SLS approach.[33] Table 5 shows that the magnitude of the effects are similar for both specifications. Moreover, when I estimate the effect for the municipalities in the urban regions of Colombia, I find a non-statistically significant relationship between coffee price shocks and domestic violence.[34] This last finding strengthens my argument, as I find that the households affected by coffee price shocks are those more closely related to the rural coffee sector.

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[33]I instrument the internal coffee price with *CETOP3*, as in the municipality-level analysis.

[34]There are women living in the urban sector, and also living in a coffee-producing municipality. For example in municipalities like: Ocaña, Acevedo, Calarcá, among others.

Table 4: IV Estimates

Variables	(1) Domestic violence against women x 100,000h	(2) Domestic violence against women x 100,000h
Internal coffee price*Mean production 2007–2009	-9.451***	-11.588***
	(1.989)	(2.132)
Observations	8,520	8,416
Number of municipalities	1,065	1,052
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: DV against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. The interaction of the internal coffee price with coffee intensity is instrumented by the interaction of the coffee export volume of Brazil, Vietnam, and Indonesia with the coffee production average in the years 2007-2009. In column 2, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Attempting to characterize the profile of women who are more likely to be victims of domestic violence, I find that women who have a husband with secondary or lower education are more likely to be subjected to domestic violence than women whose husbands have a tertiary level of education (the base group of the categorical education variable).[35] Also, women who have a younger husband (between 20 and 29 years old) have a higher probability of being victims of domestic violence relative to women with older husbands. Therefore, the most vulnerable rural women are those who have a less educated and younger husband. Regarding women's levels of education, I find that there are non-statistically significant differences in terms of domestic violence between less or more educated rural women.

Finally, I explore the role of women's empowerment, analyzing the relationship between domestic violence and a woman's decision-making power within the household. The measure of decision-making power that I use is a dummy variable equal to one if a woman participates often in household decisions as large household purchases, purchases for daily needs, and her own health care expenses.[36] I find a negative statistical significance effect of decision-making power on the probability of being a victim of domestic violence. As a result, I find that women's empowerment is a relevant factor when analyzing women's exposure to domestic violence. A potential problem with including women's decision-making power in my

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[35]See Table 10 in the Appendix for a complete version of Table 5. This version has all the control variables interpreted in Section 5.2.

[36]In this specification, women's participation in household expenditure decisions is a dummy variable equal to 1 if the woman **participates** in household decisions as large household purchases, purchases for daily needs, and her own health care expenses. Specifically, the dummy variable equals 1 if the woman answers "respondent alone, respondent and husband/partner, respondent and other person" to the following questions: Who usually decides on large household purchases? Who usually decides on household purchases for daily needs? Who usually decides on your health care?

Table 5: LPM Results at the Individual-Level

	LPM				IV estimates	
	Urban population		*Rural population*			
	Mean Production 2007–2009					
Variables	(1) DV	(2) DV	(3) DV	(4) DV	(5) DV	(6) DV
Internal price*Production	-0.027	-0.025	-0.062*	-0.068**	-0.082**	-0.088**
	(0.060)	(0.058)	(0.036)	(0.035)	(0.041)	(0.040)
Observations	9,144	9,144	8,889	8,889	8,889	8,889
Number of municipalities	329	329	329	329	329	329
HH or partner	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes
HH or partner	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap F					428.726	429.550
Montiel-Pflueger F					412.921	413.692

Notes: Columns 1-4 are the results of the LPM, and columns 5-6 the results of the 2SLS approach. DV is a dummy variable indicating if a woman suffers psychological, physical, or sexual violence. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. Internal coffee price is the yearly mean coffee price paid to coffee growers. In columns 2, 4, and 6, I control by individual and household characteristics, and by population (urban or rural depending on the case). All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses. See the complete version of this table in Table 10, Appendix.

specification is the existence of associated shocks with the coffee price disturbances that makes women's wages rise. This leads to a possible increase in decision-making power over household expenditures. To test for the existence of different shocks that could potentially influence female employment and/or women's income is out of the scope of this paper. However, in Section 5.4, I explore the relationship between coffee price shocks and female employment.

5.3 Heterogeneous effects

Considering the big picture of the effects of income shocks on domestic violence for coffee producers' municipalities and individual rural women, I explore the different heterogeneous effects of my main findings in order to characterize the environments where the income shocks more greatly affect domestic violence. One key point to highlight, is that the results of this section are suggestive and I do not claim that these represent a causal effect.

Municipality-Level

Based on the heterogeneous effects at the municipality-level (Table 11, Appendix), I show that in the case of a positive income shock, there are higher rates of domestic violence in municipalities within departments where the female unemployment rate is higher than the value of its median, compared to those municipalities within departments where the female unemployment rate is lower (column 1). According to this last finding, the reported cases of domestic violence are greater in regions where women have less success in the labor

market. Similarly, municipalities in departments where women have a lower income than the median income they receive on average, perceive a higher rate of domestic violence than in the opposite case (column 2). This finding suggests that women located in regions with lower incomes, who are more likely to have reduced household bargaining power, are more vulnerable to be victims of domestic violence. Moreover, based on the positive sign of the gender wage gap[37] coefficient (column 3), I argue that when women begin to earn more and the gender wage gap begins to narrow, the rate of domestic violence increases (Eswaran and Malhotra, 2011; Heath, 2014; Abramsky et al., 2019). However, this last result is non-statistically significant in my model.

An additional heterogeneous effect that I employ using municipality-level data, is the interaction between the main regressor and an index of rurality within each municipality.[38] The results of this specification (Table 12, Appendix) show that the main effect is driven by rural municipalities. Henceforth, coffee-producing municipalities that are mostly rural are those principal affected by a negative shock to coffee prices.

Individual-Level

For the heterogeneous effect at the individual-level, I define women's autonomy in household expenditure decisions as a dummy variable that indicates if a woman **mainly decides** large household purchases, purchases for daily needs, her own health care expenses, and how to spend her earnings.[39] The triple interaction between internal coffee price, average coffee production, and the dummy variable previously described, shows that when facing a positive income shock, a woman who has decision-making power in her household has a lower probability of being a victim of domestic violence relative to a woman who has no decision-making power within the household (Table 13, Appendix). In this specification, the interaction variable between the internal coffee price and average coffee production is no longer statistically significant. This fact shows that the decrease in the probability of domestic violence due to a positive income shock is driven by women's empowerment. My results are consistent with those found in Cools et al. (2015) since they suggests that intimate partner relationships are more likely to turn violent when a woman's relative economic power within her household is reduced. Given these points, the results at the individual-level suggests also that women's empowerment is a relevant factor that reduces women's exposure to domestic violence.

Additionally, analyzing the heterogeneity of the effect by age (See Figure 5), it is clearly that women in the second quartile of the age distribution (26 to 33 years) are the ones that experience a lower probability of becoming a victim of domestic violence when there is a positive income shock.[40] The probability of becoming a victim of domestic violence decreases also for women in the third quartile but this effect is non-statistically

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[37]According to the definition of the gender wage gap, an increase illustrates that the average labor income of women is higher than the average labor income of men.

[38]The rural index is measured as the share of rural population over the total population in each municipality.

[39]Specifically, the dummy variable equals 1 if the woman answers "respondent alone" to the following questions: Who usually decides on large household purchases? Who usually decides on household purchases for daily needs? Who usually decides on respondent's health care? Who usually decides how to spend respondent's earnings?

[40]The 25th percentile of the age distribution in the sample is 25, the median is 33, and the 75th percentile is 41.

significant. For women in the bottom and fourth quartile, the likelihood increases with a positive income shock but these effects are also non-statistically significant. Therefore, I evidence that the mean statistically significant effect for the total sample is driven by the women in the second quartile of the age distribution. These women represent the 24.55% of the total sample.

Regarding household characteristics, households that have a male head of household are those that perceive a decrease in domestic violence as a consequence of a positive shock to coffee prices (See Figure 8, Appendix).

Figure 5: Individual-Level Income Shock Effect by Age Group
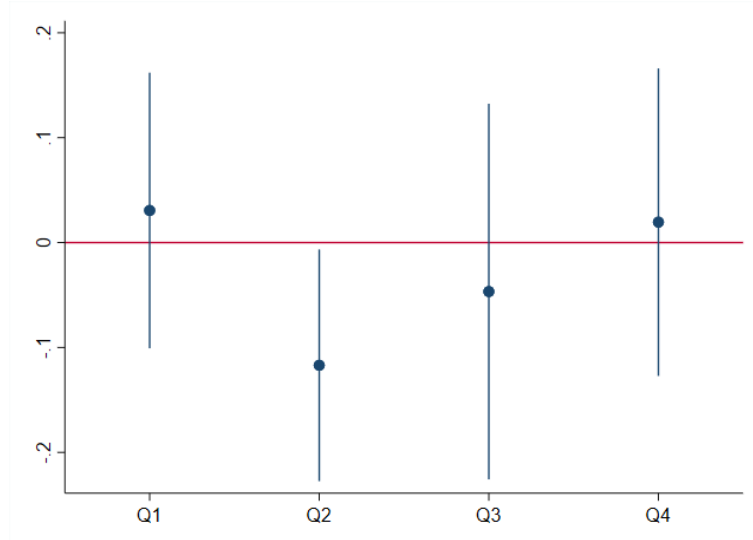
The Figure depicts the coefficient β when estimating equation (4). The regression is estimated separately for each age group. The coefficient for the second quartile is statistically significant at 5% level. All regressions have municipality and year fixed effects.

5.4 Female Employment Mechanism

One possible mechanism to explain the decrease in domestic violence as a consequence of a positive income shock is women's employment status. To explore this mechanism, I estimate equation (7).

$$Women's Employment_{i,h,m,t} = \delta_m + \gamma_t + \beta(P_t * Q_m) + \rho_1 X_h + \rho_2 X_i + \upsilon_{m,t} \qquad (7)$$

First, I analyze the effect of a positive shock to coffee prices on whether women are employed. Specifically, the *Women's Employment* dummy variable in equation (7) indicates if women have an active labor relation of any kind, regardless of the labor sector. This naive specification does not find a strong statistical relation between employment and a positive shock to coffee prices. Second, I focus the analysis on the agricultural sector, i.e., the *Women's Employment* dummy variable now indicates whether women work in the agricultural sector. For the entire sample, I do not find an effect of a positive income shock on women's employment in agriculture. However, following my previous findings in Section 5.3, I decompose the positive shock to coffee prices into age quartiles. I find that there is a strong positive effect of a coffee price shock for women

in the second quartile of the age distribution (See Figure 6). Thus, a positive income shock measured as an increase in coffee prices, increases the probability of women between age 26 and 33 to be employed when they live in a coffee-intensive producer municipality. This result is consistent with my findings in Section 5.3 since women in the same age group are the ones that face a lower probability of being victims of domestic violence when there is a positive shock to coffee prices. This suggests that employed women are likely to have a higher bargaining power within the household and thus face lower probabilities of being victims of domestic violence.

Figure 6: Individual-Level Income Shock Effect on Female Employment by Age Group

The Figure depicts the coefficient β when estimating equation (7). The regression is estimated separately for each age group. The coefficient for the second quartile is statistically significant at 10% level. All regressions have municipality and year fixed effects.
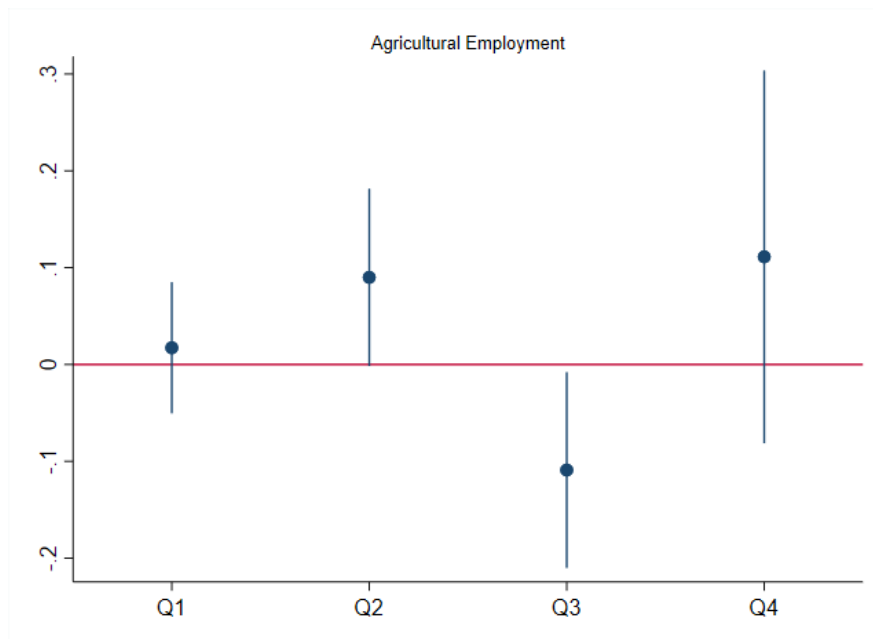
6 Conclusions

Income shocks have greater implications for the incidence of domestic violence. In both municipality and individual level analysis, this paper finds that a negative coffee price shock increases the level of domestic violence against women in Colombian coffee-producing municipalities. I show that this increase is driven by rural municipalities who are principal affected by the income shock. Suggestive results show also that the main effect is worse in an environment of less women's success in the labor market, and in households where women have no decision-making power. For the coffee sector, I show that rural women have very low labor participation, and their wages are significantly lower than the wages that men receive. This leaves women little bargaining power within their households and makes them more vulnerable to becoming victims of domestic violence. Therefore, the generation of rural employment seems crucial for rural women.

Employment opportunities for rural women would help to improve women's labor conditions, and the

role they have in their household. Within agriculture, most rural women live with norms that define them primarily as wives and mothers, focused on domestic activities, where men do less than their fair share of household chores (Fox et al., 2018). It is important to continue abolishing these gendered activities, especially in rural areas where, in most cases, women are subordinate to the needs and desires of their male partners. For instance, this paper shows that the group of rural women who perceive a lower probability of being victims of domestic violence are also the ones who increase their labor participation in the agricultural sector after a positive shock to coffee prices. Thus, programs that aim to reallocate basic duties like household chores could create the possibility for women to use their time in productive jobs that make them feel more profitable and empowered.

My analysis suggests that psychological violence is just as important to analyze in a context of violence against women as other types of violence. Based on the results found at the individual level, I demonstrate how negative income shocks primarily affect psychological violence. For this reason, it is important to create more opportunities for women to report any psychological abuse they receive. In Colombia, the women's help line, or "Línea 155", is a great example of this type of opportunities where abused women receive an appropriate counseling. To make the Colombian population aware of this line should be a central objective in terms of gender violence.

Generally speaking, public investments in rural education is also a relevant public policy. Educated women have better economic opportunities.[41] A woman with a formal job is much more likely to control her income. On the contrary, a woman with an informal labor contract earns a lower income, mainly in cash, and is likely to loose control over it to her husband. Hence, in terms of policy implications, this paper is in line with the claims made in Fox et al. (2018). In a developing country like Colombia, *rural women's rights - to land and property, to public services, to fair and decent treatment at work, to protection from violence - need strengthening. All these rights support women in rural areas, and when they seek to leave rural areas, as migrants*.

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[41]UNWOMEN, 2018. Photo essay: Rural women, human rights. https://www.unwomen.org/en/digital-library/multimedia/2018/2/photo-rural-women-human-rights

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26

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7 Appendix

7.1 Variables definition

7.1.1 Municipal characteristics (CEDE panel)

- *Total attacks by armed groups:* number of attacks against the civil population committed by the FARC, ELN, AUC, or an unknown actor within a municipality. This variable is constructed using data from the National Police of Colombia.

- *Number of homicides:* total number of homicides within a municipality. This variable is constructed using data from the Ministry of Defense from Colombia.

- *Total investment in education:* total investment in education coverage and quality, efficiency in the administration of education services, special education needs, boarding schools, and other education expenses not included in the above categories. This variable is provided by the National Planning Department (DNP) of Colombia.

- *Index of municipal development:* rating based on social and financial variables of the municipality. This index is provided by the National Planning Department (DNP) of Colombia.

7.1.2 Women's characteristics (DHS survey)

- *Women's participation in household expenditure decisions:* dummy variable equal to 1 if the woman participates in household decisions as large household purchases, purchases for daily needs, and her own health care expenses. Specifically, the dummy variable equals 1 if the woman answers "respondent alone, respondent and husband/partner, respondent and other person" to the following questions: *Who usually decides on large household purchases? Who usually decides on household purchases for daily needs? Who usually decides on respondent's health care?*

- *Women's autonomy in household expenditure decisions:* dummy variable equal to 1 if the woman mainly decides large household purchases, purchases for daily needs, and her own health care expenses. Specifically, the dummy variable equals 1 if the woman answers "respondent alone" to the following questions: *Who usually decides on large household purchases? Who usually decides on household purchases for daily needs? Who usually decides on respondent's health care? Who usually decides how to spend respondent's earnings?*

- *Women's levels of education:* 1. Primary education or less; 2. Secondary education; 3. Higher education.

- *Education of women's intimate partner:* 1. Primary education or less; 2. Secondary education; 3. Higher education; 4. Woman does not know her partner's level of education.

- *Family members:* number of family members within a household.

- **Questions used for the definition of domestic violence variables:**

  - *Psychological violence*

    * Husband/partner jealous if respondent talks with other men?

    * Husband/partner accuses respondent of unfaithfulness?

    * Husband/partner does not permit respondent to meet female friends?

    * Husband/partner tries to limit respondent's contact with family?

    * Husband/partner insists on knowing where respondent is?

    * Husband/partner does not trust respondent with money?

    * Husband/partner ignores/do not address respondent?

    * Husband/partner has not request opinion for family/social gatherings?

    * Husband/partner hast not request opinion on important family matters?

    * Husband/partner ever insulted or made feel bad respondent?

    * Husband/partner has threaten to leave respondent?

    * Husband/partner has threaten to take away children?

  - *Minor physical violence*

    * Ever been pushed, shook or had something thrown by husband/partner?

    * Ever been slapped by husband/partner?

    * Ever been punched with fist or hit by something harmful by husband/partner?

    * Ever been kicked or dragged by husband/partner?

  - *Serious physical violence*

    * Ever been strangled or burnt by husband/partner?

    * Ever been threatened with knife/gun or other weapon by husband/partner?

    * Ever been attacked with knife/gun or other weapon by husband/partner?

  - *Sexual violence*

    * Ever been physically forced into unwanted sex by husband/partner?

7.2 Additional Figures and Tables

Figure 1: Reported Cases of Domestic Violence Against Women per 100,000 Inhabitants in 2010
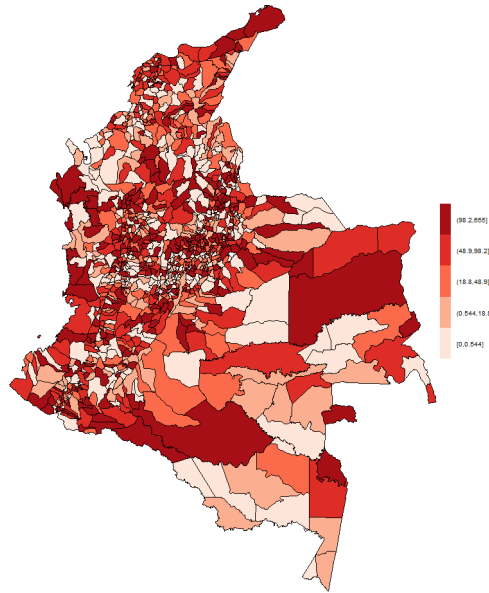
Source: Author's calculation based on the data from INMLCF. The figure depicts the municipalities from Colombia classified by the quintile they belong in terms of domestic violence per 1 hundred thousand inhabitants. The missing are interpreted as 0 cases but excluded when the quintiles are calculated. Then they are added to the first quintile. The number of municipalities that report cases of domestic violence is 1,043.

Figure 2: Reported Cases of Domestic Violence Against Women per 100,000 Inhabitants in 2017
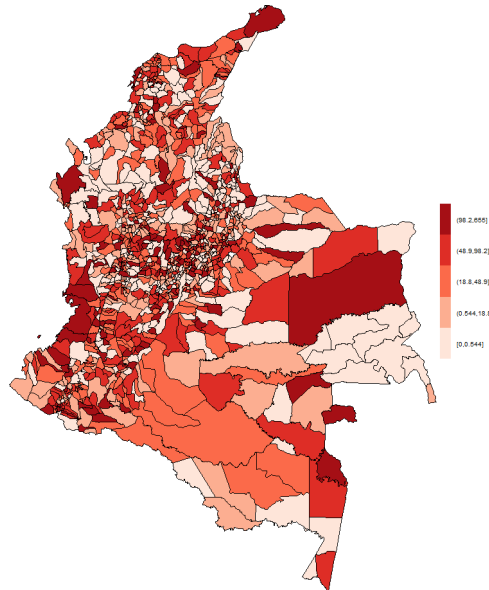
Source: Author's calculation based on the data from INMLCF. The figure depicts the municipalities from Colombia classified by the quintile they belong in terms of domestic violence per 1 hundred thousand inhabitants. The missing are interpreted as 0 cases but excluded when the quintiles are calculated. Then they are added to the first quintile. The number of municipalities that report cases of domestic violence is 1,013.

Figure 3: Mean coffee production between 2007-2009 (hectares)
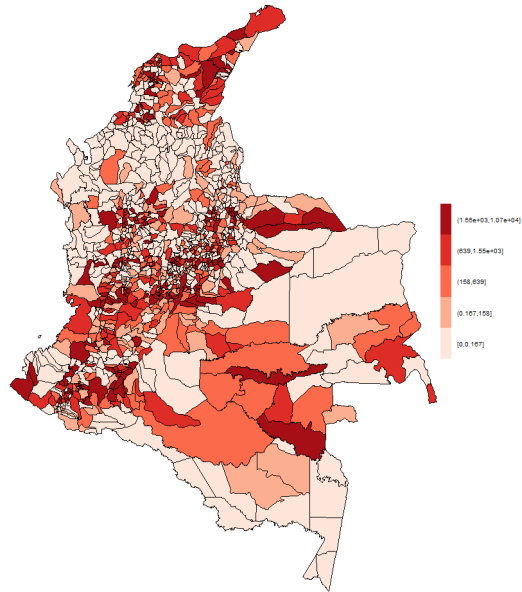
Source: Author's calculation based on the data from CEDE panel. The figure depicts the municipalities from Colombia classified by the quintile they belong in terms of mean coffee production during the period 2007-2009. The non-coffee producing municipalities are interpreted as 0 production but excluded when the quintiles are calculated. Then they are added to the first quintile. The number of municipalities that produce coffee is 614.

Figure 4: Domestic Violence Against Women in Latin America
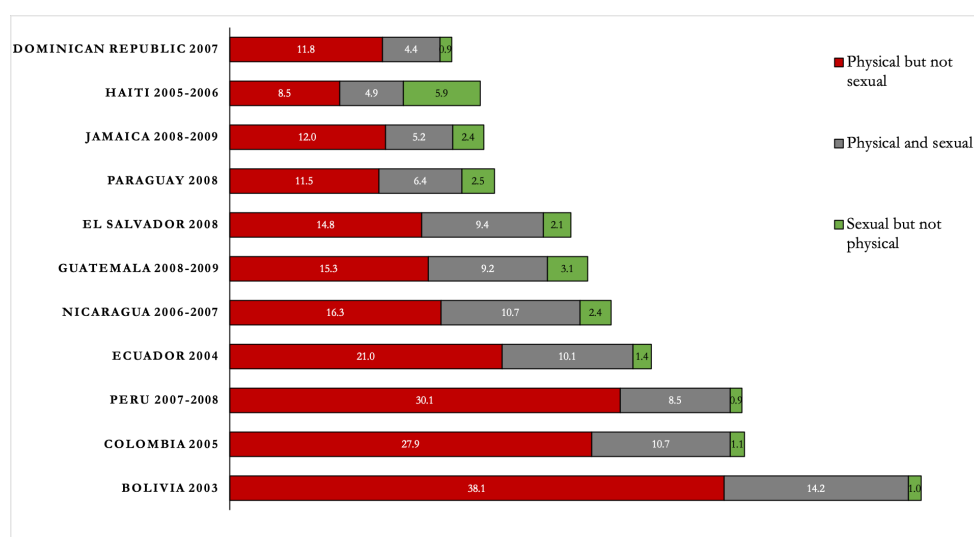
Source: Pan American Health Organization, 2012. Violence Against Women in Latin America and the Caribbean: A Comparative Analysis of Population-Based Data from 12 Countries.

Notes: The Figure depicts the percentage of women who reported some sort of domestic violence divided into three categories. Physical but not sexual violence by intimate partner, both physical and sexual violence by intimate partner and sexual but not physical violence by intimate partner. The sample consists of women who have ever been married or lived in union between the ages of 15 ans 49.

Figure 5: Mean Hourly Wage by Gender - Coffee Sector
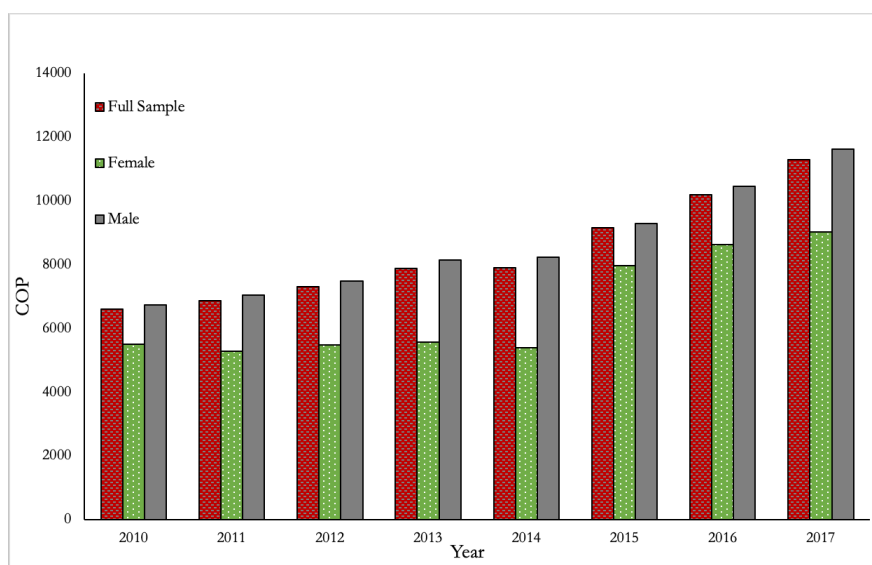
Source: Author's calculations based on the Rural component of GEIH.

Notes: Wages are at current Colombian pesos.

Figure 6: Coffee price and domestic

Notes: Difference between municipalities with above- and below-median coffee cultivation.

Table 1: Descriptive Statistics A

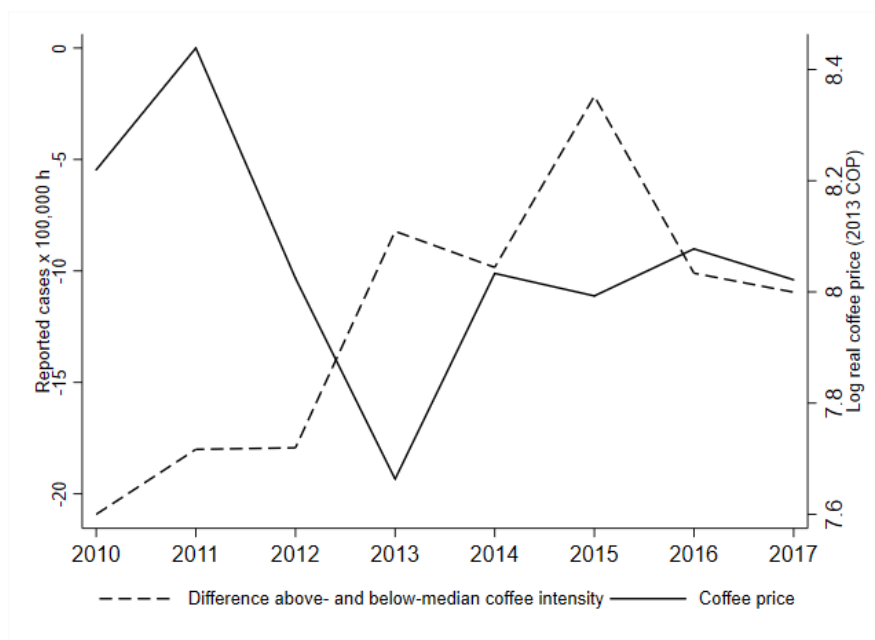| Variables	(1) N	(2) Mean	(3) SD	(4) Min	(5) Max
Municipal domestic violence					
Against women	8,520	16.51	55.93	0	1,385
Against men	8,520	2.08	7.66	0	185
Against women x 100,000 inhabitants	8,520	50.69	67.83	0	654.8
Against men x 100,000 inhabitants	8,520	6.40	13.87	0	367.40
Municipal characteristics					
Coffee producers	8,520	0.557	0.497	0	1
Mean coffee production 2007-2009,	8,520	0.676	1.332	0	10.741
thousands of hectares					
Number of homicides (2010)	8,520	7.80	19.29	0	349
Development index (2010)	8,472	0.522	0.122	0.048	0.897
Total investment in education (2005)	8,416	1.415e+06	5.627e+06	0	8.167e+07
Total coverage of Aqueduct (2005)	8,448	65.63	21.94	0.08	98.70
Total armed groups attacks (2005)	8,496	2.24	5.08	0	62
Annual total precipitation	8,472	1,772	988.70	117.18	7,323
Annual-level variables					
Log internal coffee price, thousands	8	8.06	0.20	7.66	8.44
of 2013 pesos/lb					
Log coffee exports of top 3	8	4.14	0.07	4.04	4.27
coffee producers, millions 60 kg bags					
Woman characteristics					
Rural					
Age	8,889	33.89	8.563	15	49
Q1 age	8,889	0.228	0.420	0	1
Q2 age	8,889	0.254	0.435	0	1
Q3 age	8,889	0.285	0.452	0	1
Q4 age	8,889	0.233	0.423	0	1
Primary or less education	8,889	0.619	0.486	0	1
Secondary education	8,889	0.325	0.468	0	1
Higher education	8,889	0.057	0.231	0	1
Participates in household expenditure decisions	8,889	0.587	0.492	0	1
Mainly decides household expenditures	8,889	0.128	0.334	0	1
Works	8,889	0.451	0.498	0	1
Works in agriculture	8,889	0.213	0.409	0	1
Domestic violence	8,889	0.638	0.480	0	1
Sexual violence	8,889	0.064	0.244	0	1
Psychological violence	8,889	0.610	0.488	0	1
Physical violence	8,889	0.296	0.456	0	1
Urban					
Age	9,160	34.60	8.393	14	49
Q1 age	9,160	0.203	0.402	0	1
Q2 age	9,160	0.250	0.433	0	1
Q3 age	9,160	0.292	0.455	0	1
Q4 age	9,160	0.254	0.436	0	1
Primary or less education	9,160	0.281	0.450	0	1
Secondary education	9,160	0.499	0.500	0	1
Higher education	9,160	0.220	0.414	0	1
Participates in household expenditure decisions	9,160	0.717	0.451	0	1
Mainly decides household expenditures	9,160	0.194	0.395	0	1
Works	9,160	0.562	0.496	0	1
Works in agriculture	9,160	0.020	0.141	0	1
Domestic violence	9,160	0.659	0.474	0	1
Sexual violence	9,160	0.057	0.231	0	1
Psychological violence	9,160	0.636	0.481	0	1
Physical violence	9,160	0.294	0.456	0	1

Note: Source for *Municipal domestic violence* data was provided by INMLCF. Municipal characteristic were retrieved from Panel CEDE. The final sample at the municipality-level consist of 1,065 municipalities. The specific source for each variable is described in Section 7.1. Individual-level data for women is retrieved from the DHS survey. The survey has information for two years: 2010 and 2015. The sample consist of 23,107 women.

Table 2: Descriptive Statistics B

Variables	(1) N	(2) mean	(3) sd	(4) min	(5) max
Partner characteristics					
Rural					
Age	8,889	38.69	9.311	20	60
Age: 20-29	8,889	0.191	0.393	0	1
Age: 30-39	8,889	0.342	0.474	0	1
Age: 40-49	8,889	0.323	0.468	0	1
Age: 50-59	8,889	0.144	0.351	0	1
Primary or less education	8,889	0.690	0.462	0	1
Secondary education	8,889	0.258	0.438	0	1
Higher education	8,889	0.044	0.205	0	1
Don't know level of education	8,889	0.007	0.085	0	1
Urban					
Age	9,160	39.12	9.262	20	60
Age: 20-29	9,160	0.177	0.381	0	1
Age: 30-39	9,160	0.338	0.473	0	1
Age: 40-49	9,160	0.337	0.473	0	1
Age: 50-59	9,160	0.149	0.356	0	1
Primary or less education	9,160	0.351	0.477	0	1
Secondary education	9,160	0.463	0.499	0	1
Higher education	9,160	0.183	0.386	0	1
Don't know level of education	9,160	0.004	0.059	0	1

Note: Source for *Municipal domestic violence* data was provided by INMLCF. Municipal characteristic were retrieved from Panel CEDE. The final sample at the municipality-level consist of 1,065 municipalities. The specific source for each variable is described in Section 7.1. Individual-level data for women is retrieved from the DHS survey. The survey has information for two years: 2010 and 2015. The sample consist of 23,107 women.

Table 3: Gender Roles Perceptions

	Agrees on statement:		
	men has the last word on household decisions	most important role for women is to take care of their home and cook for their family	men are head of households
	Women		
Rural	0.368	0.580	0.663
Urban	0.151	0.295	0.418
	Men		
Rural	0.455	0.620	0.736
Urban	0.225	0.332	0.539

Source: Author's calculations based on the DHS of 2015.

Table 4: Levels of Education in Coffee-Producing Households

	Men	Women
Without information	0.015	0.013
Preschool	0.001	0.001
Basic Primary	0.656	0.623
Basic Secondary	0.088	0.119
Middle	0.054	0.080
Technical	0.007	0.008
Technological	0.003	0.003
Undergraduate	0.009	0.008
Graduate	0.002	0.002
No education	0.166	0.142

Source: Author's calculations based on the National Agricultural Census, 2014.

Table 5: Non-Reporting Municipalities over Period of Interest

BOLIVAR	BOYACA	CALDAS	CAUCA	CHOCO	NARIÑO	AMAZONAS	GUAINIA	VAUPES
Margarita	Chiscas	Marulanda	Lopez	Jurado	Linares	El Encanto	Barranco Minas	Pacoa
Norosi	El Cocuy				Olaya Herrera	La Victoria	Mapiripana	Taraira
	San Mateo					Puerto Alegria	San Felipe	Papunaua
							La Guadalupe	Yavarate
							Cacahual	
							Pana Pana	
							Morichal	

Notes: these 25 municipalities were dropped from the final database because they did not have reported cases of domestic violence from the INMLCF data set during the period 2010-2017.

7.3   Additional Results

Table 6: International Coffee Price x Mean Coffee Production

Variables	(1) Domestic violence against women x 100,000h	(2) Domestic violence against women x 100,000h
International coffee price*Mean production 2007–2009	-3.899***	-4.399***
	(1.450)	(1.554)
Observations	8,520	8,416
Number of municipalities	1,065	1,052
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: Domestic violence against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. International coffee price is the yearly mean Arabica coffee price. In column 2, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 7: First Stage: Municipality-Level IV Estimates

Variables	(1)	(2)
	Internal coffee price*	
	$Q_{2007-2009}$	
CETOP3*$Q_{2007-2009}$	-1.787***	-1.787***
	(0.096)	(0.093)
Kleibergen-Paap F	344.386	369.782
Montiel-Pflueger F	344.386	369.782
Observations	8,520	8,416
Number of municipalities	1,065	1,052
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: This table reports the first stage results of the 2SLS at the municipality-level. The interaction of the internal coffee price with coffee intensity is regressed over the interaction of the coffee export volume of Brazil, Vietnam, and Indonesia with the coffee production average in the years 2007-2009. Internal coffee price is the yearly mean coffee price paid to coffee growers. In column 2, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. Kleibergen-Paap F and Montiel-Pflueger F are reported to test for weak instruments. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 8: First Stage: Individual-Level IV Estimates

Variables	(1)	(2)
	Internal coffee price*	Internal coffee price*
	$Q_{2007-2009}$	$Q_{2007-2009}$
CETOP3*$Q_{2007-2009}$	-0.905***	-0.905***
	(0.045)	(0.044)
Kleibergen-Paap F	428.726	429.550
Montiel-Pflueger F	412.921	413.692
Observations	8,889	8,889
Number of municipalities	329	329
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: This table reports the first stage results of the 2SLS at the individual-level. The interaction of the internal coffee price with coffee intensity is regressed over the interaction of the coffee export volume of Brazil, Vietnam, and Indonesia with the coffee production average in the years 2007-2009. Internal coffee price is the yearly mean coffee price paid to coffee growers. In column 2, I control by individual and household characteristics. Kleibergen-Paap F and Montiel-Pflueger F are reported to test for weak instruments. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 9: Effects of Coffee Price Shocks on Hourly Coffee Sector Wage

Variables	(1) Coffee sector Wage
Internal coffee price*Mean production 2007-2009	0.001***
	(0.000)
Years of education	0.011***
	(0.001)
Women	-0.169***
	(0.015)
Observations	22,130

Notes: This table reports the correlation between a positive shock to coffee prices and the hourly wage for the coffee sector workers. Internal coffee price is the yearly mean coffee price paid to coffee growers. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. The specification controls by years of education and gender. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Robust standard errors are shown in parentheses.

Table 10: LPM Results at the Individual-Level

|	LPM				IV estimates	
	Urban population		*Rural population*			
			Mean Production 2007–2009			
Variables	(1) DV	(2) DV	(3) DV	(4) DV	(5) DV	(6) DV
Internal price*Production	-0.027	-0.025	-0.062*	-0.068**	-0.082**	-0.088**
	(0.060)	(0.058)	(0.036)	(0.035)	(0.041)	(0.040)
Population	-0.134	-0.084	0.356	0.366	0.371	0.381
	(0.395)	(0.392)	(0.280)	(0.274)	(0.282)	(0.277)
Women's characteristics						
Age 16 to 24		0.059***		0.008		0.008
		(0.021)		(0.022)		(0.022)
Age 25 to 32		0.018		0.006		0.006
		(0.017)		(0.017)		(0.017)
Age 33 to 40		0.026*		0.000		0.000
		(0.014)		(0.016)		(0.015)
Primary education or less		0.017		-0.010		-0.010
		(0.018)		(0.024)		(0.024)
Secondary education		0.007		0.010		0.010
		(0.015)		(0.025)		(0.024)
Participate in household expenditure decisions		-0.057***		-0.049***		-0.049***
		(0.011)		(0.011)		(0.011)
Household and partner characteristics						
Family members		0.010***		0.001		0.001
		(0.003)		(0.003)		(0.003)
Partner age - 30 to 39		-0.026		-0.045***		-0.045***
		(0.018)		(0.016)		(0.016)
Partner age - 40 to 49		-0.026		-0.047**		-0.047**
		(0.020)		(0.020)		(0.020)
Partner age - 50 to 60		-0.046**		-0.043*		-0.043*
		(0.023)		(0.023)		(0.023)
Partner education - Primary or less		0.063***		0.047*		0.047*
		(0.017)		(0.026)		(0.026)
Partner education - Secondary		0.056***		0.042*		0.042*
		(0.016)		(0.025)		(0.025)
Partner education - does not know		0.097		0.020		0.020
		(0.082)		(0.071)		(0.070)
Observations	9,144	9,144	8,889	8,889	8,889	8,889
Number of municipalities	329	329	329	329	329	329
Cluster	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes
HH or partner	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the complete results of Table 5. Columns 1-4 are the results of the LPM, and columns 5-6 the results of the 2SLS approach. DV is a dummy variable indicating if a woman suffers psychological, physical, or sexual violence. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. Internal coffee price is the yearly mean coffee price paid to coffee growers. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Figure 7: Individual-Level Income Shock Effect by Type of Violence
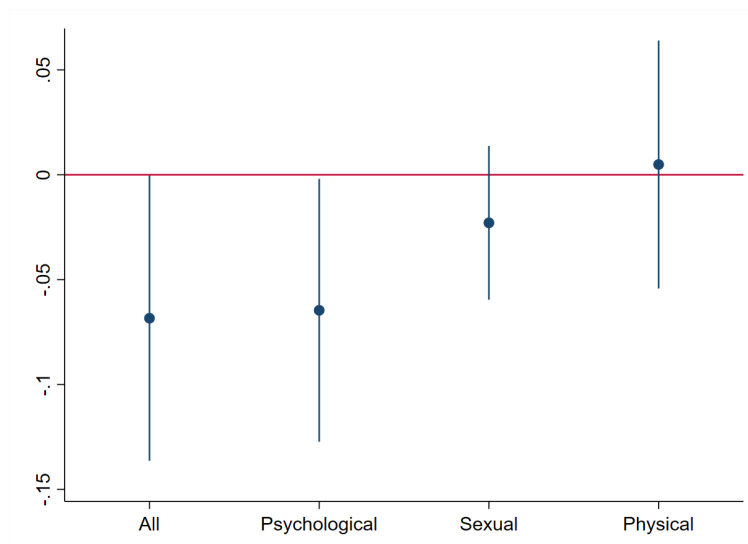
The Figure depicts the coefficient β when estimating equation (4). The regression is estimated separately for each type of violence. The coefficients for all types of violence, and for psychological violence are statistically significant at 5% level. All regressions have municipality and year fixed effects.

Figure 8: Individual-Level Income Shock Effect by Household Head
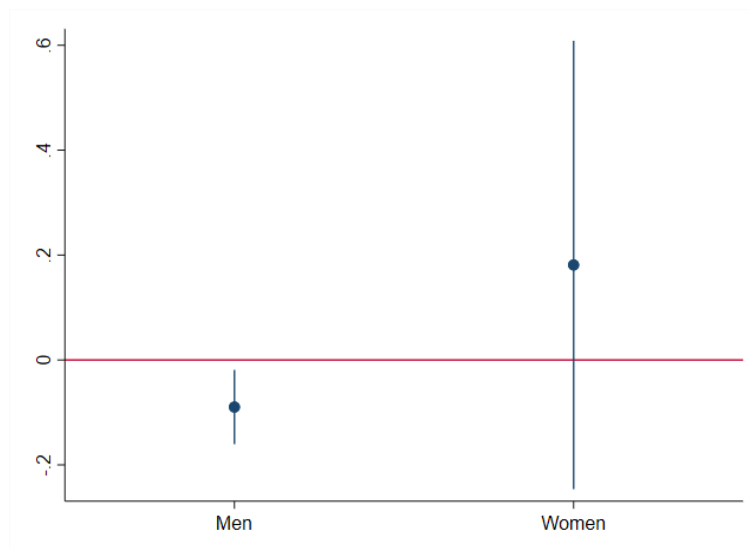
The Figure depicts the coefficient β when estimating equation (4). The regression is estimated separately for men and women. The coefficient for men is statistically significant at 5% level. All regressions have municipality and year fixed effects.

Table 11: Heterogeneous Effects at the Municipality-Level - Labor Market

Variables	(1) Domestic violence against women x 100,000h	(2) Domestic violence against women x 100,000h	(3) Domestic violence against women x 100,000h
P_t*$Q_{m,2007-2009}$	-9.529***	-8.026***	-5.680**
	(3.092)	(2.388)	(2.373)
P_t*$Q_{m,2007-2009}$*High woman's unemployment rate	**12.464***		
	(3.406)		
High woman's unemployment rate*P_t	-40.328***		
	(6.030)		
P_t*$Q_{m,2007-2009}$*Low woman's wage		**6.047**	
		(2.895)	
Low woman's wage*P_t		-9.618	
		(6.897)	
P_t*$Q_{m,2007-2009}$*High gender wage gap			**3.663**
			(2.862)
High gender wage gap*P_t			-16.555**
			(6.756)
Observations	8,112	8,112	8,112
Number of municipalities	1,014	1,014	1,014
Cluster	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Mun FE	Yes	Yes	Yes

Notes: This table reports the heterogeneous effects by labor market variables at the municipality-level. Domestic violence against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. $Q_{2007-2009}$ is the coffee production average in the years 2007-2009 in each municipality. P_t is the internal coffee price paid to growers. High woman's unemployment rate indicates whether a municipality is in a department where the unemployment rate is higher that the value of its median for all Colombia departments. Low woman's wage indicates whether a municipality is in a department where the labor income for women is lower than the value of its median for all Colombian departments. High gender wage gap indicates whether a municipality is in a department where the gender wage gap is higher that the median of all Colombia departments. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 12: Heterogeneous Effects at the Municipality-Level - Rural Index

Variables	(1) Domestic violence against women x 100,000h
P_t*$Q_{m,2007-2009}$	1.770
	(2.603)
P_t*$Q_{m,2007-2009}$*Rural Index	**-7.978***
	(3.406)
Rural Index*P_t	8.124
	(10.016)
Observations	8,776
Number of municipalities	1,097
Cluster	Yes
Year FE	Yes
Mun FE	Yes

Notes: This table reports the heterogeneous effects by rural index at the municipality-level. The sample of municipalities used in this specification include the departmental capitals in Colombia. Domestic violence against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. $Q_{2007-2009}$ is the coffee production average in the years 2007-2009 in each municipality. P_t is the internal coffee price paid to growers. Rural index is measured as the share of rural population over the total population in each municipality. The specification includes municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 13: Heterogeneous Effects at the Individual-Level

Variables	(1) DV
P_t*$Q_{2007-2009}$	-0.051
	(0.036)
P_t*$Q_{2007-2009}$*Women's autonomy	-0.206*
	(0.124)
Observations	8,889
Rural population	Yes
Cluster	Yes
Controls	Yes
HH or partner	Yes

Notes: This table reports the heterogeneous effects by women's autonomy within the household at the individual level. Women's autonomy is a dummy variable equal to 1 if the woman mainly decides large household purchases, purchases for daily needs, her own health care expenses, and how to spend her earnings. DV is a dummy variable indicating if the woman suffers psychological, physical, or sexual violence. $Q_{2007-2009}$ is the coffee production average in the years 2007-2009 in each municipality. P_t is the yearly mean coffee price paid to coffee growers. The specification controls by rural population, individual and household characteristics, and include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 14: Municipality-Level Estimates with the Sample of DHS Municipalities

Variables	(1) DV against women x 100,000h	(2) DV against women x 100,000h
	OLS	
P_t*$Q_{2007-2009}$	-0.900	-2.228
	(1.651)	(1.802)
	IV: $CETOP3$*$Q_{2007-2009}$	
P_t*$Q_{2007-2009}$	-8.628*	-13.779***
	(4.486)	(4.890)
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: This table reports the results at the municipality-level for the sample of DHS municipalities in the years 2010, and 2015. DV against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. $Q_{2007-2009}$ is the coffee production average in the years 2007-2009 in each municipality. P_t is internal coffee price paid to growers. In column 2, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

7.4 Robustness checks

Table 15: Baseline Results Inlcuding the Departmental Capitals

Variables	(1) Domestic violence against women x 100,000h	(2) Domestic violence against women x 100,000h
Internal coffee price*Mean production 2007–2009	-2.903**	-4.156***
	(1.263)	(1.324)
Observations	8,776	8,656
Number of municipalities	1,097	1,082
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: This table reports the baseline results including the departmental capitals in Colombia. Domestic violence against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. Internal coffee price is the yearly mean coffee price paid to growers. In columns 2, and 4, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 16: Baseline Results Including Non-Reporting Municipalities

Variables	(1) Domestic violence against women x 100,000h	(2) Domestic violence against women x 100,000h
Internal coffee price*Mean production 2007–2009	-3.156**	-3.870***
	(1.283)	(1.391)
Observations	8,720	8,496
Number of municipalities	1,090	1,062
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: This table reports the baseline results including municipalities that do not experience any case of domestic violence in the period 2010-2017. Domestic violence against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. Internal coffee price is the yearly mean coffee price paid to growers. In columns 2, and 4, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 17: Internal Coffee Price x 1997 and 2010 Coffee Production

Variables	(1) DV against women x 100,000h	(2) DV against women x 100,000h	(3) DV against women x 100,000h	(4) DV against women x 100,000h
	Q_m = Coffee production 1997		Q_m = Coffee production 2010	
Internal coffee price*Q_m	-3.404***	-3.721***	-3.589***	-4.073***
	(1.267)	(1.340)	(1.323)	(1.416)
Observations	7,504	7,440	8,520	8,416
Number of municipalities	938	930	1,065	1,052
Cluster	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Mun FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Notes: DV against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. In columns 1, and 2, Q_m is the coffee production in 1997 at the municipality-level. In columns 3, and 4, Q_m is the coffee production in 2010 at the municipality-level. Internal coffee price is the yearly mean coffee price paid to growers. In columns 2, and 4, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.

Table 18: Baseline Results Without the Most Coffee-Producing Municipalities

Variables	(1) Domestic violence against women x 100,000h	(2) Domestic violence against women x 100,000h
Internal coffee price*Mean production 2007–2009	-4.355**	-5.286***
	(1.923)	(1.907)
Observations	8,416	8,312
Number of municipalities	1,052	1,039
Cluster	Yes	Yes
Year FE	Yes	Yes
Mun FE	Yes	Yes
Controls	No	Yes

Notes: This table reports the baseline results excluding municipalities that ever produced more than 1% of the total coffee production in Colombia in any year during the period 2010-2017. Domestic violence against women X 100,000h represents domestic violence against women per 100,000 inhabitants in each municipality. Mean production 2007-2009 is the coffee production average in the years 2007-2009 in each municipality. Internal coffee price is the yearly mean coffee price paid to growers. In columns 2, and 4, I control by municipality characteristics including total attacks by armed groups, number of homicides, total investment in education, and an index of municipal development. All specifications include municipality and year fixed effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively. Standard errors are clustered at the municipality-level and are shown in parentheses.